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The Global Innovation Index 2016

Winning with Global Innovation

Confederation of Indian Industry

ATKearney

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The Global Innovation Index 2016

Winning with Global Innovation

Soumitra Dutta, Bruno Lanvin, and **Sacha Wunsch-Vincent**
Editors

Confederation of Indian Industry

ATKearney

IMPrOve academy

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Releasing the Global Innovation Index 2016: Winning with Global Innovation

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We are pleased to present the Global Innovation Index (GII) 2016 on the theme 'Winning with Global Innovation'.

The geography and process of innovation have changed considerably since the first GII. Science and research and development (R&D) are now more open, collaborative, and geographically dispersed. R&D efforts are simultaneously more globalized and more localized while an increasing variety of actors in emerging countries contributes to enrich the innovation landscape.

Arguably, everyone stands to gain from global innovation. More resources are now spent on innovation and related factors globally than at any other given point in human history. Thus far, however, innovation has sometimes not been portrayed as a global win-win proposition. Two factors explain this state of affairs: First, evidence regarding the organization and outcomes of the new global innovation model is lacking. Second, governments and institutions need to approach global innovation as a positive-sum proposition and tailor policies accordingly.

The 2016 edition of the GII is dedicated to this theme. The report aims to contribute an analysis of global innovation as a win-win proposition and so facilitate improved policy making.

Over the last nine years, the GII has established itself as both a leading reference on innovation and a 'tool for action' for decision makers. The launch events of the GII rotate across capitals of the world to ensure visibility of this data-driven exercise and a high degree of implementation on the ground. After a launch hosted by the Australian government in 2014, in 2015 the UK's then Minister for Intellectual Property, Baroness Neville-Rolfe, hosted the launch of the GII in London. Following the 2016 global launch, regions and countries will use the GII as a tool for action as in previous years. In addition, the theme chosen for the 2016 edition of the GII and the indicators themselves can make a contribution to the debates on the Sustainable Development Goals (SDGs) adopted by the United Nations in November 2015.

We thank our Knowledge Partners, the Confederation of Indian Industry (CII), du, and A.T. Kearney and IMP³rove – European Innovation Management Academy for their support of this year's report.

Likewise, we thank our prominent Advisory Board, which has been enriched by two new members this year: Fabiola Gianotti, Director-General of the European Organization for Nuclear Research (CERN), and Pedro Wongtschowski, Member of the Board of Directors of Ultrapar Participações S.A. and of Embraer S.A.; Chairman of the Board of Directors of the Brazilian Enterprise for Research and Innovation (EMBRAPII) and of the Brazilian Association of Innovative Companies (ANPEI).

We hope that the collective efforts of innovation actors using the GII will continue to pave the way for better innovation policies around the world.

Soumitra Dutta
Dean, College of Business, Cornell University

Francis Gurry
Director General, World Intellectual Property Organization

Bruno Lanvin
Executive Director for Global Indices, INSEAD

Global Innovation, Local Innovators

For several years now, A.T. Kearney has taken a somewhat distinct stance on innovation. Innovation, in our view, is the culmination of a strong global network that, when combined with local expertise, forges a deeper understanding of the needs and dynamics of markets—ultimately triggering an unconstrained flow of ideas.

For us at A.T. Kearney, this plays out annually at our Global Innovator Days, an innovation competition in which colleagues from our 59 offices in 40 countries form teams and submit their latest thinking on concepts that can add value for our clients. Team members are from a variety of practices, geographies, and ranks; they bring their local perspectives, expertise, and sheer enthusiasm to the table. Global Innovator Days is well known for regularly challenging our assumptions, frequently leveraging digital technologies, and always opening up new opportunities.

But executing a global innovation strategy and creating lasting value is a challenging task for any corporation. Our research, conducted as part of our work for the Global Innovation Index (GII), finds that the innovation activities of more than 7 out of 10 companies—regardless of their local or global footprints—are becoming more global. Companies expect their innovation network to grow. Within that network, the role of customer-driven innovation, start-ups, and suppliers, as well as research institutes and academia, is especially expected to grow. Success is to a large extent driven by the collaboration capabilities of all parties involved, and this trend is expected to continue.

This is an exciting development. Collaboration is essential for unlocking the innovation potential of large corporations as well as small and medium-sized innovators, who may have outstanding ideas but lack the market access to commercialize them successfully. Matching David and Goliath, however, is far from being trivial. Setting up and maintaining partnerships are processes that take skills that many organizations lack or overlook. Differences in corporate culture, a fear of sharing, and keeping the partnership relevant can all become obstacles to successful innovation if these issues are not addressed. Our recent work as a Knowledge Partner of the World Economic Forum on collaborative innovation has shown that innovative approaches and a culture conducive to collaboration from all parties involved are needed to make global innovation work. These capabilities are the key to unlocking the leverage inherent in complementary resources.

Who will benefit most from these developments and how can others foster their innovation capabilities? A.T. Kearney, in collaboration with IMP^{3}rove - European Innovation Management Academy (nonprofit), works with countries, regions, industries, sectors, and companies of all sizes and profiles to support innovation and digitization management capabilities. At the core of our approach and suite of services is a proprietary rapidly growing database of 7,000 company-specific innovation assessments. These allow us to support policy makers, intermediaries, and business leaders in profiling strengths and challenges in innovation management and to highlight areas in which action needs to be taken to accelerate profitable growth and wealth.

I would like to thank the GII team for their excellent work on the 2016 report, and especially for their timely and in-depth research on the theme 'Winning with Global Innovation'. We are delighted to be partners in the effort to advance global innovation—with local innovators—as a strategic priority.

Johan Aurik
Managing Partner and Chairman of the Board
A.T. Kearney

Local Problems, Global Solutions: The Globalization of Innovation as a Win-Win Proposition

Gone are the days when the local could not drive the global. As nations in the developing world become ever more globalized, innovation linkages are quickly gaining prominence, leading to collaboration among nations involving academia and industry as a key driver of economic growth.

In today's competitive world, both developed and developing countries need to come up with joint innovative solutions to counter global challenges; simultaneously they need to address the pressing needs of their respective populations. These twin goals can be achieved by empowering global citizens to think independently and to risk transforming their ideas into value propositions.

Innovation is now a critical factor in the growth of dynamic clusters of nations that support policies that empower people beyond national boundaries with the ability to solve problems at all levels—individual, societal, regional, and global. This growing trend of increasing global connectivity necessitates a standardized way of measuring and analysing innovation data through key indicators.

The Global Innovation Index (GII) has been ranking world economies since 2007 according to their innovation capabilities and results using approximately 80 indicators that include measures of human capital development and research, development funding, university performance, and international dimensions of patent applications, among a host of other important parameters. Over the years, the GII has demonstrated that the innovation capacity of any nation is measured not only by what it does locally, but also by how it impacts the entire globe. Issues such as poverty, health, urbanization, access to water, and climate change are of a global nature but, at the same time, both the challenges and their solutions have local consequences. Therefore innovative breakthroughs that provide local solutions in the developing world can have a global impact and can provide an opportunity for sharing among other emerging nations for mutual benefit.

Over the course of its nine-year journey, the GII has become a well-known and credible reference on innovation policy. This year the GII has attempted to understand the globalization of innovation in its various permutations and combinations to analyse the ways in which this is a positive-sum game where all stakeholders stand to gain. In addition, the present edition of the GII seeks to present the case for an extension of policy approaches that goes beyond national priorities towards global innovation cooperation, especially South–South cooperation.

The GII 2016 includes chapters containing powerful insights from some of the most influential policy makers, academics, and industrialists in the world. These chapters expand the knowledge base on global innovation, and they demonstrate how national policies for innovation should be aligned with tackling global needs and geared towards solving global challenges.

I would like to congratulate the GII team for their passionate stewardship of the promotion of global innovation. We, at CII, are delighted to be a Knowledge Partner and contributor to the current volume, which aims to positively influence all its readers.

Chandrajit Banerjee
Director General
Confederation of Indian Industry

Global Innovation: An Accelerated Path for Growth

In today's economic climate, innovation—technological innovation in particular—is considered to be a major force for economic growth. The convergence of data analytics, commerce, and technological progress is seen as a key driver of innovation in the global economy. Moreover, entrepreneurship, evolving business models, and technological progress are at the heart of innovation.

Over the past year, we have witnessed incredible growth in technology on a global scale. More and more entities are working together to innovate and create an impact, not only nationally but globally—in what is commonly referred to as the 'sharing economy'. What started off with participants at an individual level is materializing into participation at enterprise and government levels.

The United Arab Emirates (UAE) has always been a keen supporter of innovation. Last year the country took a collaborative approach to smart city transformation, acknowledging the joint efforts of the public and private sector in accomplishing its objectives. Dubai, in particular, is looking towards technological innovation to meet its goal of becoming the smartest city in the world by 2017. With happiness as the ultimate measure of success, the city is investing in an array of smart service initiatives—including smart parking meters, smart energy meters, and smart waste management—all meant to bring about a greater degree of convenience and satisfaction, and ultimately happiness, for its residents.

To achieve its goal of making Dubai the smartest city, the UAE government continues to encourage collaboration among public and private stakeholders to drive the move towards diversification and encourage the entrepreneurial aspirations of both individual players and small, medium, and large businesses, which can play an increasing role in the national and global economy. In addition, the government has anticipated the positive impact of innovation; hence the UAE Vision 2021 national agenda takes on a global strategy to ensure that the country becomes a major contributor to innovation at an international level.

The theme of this year's Global Innovation Index (GII), 'Winning with Global Innovation', particularly emphasizes the ways in which globalized innovation strategy is a win-win prospect for all: it inspires greater investment into industries previously not linked with innovation, and allows for cross-border investments that create benefits for the larger economy.

At du, we have long been advocates of collaboration. Today we are proud to be the official Smart City Partner for the UAE government. As part of our collaboration, we have recently entered into a strategic partnership with Smart Dubai to develop and implement the Smart Dubai Platform, a digital backbone that will power the city in the near future. The Smart Dubai Platform will be the central operating system for the city, providing access to city services and data for all individuals and businesses in the private sector as well as public sector entities. We have long been advocates of change, and rethinking the way that we are communicating on a national level meshes well with our regional strategy.

We are very proud to have been associated with the Global Innovation Index for the past four years. The GII report is a useful barometer on an economy's innovation performance, and it provides valuable tools that we, and every economy wanting to enhance its innovation capacity, can use.

Osman Sultan
Chief Executive Officer
du

Contributors to the Report

The Global Innovation Index 2016: Winning with Innovation was developed under the general direction of **Francis GURRY** (Director General, World Intellectual Property Organization), and the editors of the report, **Soumitra DUTTA, Bruno LANVIN,** and **Sacha WUNSCH-VINCENT.**

The report was prepared and coordinated by a core team comprising:

CORE TEAM

Soumitra DUTTA, Dean, College of Business, Cornell University

Rafael ESCALONA REYNOSO, GII Lead Researcher, College of Business, Cornell University

Jordan LITNER, GII Project Manager, College of Business, Cornell University

Bruno LANVIN, Executive Director for Global Indices, INSEAD

Sacha WUNSCH-VINCENT, Senior Economist, Economics and Statistics Division, WIPO

The following persons and institutions have supported the production of the GII:

CO-PUBLISHERS

Cornell University

Shannon DORTCH, Associate Director, Public and Media Relations, Samuel Curtis Johnson Graduate School of Management, Cornell University

INSEAD

Christine HIRZEL, Global Head, Boards & External Relations

Sophie BADRE, Director, Media Relations Europe & Asia

Virginie BONGEOT-MINET, Centre Coordinator

Chris HOWELLS, Managing Editor, INSEAD Knowledge

Aileen HUANG, Assistant Director, Media Relations, Asia

World Intellectual Property Organization (WIPO)

Carsten FINK, Chief Economist, Economics and Statistics Division

Kritika SAXENA, Innovation Economics Section

WIPO IP Statistics Section

WIPO Communications Division

WIPO External Relations Division and WIPO Coordination Office in New York

WIPO Office in China

WIPO Printing Plant

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Confederation of Indian Industry

Anjan DAS, Executive Director

Jibak DASGUPTA, Deputy Director

du

Hala BADRI, Executive Vice President, Brand and Communications

Humaida AL KHALSAN, Director Corporate Communications Projects & Sustainability

Maryam AL BALOOSHI, PR Lead, Corporate

Sveccha KUMAR, Manager, Corporate Sustainability

Yasmine ABDELAZIZ, Public Relations and Media Senior Specialist, Chief Executive Officer's Office

A.T. Kearney

Nigel P. ANDRADE, Partner

Violetka DIRLEA, Partner

Nikolai DOBBERSTEIN, Partner

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Sherri HE, Partner

Naveen MENON, Partner

Erik R. PETERSON, Partner and Managing Director, Global Business Policy Council

Dan STARTA, Partner

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Branko ZIBRET, Partner

Mauricio ZUAZUA, Partner

Olivier GERGELE, Principal

Bharat KAPOOR, Principal

Harman LIDDER, Principal

Michael ROMKEY, Principal

Benoit BOUVARD,, Manager

Krzysztof JEDZINIAK, Manager

(Continued on next page)

A.T. Kearney *(continued)*

Karin DUKE-ROEDLER, Strategic Content Manager

Ben COPCUTT, Head of Asia-Pacific Marketing

Anja VINTER, EMEA Marketing Coordinator

Jim BROWN, Marketing Director North America

IMP^{3}rove – European Innovation Management Academy

Eva DIEDRICHS, Managing Director

Martin RUPPERT, Managing Director

Nils DÜLFER, Associate

DIRECT COLLABORATORS

Antanina GARANASVILI, PhD Candidate in Economics, University of Padova and Queen Mary, University of London

Michaela SAISANA, Project Leader, Competence Centre on Composite Indicators & Scoreboards (COIN), European Commission, Joint Research Centre; and **Sven LANGEDIJK,** Head of Unit, Econometrics and Applied Statistics, European Commission, Joint Research Centre

Giovanni ANELLI, Knowledge Transfer Group Leader; and **Fabienne MARCASTEL,** Art Director, Design and Visual Identity Service Leader, both from the European Organization for Nuclear Research (CERN)

Alexandra BERNARD, Consultant on Innovation Metrics

Hope STEELE, Principal and Editor, Steele Editorial Services

Neil WEINBERG, Principal, Neil Weinberg Design

DATA COLLABORATORS

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David BESCOND, Department of Statistics, International Labour Office (ILO)

Mohsen BONAKDARPOUR, Managing Director, IHS Economics

Barbara D'ANDREA, Senior Statistician, and **Sanja BLAZEVIC,** Statistician, International Trade Statistics Section; **Adelina MENDOZA,** Senior Statistical Officer, Market Access Intelligence Section, all from the Economic Research and Statistics Division, World Trade Organization (WTO)

Thierry GEIGER, Head of Quantitative Research and Analytics, and **Attilio DI BATTISTA,** Quantitative Economist, both from Global Competitiveness and Risks, Word Economic Forum

Dong GUO, Statistician; **Rita LANG,** Senior Statistical Assistant; **Jürgen MUTH,** Senior Statistical Assistant; and **Valentin TODOROV,** Senior Information Management Officer, all from the Statistics Division, Policy, Research and Statistics Department, United Nations Industrial Development Organization (UNIDO)

Héctor HERNANDEZ, Project Leader – Scoreboard, Joint Research Centre; **Fernando HERVÁS,** IRITEC Group Leader, Joint Research Centre; **Alexander TUEBKE,** Project Leader – Scoreboard, Joint Research Centre, all from the Institute for Prospective Technological Studies, Unit Knowledge for Growth

Élise LEGAULT, Programme Specialist, and **Chiao-Ling CHIEN,** Assistant Programme Specialist, Education Indicators and Data Analysis Section; **Lydia DELOUMEAUX,** Assistant Programme Specialist, and **Lisa BARBOSA,** Statistical Assistant, Culture Unit; **Martin SCHAAPER,** Programme Specialist, **Luciana MARINS** and **Rohan PATHIRAGE,** Assistant Programme Specialists, and **Zahia SALMI** and **Wilfried AMOUSSOU-GUÉNOU,** Statistical Assistants, Science, Technology and Innovation Unit, all from the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS)

Sebastien MIROUDOT, Senior Trade Policy Analyst, Trade in Services Division, Trade and Agriculture Directorate (OECD)

Ben SOWTER, Head of Division, QS Intelligence Unit, QS Quacquarelli Symonds Ltd

Petra STEINER, Key Account Manager, Bureau van Dijk Electronic Publishing GmbH

Susan TELTSCHER, Head; **Esperanza MAGPANTAY,** Senior Statistician; **Ivan VALLEJO,** Market Analyst; and **Nathalie DELMAS,** Assistant, at the ICT Data and Statistics Division (IDS), Telecommunication Development Bureau (BDT), International Telecommunication Union (ITU)

Clement WOLF, Public Policy Manager, Google

Matthew ZOOK, Professor at the University of Kentucky and President, ZookNIC Inc.

Energy Data Centre, headed by Duncan Millard, International Energy Agency (IEA)

United Nations Commodity Trade Statistics Database, Department of Economic and Social Affairs/ Statistics Division, **http://comtrade.un.org/db/**

PwC Global entertainment and media outlook 2015–2019, www.pwc.com/outlook

Advisory Board to the Global Innovation Index

In 2011, an Advisory Board was set up to provide advice on the research underlying the Global Innovation Index (GII), generate synergies at its stages of development, and assist with the dissemination of its messages and results. The Advisory Board is a select group of leading international practitioners and experts with unique knowledge and skills in the realm of innovation. Its members, while coming from diverse geographical and institutional backgrounds (international organizations, the public sector, non-governmental organizations, business, and academia), participate in their personal capacity. We are grateful for the time and support provided by the Advisory Board members.

In 2016, we welcome two new members to the Advisory Board: Fabiola Gianotti, Director-General of the European Organization for Nuclear Research (CERN); and Pedro Wongtschowski, Member of the Board of Directors of Ultrapar Participações S.A. and of Embraer S.A., and Chairman of the Board of Directors of the Brazilian Enterprise for Research and Innovation (EMBRAPII) and of the Brazilian Association of Innovative Companies (ANPEI).

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ADVISORY BOARD MEMBERS

Robert D. ATKINSON
President, The Information Technology and Innovation Foundation (ITIF), United States of America

Irina BOKOVA
Director General of the United Nations Educational, Scientific and Cultural Organization (UNESCO)

Dongmin CHEN
Professor/Dean, School of Innovation and Entrepreneurship and Director, Office of Business Development for Science and Technology, Peking University, China

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Program Director, National Science Foundation (NSF), United States of America

Raghunath Anant MASHELKAR
Chairman, National Innovation Foundation and President, Global Research Alliance

Mary O'KANE
Professor, NSW Chief Scientist and Engineer, Australia

Sibusiso SIBISI
President and Chief Executive Officer, Council for Scientific and Industrial Research (CSIR), South Africa

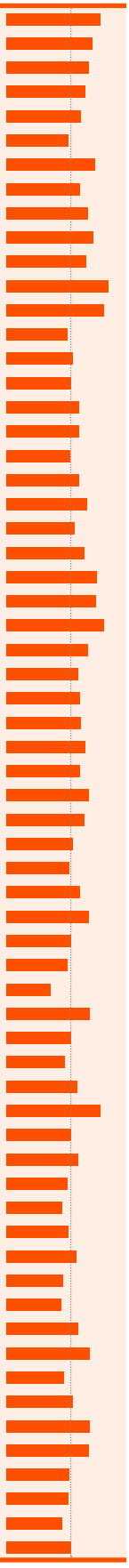
Pedro WONGTSCHOWSKI
Member of the Board of Directors of Ultrapar Participações S.A. and of Embraer S.A.; Chairman of the Board of Directors of the Brazilian Enterprise for Research and Innovation (EMBRAPII) and of the Brazilian Association of Innovative Companies (ANPEI)

Houlin ZHAO
Secretary-General, International Telecommunication Union (ITU)

Rankings

Global Innovation Index 2016 rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank
Switzerland	66.28	1	HI	1	EUR	1	0.94	5
Sweden	63.57	2	HI	2	EUR	2	0.86	10
United Kingdom	61.93	3	HI	3	EUR	3	0.83	14
United States of America	61.40	4	HI	4	NAC	1	0.79	25
Finland	59.90	5	HI	5	EUR	4	0.75	32
Singapore	59.16	6	HI	6	SEAO	1	0.62	78
Ireland	59.03	7	HI	7	EUR	5	0.89	8
Denmark	58.45	8	HI	8	EUR	6	0.74	34
Netherlands	58.29	9	HI	9	EUR	7	0.82	20
Germany	57.94	10	HI	10	EUR	8	0.87	9
Korea, Rep.	57.15	11	HI	11	SEAO	2	0.80	24
Luxembourg	57.11	12	HI	12	EUR	9	1.02	1
Iceland	55.99	13	HI	13	EUR	10	0.98	3
Hong Kong (China)	55.69	14	HI	14	SEAO	3	0.61	83
Canada	54.71	15	HI	15	NAC	2	0.67	57
Japan	54.52	16	HI	16	SEAO	4	0.65	65
New Zealand	54.23	17	HI	17	SEAO	5	0.73	40
France	54.04	18	HI	18	EUR	11	0.73	44
Australia	53.07	19	HI	19	SEAO	6	0.64	73
Austria	52.65	20	HI	20	EUR	12	0.73	43
Israel	52.28	21	HI	21	NAWA	1	0.81	23
Norway	52.01	22	HI	22	EUR	13	0.68	55
Belgium	51.97	23	HI	23	EUR	14	0.78	27
Estonia	51.73	24	HI	24	EUR	15	0.91	6
China	50.57	25	UM	1	SEAO	7	0.90	7
Malta	50.44	26	HI	25	EUR	16	0.98	2
Czech Republic	49.40	27	HI	26	EUR	17	0.82	21
Spain	49.19	28	HI	27	EUR	18	0.72	48
Italy	47.17	29	HI	28	EUR	19	0.74	33
Portugal	46.45	30	HI	29	EUR	20	0.75	31
Cyprus	46.34	31	HI	30	NAWA	2	0.79	26
Slovenia	45.97	32	HI	31	EUR	21	0.74	39
Hungary	44.71	33	HI	32	EUR	22	0.83	17
Latvia	44.33	34	HI	33	EUR	23	0.78	28
Malaysia	43.36	35	UM	2	SEAO	8	0.67	59
Lithuania	41.76	36	HI	34	EUR	24	0.63	75
Slovakia	41.70	37	HI	35	EUR	25	0.74	36
Bulgaria	41.42	38	UM	3	EUR	26	0.83	16
Poland	40.22	39	HI	36	EUR	27	0.65	66
Greece	39.75	40	HI	37	EUR	28	0.61	84
United Arab Emirates	39.35	41	HI	38	NAWA	3	0.44	117
Turkey	39.03	42	UM	4	NAWA	4	0.84	13
Russian Federation	38.50	43	HI	39	EUR	29	0.65	69
Chile	38.41	44	HI	40	LCN	1	0.59	91
Costa Rica	38.40	45	UM	5	LCN	2	0.71	50
Moldova, Rep.	38.39	46	LM	1	EUR	30	0.94	4
Croatia	38.29	47	HI	41	EUR	31	0.65	68
Romania	37.90	48	UM	6	EUR	32	0.72	46
Saudi Arabia	37.75	49	HI	42	NAWA	5	0.61	85
Qatar	37.47	50	HI	43	NAWA	6	0.56	97
Montenegro	37.36	51	UM	7	EUR	33	0.62	80
Thailand	36.51	52	UM	8	SEAO	9	0.70	53
Mauritius	35.86	53	UM	9	SSF	1	0.57	95
South Africa	35.85	54	UM	10	SSF	2	0.55	99
Mongolia	35.74	55	UM	11	SEAO	10	0.72	47
Ukraine	35.72	56	LM	2	EUR	34	0.84	12
Bahrain	35.48	57	HI	44	NAWA	7	0.58	92
TFYR of Macedonia	35.40	58	UM	12	EUR	35	0.67	56
Viet Nam	35.37	59	LM	3	SEAO	11	0.84	11
Armenia	35.14	60	LM	4	NAWA	8	0.83	15
Mexico	34.56	61	UM	13	LCN	3	0.63	76
Uruguay	34.28	62	HI	45	LCN	4	0.62	81
Colombia	34.16	63	UM	14	LCN	5	0.56	96
Georgia	33.86	64	LM	5	NAWA	9	0.65	67



Global Innovation Index 2016 rankings *(continued)*

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.65
Serbia	33.75	65	UM	15	EUR	36	0.65	70	
India	33.61	66	LM	6	CSA	1	0.66	63	
Kuwait	33.61	67	HI	46	NAWA	10	0.73	42	
Panama	33.49	68	UM	16	LCN	6	0.66	61	
Brazil	33.19	69	UM	17	LCN	7	0.55	100	
Lebanon	32.70	70	UM	18	NAWA	11	0.73	41	
Peru	32.51	71	UM	19	LCN	8	0.51	109	
Morocco	32.26	72	LM	7	NAWA	12	0.66	64	
Oman	32.21	73	HI	47	NAWA	13	0.53	103	
Philippines	31.83	74	LM	8	SEAO	12	0.71	49	
Kazakhstan	31.51	75	UM	20	CSA	2	0.51	108	
Dominican Republic	30.55	76	UM	21	LCN	9	0.62	82	
Tunisia	30.55	77	UM	22	NAWA	14	0.60	86	
Iran, Islamic Rep.	30.52	78	UM	23	CSA	3	0.71	51	
Belarus	30.39	79	UM	24	EUR	37	0.45	116	
Kenya	30.36	80	LM	9	SSF	3	0.76	30	
Argentina	30.24	81	HI	48	LCN	10	0.56	98	
Jordan	30.04	82	UM	25	NAWA	15	0.67	58	
Rwanda	29.96	83	LI	1	SSF	4	0.38	123	
Mozambique	29.84	84	LI	2	SSF	5	0.73	45	
Azerbaijan	29.64	85	UM	26	NAWA	16	0.54	101	
Tajikistan	29.62	86	LM	10	CSA	4	0.77	29	
Bosnia and Herzegovina	29.62	87	UM	27	EUR	38	0.46	115	
Indonesia	29.07	88	LM	11	SEAO	13	0.71	52	
Jamaica	28.97	89	UM	28	LCN	11	0.53	104	
Botswana	28.96	90	UM	29	SSF	6	0.42	119	
Sri Lanka	28.92	91	LM	12	CSA	5	0.70	54	
Albania	28.38	92	UM	30	EUR	39	0.40	121	
Namibia	28.24	93	UM	31	SSF	7	0.54	102	
Paraguay	28.20	94	UM	32	LCN	12	0.62	77	
Cambodia	27.94	95	LI	3	SEAO	14	0.59	90	
Bhutan	27.88	96	LM	13	CSA	6	0.28	128	
Guatemala	27.30	97	LM	14	LCN	13	0.62	79	
Malawi	27.26	98	LI	4	SSF	8	0.74	38	
Uganda	27.14	99	LI	5	SSF	9	0.52	106	
Ecuador	27.11	100	UM	33	LCN	14	0.60	87	
Honduras	26.94	101	LM	15	LCN	15	0.53	105	
Ghana	26.66	102	LM	16	SSF	10	0.60	88	
Kyrgyzstan	26.62	103	LM	17	CSA	7	0.50	110	
El Salvador	26.56	104	LM	18	LCN	16	0.48	113	
Tanzania, United Rep.	26.35	105	LI	6	SSF	11	0.81	22	
Senegal	26.14	106	LM	19	SSF	12	0.66	62	
Egypt	25.96	107	LM	20	NAWA	17	0.63	74	
Côte d'Ivoire	25.80	108	LM	21	SSF	13	0.82	19	
Bolivia, Plurinational St.	25.24	109	LM	22	LCN	17	0.59	89	
Ethiopia	24.83	110	LI	7	SSF	14	0.83	18	
Madagascar	24.79	111	LI	8	SSF	15	0.74	35	
Mali	24.77	112	LI	9	SSF	16	0.74	37	
Algeria	24.46	113	UM	34	NAWA	18	0.49	111	
Nigeria	23.15	114	LM	23	SSF	17	0.67	60	
Nepal	23.13	115	LI	10	CSA	8	0.58	94	
Nicaragua	23.06	116	LM	24	LCN	18	0.41	120	
Bangladesh	22.86	117	LM	25	CSA	9	0.52	107	
Cameroon	22.82	118	LM	26	SSF	18	0.58	93	
Pakistan	22.63	119	LM	27	CSA	10	0.64	71	
Venezuela, Bolivarian Rep.	22.32	120	HI	49	LCN	19	0.46	114	
Benin	22.25	121	LI	11	SSF	19	0.43	118	
Burkina Faso	21.05	122	LI	12	SSF	20	0.28	127	
Burundi	20.93	123	LI	13	SSF	21	0.39	122	
Niger	20.44	124	LI	14	SSF	22	0.36	125	
Zambia	19.92	125	LM	28	SSF	23	0.64	72	
Togo	18.42	126	LI	15	SSF	24	0.36	124	
Guinea	17.24	127	LI	16	SSF	25	0.49	112	
Yemen	14.55	128	LM	29	NAWA	19	0.34	126	

Note: World Bank Income Group Classification (July 2015): LI = low income; LM = lower-middle income; UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

Key Findings

Key Findings of Chapter 1

The six key findings of Chapter 1 of the GII 2016 are pertinent to this year's theme of 'Winning with Global Innovation'. They fall into two general categories: strategies for innovation that can support global goals and observations about geographic regions.

Finding 1: Leveraging global innovation to avoid a continued low-growth scenario

Investments in research and development (R&D) and innovation are central for economic growth. Whether we consider the longstanding champions of innovation—typically the countries that have been repeatedly part of the top 25 of the GII—or those, such as China, the Republic of Korea, and Singapore, that have made continuous and rapid progress, we see a common pattern by which innovation has remained a key priority, supported by a steady flow of R&D spending.

The global economy is not back on track. Concerns about weak future output growth and low productivity are now serious. In this light, uncovering new sources of productivity and future growth are the priority. More efforts are needed to return to pre-crisis R&D growth levels and to counteract an apparent R&D expenditure slowdown in 2014, which was caused by both slower growth in China and other emerging economies and tighter R&D budgets in high-income economies.

The question faced by the innovation community is how to more systematically spread R&D to low- and middle-income economies, thus avoiding an overreliance on a handful of countries to drive global R&D growth. Even leading emerging countries, including China, still spend only a small share of their research budget on basic R&D; instead they focus on applied R&D and development.

Policy makers are urged to step up public investments in innovation to boost short-term demand and to raise long-term growth potential. Successful innovation strategies cannot afford 'stop-and-go' approaches: if R&D expenses or incentives to innovators are not sustained, the progress accumulated in previous years can vanish quickly.

Finding 2: Need for a global innovation mindset and fresh governance frameworks

It is now common wisdom that science and innovation are more internationalized and collaborative than ever before. All stand to gain from global innovation. First, more innovation investments are conducted today than at any other time. Second, through international openness, the potential for global knowledge spillovers are on the rise. Finally, innovation actors in emerging countries now make meaningful contributions to local and global innovation.

Still, innovation is sometimes not portrayed as a global win-win proposition. On the contrary, most metrics and innovation policies are designed for the national level. Countries are regularly perceived as 'contenders rather than collaborators'. In some cases, 'techno-nationalist policies' erecting barriers to different knowledge flows have become a popular endeavour.

What is needed to better communicate and amplify the benefits of global innovation and related cooperation? First, measurable evidence regarding the organization and outcomes of the current global innovation model is missing. Although empirical economic work has gone a long way towards supporting international trade as a win-win strategy and in constructing appropriate indicators, the same is not true for global innovation.

Second, although difficult to measure, there seems to be ample scope to expand global corporate and public R&D cooperation. Business strategies and public policies need to better approach innovation as a global positive—rather than as a zero-sum—proposition and better complement the realm of national innovation systems.

For firms, global innovation has been a long time in the making. Yet, despite this positive trend, untapped potential exists according to the analysis presented in this report. Most companies in high-income countries

and nearly all firms in emerging economies still run all of their innovation activities at their corporate centres. A new corporate innovation culture is required to benefit from global innovation. This entails flatter hierarchies and increased cross-functional collaboration across R&D, supply chain management, and marketing; a diversified talent pool that brings in fresh perspectives and skills; an environment that encourages risk-taking; and experimenting with novel partnership models and innovation platforms.

For national policy making, facilitating increased international collaboration and complementing inward with more outward-looking approaches is key to sustained success in innovation. New ideas are emerging in different parts of the globe and successful innovation strategies have to leverage them effectively. Identifying barriers to global cooperation and the flow of ideas should be a new innovation policy priority. Fiscal incentives, grants, and other national innovation policies could more explicitly favour international collaboration and the diffusion of knowledge across borders. Calls for proposals could, more often, be jointly issued by multiple countries, particularly when convening large-scale, multi-disciplinary programmes or when planning large critical research infrastructure.

Science and innovation policies should also become more inclusive of developing countries. Revamping official development assistance with the inclusion of R&D and innovation components is a welcome development. The crafting of globally focused demand-side innovation policies to support the generation and diffusion of innovation addressing local needs must also be a priority of policy makers. Appropriate innovation for and from low- and lower-middle-income economies is desperately needed.

Are new governance systems needed to improve global innovation cooperation? This question should be at the centre of future innovation policy debates. The challenge is to move towards increased global innovation cooperation via more inclusive governance mechanisms. The latter need to produce more measurable outcomes that are evaluated over time and more clearly communicated.

In addition to helping with growth, ultimately smart, globally orientated innovation policies and a new global innovation mindset can provide a timely counter to rising sentiments of nationalism and fragmentation.

Finding 3: Innovation is becoming more global but divides remain

The GII rankings have shown a remarkable level of global diversity among innovation leaders over the years. In 2016, the GII remains relatively stable at the top. Switzerland leads the rankings for the sixth consecutive year. Yet among the top-ranked 25 innovation nations this year are not only economies from Northern America (such as Canada and the USA) and Europe (such as Germany, Switzerland, and the UK) but also from South East Asia, East Asia, and Oceania (such as Australia, Japan, Korea, and Singapore) and Western Asia (Israel).

Economies that perform at least 10 percent higher than their peers for their level of GDP are labelled 'innovation achievers'; they include many economies from Africa, such as Kenya, Madagascar, Malawi, Rwanda, and Uganda; one from Northern Africa and Western Asia (Armenia); one from South East Asia, East Asia, and Oceania (Viet Nam); and several from Central and Southern Asia (such as India and Tajikistan). A wide variety of countries outperform their income group on at least four of the seven GII pillars; these include countries such as Bhutan, Brazil, Cambodia, Costa Rica, Georgia, Indonesia, Mexico, Morocco, the Philippines, South Africa, and others.

A symbolic first step in closing the divide between developed and developing countries has also been made: China is the first middle-income economy to join the top 25 of the GII, a group typically composed of high-income countries. China also moves to 17th place in innovation quality this year, narrowing the distance with the high-income economies.

Yet, rather than levelling the playing field, a multipolar world of research and innovation has emerged. The majority of activities are still concentrated in high-income economies and select middle-income economies such as Brazil, China, India, and South Africa. Only China has seen its R&D expenditures or other innovation input and output metrics move closer to rich countries such as the USA. Other middle-income economies remain distant; Malaysia slipped further away this year. The divide between the group of upper-middle-income economies and the group of high-income economies is large, especially in the Institutions, Human capital and research, Infrastructure, and Creative outputs pillars.

Some progress can be detected among lower-middle-income economies. India is a good example of how policy is improving the innovation environment. In some dimensions—such as ICT services exports and creative goods exports—India is starting

to excel. Similar peaks of excellence exist among other middle-income economies.

On another positive note, low-income economies successfully continue to close the innovation divide that separates them from middle-income economies—in particular in the pillars on Institutions and Business sophistication.

Finding 4: There is no mechanical recipe to create sound innovation systems; entrepreneurial incentives and 'space for innovation' matter

There is no automatism or mechanical recipe for creating sound innovation systems. Absolute spending on R&D or absolute figures on the number of domestic researchers, on the number of science and engineering graduates, or on scientific publications do not guarantee a successful innovation system. In fact, all too often a higher share of science and engineering graduates, for example, is pursued as a panacea for creating sound innovation systems. Clearly policy makers have to start somewhere, and this factor is easily measurable. Yet the creation of sound innovation systems—with solid innovation inputs, sophisticated markets, a thriving business sector, and sturdy linkages among innovation actors—and assessing their performance is more complex than aiming at increasing one innovation input variable, as evidenced in the GII model.

One approach to overcoming a purely quantitative approach is to look at the quality of innovation, as the GII does, assessing the worth of universities, scientific output, and patents. Good quality remains a distinct characteristic of leaders such as Germany, Japan, the UK, and the USA. China is the only middle-income country showing a comparable innovation quality. India comes in second among middle-income economies.

Yet there is more to the story. High-quality innovation inputs and outputs are often the reflection of other factors that make an innovation ecosystem healthy, vibrant, and productive. Ideally, these systems become self-perpetuating, bottom-up, and without a recurrent need for policy or government to drive innovation. How best to create such an organic innovation system poses an interesting dilemma for governments and their role in future innovation policy models. On the one hand, it is now accepted that governments continue to play an important role in generating innovation. The boundaries between industrial and innovation policy are slim or non-existent; both play an important role. In particular, in the last few decades, Asian economies have benefited from a strong and strategic coordination role of governments in innovation. The role of governments in spurring innovation in high-income countries in Northern America and Europe has also been strong throughout history.

It can be argued that the role of governments, and also of public and coordinated private investments, might be even more significant today than it has been in the past. Driving future innovation in the fields such as travel, health, and communications is becoming more complex and costly.

On the other hand, if governments overreach, if they select technologies, they might quickly end up diluting the possibility of self-sustaining organic innovation ecosystems. Providing enough space for entrepreneurship and innovation; the right incentives and encouragement to bottom-up forces such as individuals, students, small firms, and others; and a certain 'freedom to operate' that often challenges the status quo is part of the equation. Surely developing countries are well advised to avoid over relying on government forces as the sole driver to orchestrating a sound innovation system.

For governments, finding the right balance between intervention and laissez-faire has never been as challenging.

Finding 5: Sub-Saharan Africa: Preserving the innovation momentum in one of the most promising regions

For several editions, the GII has noted that the Sub-Saharan Africa region performs well on the innovation front. Since 2012, Sub-Saharan Africa has had more countries among the group of innovation achievers than any other region. Kenya, Madagascar, Malawi, Mozambique, Rwanda, and Uganda—often oil-importing countries—perform better than their level of development would predict. Importantly, Kenya, Malawi, Mozambique, Rwanda, and Uganda stand out for being innovation achievers at least four times in the past five years.

Noted improvements in the Institutions, Business sophistication, and Knowledge and technology output pillars have allowed the region as a whole to catch up to Central and Southern Asia in these factors, and even to overtake Northern Africa and Western Asia. Led by economies such as Botswana, Mauritius, Rwanda, and South Africa, Sub-Saharan Africa countries this year show their highest scores in Institutions and in Market sophistication. Larger economies, such as Botswana and Namibia, show

stronger performances in the General infrastructure and Ecological sustainability sub-pillars.

Yet the relatively strong performance in innovation in the region is neither uniform across all economies nor is future success guaranteed. Indeed, economic forecasts predict that Sub-Saharan Africa will face an economic slowdown. As economic slowdown occurs, it will be important for Africa to preserve its current innovation momentum and to continue moving away from relying on oil and commodity revenues.

Finding 6: Latin America and the Caribbean: A region with untapped innovation potential but important risks in the near-term

In the last few GII editions, Latin America was labelled as a region with important untapped innovation potential. Although significant potential exists, the GII rankings of local countries, relative to other regions, have not steadily improved. Furthermore, none of the economies in the region has recently been an innovation achiever, with performance higher than expected by its GDP. Still, a few economies—such as Chile, Colombia, and Mexico—stood out among their peers; the important role of Brazil and the emergent role of Peru and Uruguay were noted in past GII editions. And, this year, Chile, Colombia, Costa Rica, Mexico, and Uruguay achieve the best regional GII ranks again.

Clearly, most if not all countries in Latin America, particularly their local governments, firms, and other actors, continue to have the innovation agenda firmly on their radar. This is unlikely to come to a sudden halt anytime soon. Yet, as Latin America, especially Brazil, has entered into a zone of considerable economic turbulence, it will be important to overcome short-term political and economic constraints and to cling to longer-term innovation commitments and results. Greater regional R&D and innovation cooperation in Latin America might indeed help in this process, as underlined in this year's GII theme.

Chapters

The Global Innovation Index 2016: Winning with Global Innovation

Soumitra Dutta, Rafael Escalona Reynoso, and Jordan Litner, Cornell University

Bruno Lanvin, INSEAD

Sacha Wunsch-Vincent and Kritika Saxena, WIPO

Since the release of the Global Innovation Index (GII) last year, the world economy has encountered a number of challenges that have led to further downgrades of global economic growth projections. In the context of such uncertainty, countries will seek ways to move the global economy out of its current holding pattern, thus avoiding a prolonged low-growth scenario. Innovation will be a critical ingredient to achieving this objective.

Overcoming the holding pattern and restoring the foundations for future growth

The global economy is not yet back on track towards a broadly shared and vigorous growth momentum. The world's leading economic institutions predict modest growth for 2016, no significant improvement from 2015, and a slight pick-up of growth in 2017.[1] Growth forecasts for 2015 and 2016 have been revised downwards for all world regions in recent months.

Economic recovery has indeed slowed in most high-income countries, including in the United States of America (USA), Japan, and some European countries. At the same time, low- and middle-income countries now face significantly lower growth perspectives than they did a few years ago.[2] Although economic activity is weakening, Asia as a whole continues to show robust growth despite the slowdown in China. In turn, growth in Africa, Latin America and the Caribbean, and other world regions has decreased considerably to modest levels. The fall in commodity prices has seriously weakened commodity-dependent economies such as Brazil, the Russian Federation (Russia), Nigeria, South Africa, and countries in the Middle East.

In parallel with the slowed recovery, concerns about disappointing future output growth are increasingly widespread. Today, lower capital and slower productivity growth—particularly as compared with the productivity boom of the late 1990s and early 2000s in high-income economies—are a global phenomenon, throwing into question future growth and improvements in living standards globally.[3] The term 'productivity crisis', used to characterize this situation, is now in wide circulation.

As a result, policy makers are urged to move beyond austerity policies, which shrink rather than expand longer-term investments. Stepped-up public investments in innovation would be good for short-term demand stimulus, and also good for raising long-term growth potential. Uncovering new sources of productivity and future growth are now the priority.[4] Fostering innovation-conducive business environments, investing in human capital, and taking advantage of the opportunities that global innovation and cooperation offer are critical in this regard.

Key findings in brief

The six key findings of GII Chapter 1 are:

1. Leveraging global innovation can help avoid a continued low-growth scenario
2. There is a need for a global innovation mindset and discussions on fresh governance frameworks
3. Innovation is becoming more global but divides remain
4. There is no mechanical recipe to create sound innovation systems; entrepreneurial incentives and "space for innovation" matter
5. Sub-Saharan Africa needs to preserve the innovation momentum in one of the most promising regions
6. Latin America is a region with untapped innovation potential with important risks to innovation efforts in the near-term

Leveraging global innovation to avoid a continued low-growth scenario

In the aftermath of the global financial crisis of 2009, this report and others have urged decision makers from the private and the public

Box 1: Moderate post-crisis R&D expenditure growth largely driven by the private sector

After the 2009 financial crisis, global R&D grew by 3.7% in 2010 and 5.3% in 2011 (see Figure 1). R&D expenditures slowed somewhat in 2012 to achieve 4.3% growth but, with a gain in confidence, rose to 5.2% in 2013. In high-income economies, R&D growth was mainly the result of increasingly confident business R&D. However, our estimates show a subdued scenario for 2014, with global R&D growing at 4.1% and business R&D a bit stronger, at 4.5%.[1]

This drop in momentum is driven in part by reduced R&D spending in China, which is experiencing its lowest total R&D growth rate since 1998, and an R&D slowdown in other emerging economies such as Brazil, Colombia, Mexico, and South Africa. In addition, the slowdown is a consequence of tighter government R&D budgets in high-income economies. Only few countries—such as Poland, New Zealand, Belgium, Israel, the Republic of Korea (Korea), and Spain (in order of the magnitude) were able to increase their government commitment to R&D in 2014.[2] This trend will likely continue in 2015, putting further downward pressure on global R&D.[3]

As illustrated in Tables 1.1 and 1.2, the relative growth of R&D spending after the crisis has varied across economies. Countries such as Egypt, China, Argentina, Poland, Turkey, Korea, and India, for example (in order of actual total R&D growth since 2008) have maintained robust spending in R&D. European countries such as the Czech Republic, the Netherlands, and others have seen a fall in R&D but a subsequent strong recovery. However, countries such as the United Kingdom (UK), Japan, the United States of America (USA), and also Singapore have seen a more challenging road to R&D recovery. Finally, some countries in Europe, such as Sweden, Greece, Spain, and others, as well as Canada and South Africa, are lagging.

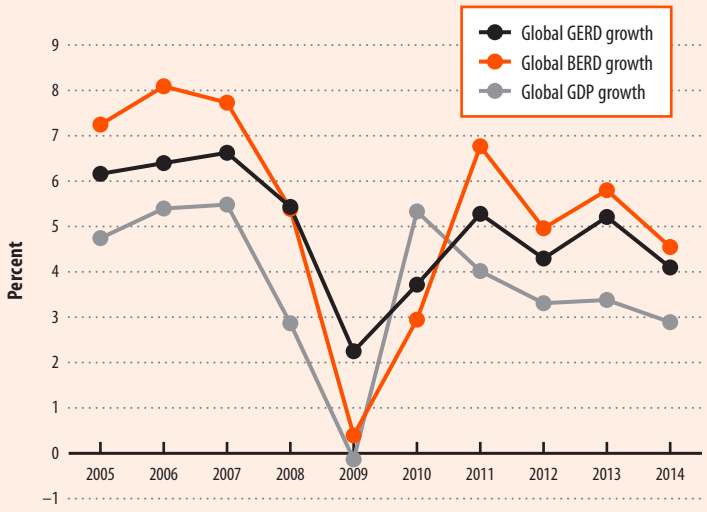
Note

Thanks to Antanina Garanasvili, PhD Candidate in Economics, University of Padova and Queen Mary, University of London, and our colleagues from the UNESCO Institute for Statistics (UIS) Martin Schaaper and Rohan Pathirage for help in producing Box 1.

Notes for this box appear at the end of the chapter.

(Continued)

Figure 1: Global R&D expenditures: Losing momentum?



Source: Authors' estimate based on the UNESCO Institute for Statistics (UIS) database and the IMF World Economic Outlook database, April 2016.
Note: GERD = gross domestic expenditure on R&D; BERD = business enterprise expenditure on R&D.

sectors to avoid a cyclical reduction of innovation expenditures.[5] Now, about seven years after the crisis, the worst-case scenario of permanently reduced R&D growth seems to have been avoided, thanks largely to good government policies and the strong contribution of countries such as China, the Republic of Korea (Korea), and other emerging countries (see Box 1).[6]

This situation, however, is far from irreversible; more efforts are needed to return to pre-crisis R&D growth levels and to counteract the observed innovation expenditure slowdown. On par with the sluggish development of the world economy, our preliminary estimates show subdued global R&D growth for 2014 (see Figure 1). Slower R&D spending—particularly tighter government R&D budgets—in specific high-income economies such as the USA, Japan, and some European countries and slower R&D spending

Box 1: Moderate post-crisis R&D expenditure growth largely driven by the private sector *(cont'd.)*

Table 1.1: Gross domestic expenditure on R&D (GERD): Crisis and recovery compared

Countries with no fall in GERD during the crisis that have expanded since

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Egypt*	100	168	177	220	229	293	300
China	100	126	143	163	189	212	231
Argentina	100	115	128	145	165	171	n/a
Poland	100	113	127	138	166	166	185
Turkey	100	111	121	134	147	157	172
Korea, Rep.	100	106	119	133	147	155	166
India*	100	106	113	125	n/a	n/a	n/a
Mexico	100	102	113	110	116p	136p	150p
Hungary	100	108	110	116	121	136	138
Belgium	100	101	107	114	126	129	133
Colombia*	100	101	106	120	125	161	129
Russian Fed.	100	111	104	105	112	114	120
Ireland	100	110	110	107	110	109	114
France	100	104	105	108	110	111	112p
New Zealand†	100	107	n/a	109	n/a	108	n/a
Denmark	100	105	102	104	105	107	108p
Australia	100	n/a	102	102	n/a	107	n/a

Countries with fall in GERD during the crisis but above pre-crisis levels in 2014

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Slovakia	100	97	132	147	181	188	206
Czech Rep.	100	99	105	125	142	150	160p
Chile	100	93	92	104	114	127	125
Netherlands	100	99	102	115	116	116	118p
Austria	100	97	104	105	113	117	118p
Estonia	100	94	110	172	166	137	118p
Israel	100	96	97	104	110	113	116
Germany	100	99	103	110	113	112	114p
Norway	100	100	99	102	105	108	112p
United Kingdom	100	99	98	99	96	101	106p
Japan	100	91	93	96	97	102	105
Italy	100	99	101	100	103	104	102p
United States	100	99	99	101	101	104	n/a
Singapore	100	82	88	100	96	100	n/a

GERD below crisis levels in 2014

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Sweden	100	94	92	96	97	99	96p
Canada	100	100	99	100	101	97	95p
Greece	100	90	82	83	81	91	94p
Spain	100	99	99	96	91	88	86p
Luxembourg	100	98	93	93	80	84	84p
Finland	100	97	99	99	92	88	84
Portugal	100	106	105	98	89	85	83p
Iceland	100	100	n/a	92	n/a	73	75
Romania	100	77	74	82	82	68	69
South Africa	100	93	84	87	88	n/a	n/a

Source: OECD MSTI, February 2016; data used: Gross domestic expenditure on R&D (GERD) at constant 2010 PPP$, base year = 2008 (index 100).
* Country data source is the UNESCO UIS database; p = provisional data.
† Index year 2007; 2008 is missing.

Table 1.2: Business enterprise expenditure on R&D (BERD): Crisis and recovery compared

Countries with no fall in BERD during the crisis that have expanded since

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Poland	100	104	109	135	199	234	279
China	100	126	144	168	196	222	244
Turkey	100	101	116	131	150	168	193
Hungary	100	118	125	138	152	180	188
Korea, Rep.	100	105	118	135	152	162	172
India*	100	102	111	124	n/a	n/a	n/a
Ireland	100	116	116	116	121	124	129
Greece†	100	n/a	n/a	117	111	121	128p
Egypt*	100	105	110	112	115	117	120
New Zealand†	100	104	n/a	116	n/a	117	n/a
France	100	102	105	110	113	115	116p
Russian Fed.	100	110	100	102	104	110	114
Mexico	100	109	113	111	n/a	n/a	n/a

Countries with fall in BERD during the crisis but above pre-crisis levels in 2014

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Slovakia	100	93	130	127	174	203	177
Czech Rep.	100	96	103	118	130	139	153p
Belgium	100	98	105	115	131	134	139
Netherlands	100	93	98	130	131	129	133p
Argentina	100	93	108	130	129	129	n/a
Austria	100	96	103	104	115	119	121p
Israel	100	97	97	105	112	114	118
Estonia	100	98	127	252	221	151	118p
Norway	100	97	95	100	104	107	113p
Colombia*	100	73	82	96	116	113	112
Germany	100	97	99	107	111	108	112p
United Kingdom	100	96	96	102	99	104	111p
Italy	100	99	102	103	104	106	106p
Japan	100	88	90	94	94	99	104
Chile	100	68	68	88	97	110	104p
United States	100	96	94	97	98	103	n/a

BERD below crisis levels in 2014

	CRISIS		RECOVERY				
	2008	2009	2010	2011	2012	2013	2014
Denmark	100	105	98	99	99	98	99p
Australia	100	96	97	97	n/a	99	n/a
Singapore	100	70	75	86	81	83	n/a
Romania	100	103	95	99	107	69	95
Canada	100	98	95	98	95	90	88
Sweden	100	90	86	89	88	92	87p
Spain	100	93	93	91	87	85	82p
Iceland	100	92	87	90	n/a	76	78
Finland	100	93	93	94	85	81	77
Portugal	100	100	96	93	88	80	76
South Africa	100	84	71	70	67	n/a	n/a
Luxembourg	100	96	79	79	57	57	57p

Source: OECD MSTI, February 2016; data used: Business enterprise expenditure on R&D (BERD) at constant 2010 PPP$, base year = 2008 (index 100).
* Country data source is the UNESCO UIS database; p = provisional data.
† Index year 2007; 2008 is missing.

growth in emerging countries, in particular China, partly explain this slowdown.[7]

In terms of the global use of intellectual property (IP), the latest figures point to a 4.5% patent filing growth in 2014.[8] Although positive, this growth is lower than it has been in the previous four years.

Uncovering new sources of growth has shifted to become a priority for all stakeholders. Greater public investment in infrastructure and innovation would boost aggregate demand in the short term—which is needed in a world of chronic demand shortages—and it would raise long-term potential growth.

Our analysis of global R&D trends calls for a stronger role by the governments—one that goes beyond the stimulus packages concluded after the financial crisis—to support continued innovation expenditures and research. Historically, and still today, governments and public research actors have been central to driving critical innovations with important growth potential.[9] Even in high-income countries, the vast majority of basic R&D—which is critical to the progress of science, and hence to long-term growth—is financed and conducted by public actors.

Moreover, the growth of innovation expenditures in the developing world has largely been driven by only a few countries, most notably China. The question faced by the innovation community is how to more systematically spread R&D to other low- and middle-income economies, avoiding an overreliance on a handful of countries to drive global R&D growth. Also, even leading emerging countries, including China, still spend only a fraction of their research budget on basic R&D; instead they focus on applied R&D and development.[10]

Furthermore, as underlined in previous editions of the GII report, the focus cannot be on R&D expenditures alone. Rather, innovations—whether they are technological or non-technological, first-rate and new to the world or more incremental and new to the local market only—need to be efficiently deployed in the market place to have a true impact. The journey from a scientific invention or a creative business idea to a commercial, widely deployed successful product is as risky and challenging now as it has ever been.[11] A focus on large innovation inputs such as large R&D expenditures or a high number of scientific papers alone is not a recipe for sure success; promoting entrepreneurship and an innovation-conducive environment are vital.

One of the central views discussed in this year's GII is that a more globalized and diversified innovation system offers more promise today than ever before, both on the innovation supply side and, importantly, also the diffusion side. The potential gains of these promises remain under-assessed and probably underexploited.

Winning with global innovation

It is now common wisdom that science and innovation are more internationalized and collaborative than ever before. Moreover, thanks to facilitated cross-border flows of knowledge, a rising share of innovation is carried out through global innovation networks, leveraging talent worldwide.[12]

Understanding global innovation as a global win-win proposition

Arguably, all stand to gain from global innovation. There are reasons for significant optimism.

First, in terms of overall effort, more innovation investments are conducted today than ever before, including in sectors or industries that were previously considered medium- or low-technology. At the same time, information and communication technologies (ICTs) and the resulting data capabilities have driven down the costs of innovation (see also Lyons in Chapter 7).

Second, through increased international openness, the potential for global knowledge spillovers and technology transfer are on the rise by historical standards, via, for example, cross-border trade, foreign direct investment (FDI), the mobility of highly skilled people, and the international licensing of IP as measured by the GII framework.[13] Clearly, the importance of international R&D spillovers has long been recognized.[14] Inbound and outbound flows in innovation inputs and outputs drive productivity and economic growth. These internationalization efforts are no longer the affair only of large firms from rich countries. Building on research capacities at home, firms and entrepreneurs from developing countries are venturing abroad as they develop new products and services for global markets (see, for example, Kim et al. in Chapter 6).

Finally, diverse innovation actors in emerging countries now make meaningful contributions to the local and global innovation landscape. After significant catch-up in human capital and research capacities, a number of middle-income economies now play a prominent role in science and innovation, as documented extensively in a number of chapters of this year's GII (see Athreye and Cantwell in Chapter 2 and von Zedtwitz and Gassman in Chapter 9).[15] Indeed, the share of high-income countries in global

R&D expenditures and the production of global scientific publications and IP filings worldwide have decreased, though often as a result of the rise of China alone.[16]

As a consequence, the quest for innovative solutions becomes more wide-ranging and intense; affordable innovations—in areas as varied as health and the environment—are being sought more than ever. As original solutions are developed to suit local markets, innovative products and services are also becoming more useful for developing countries. With the right support, a South–South market in affordable technologies for lower-income consumers will develop (see last year's GII Chapter 1 and Chaminade and Gómez in Chapter 3 of the GII 2016).[17]

Yet, despite these promising prospects, innovation is sometimes not portrayed as a global win-win proposition. On the contrary, most metrics and innovation policies are designed for the national level. When actors of one country produce more science or engineering graduates or more patents, their abundance is perceived by other countries as a competitive threat rather than as a chance. When countries import technology or technology-intensive services from abroad this is regularly considered to be more a cost than a gain. Countries are rather perceived as 'contenders rather than collaborators' (see Chapter 2).

On balance, policy makers every so often worry that global innovation contributes to a 'hollowing out' of domestic national innovation systems. Their priority is to keep talent and investment at home. Worse, 'techno-nationalist policies', as noted in Chapter 2—the spurring of national technologies at the expense of others and the erection of barriers to different knowledge and technology flows—is a popular endeavour in many countries.[18]

What is needed to better communicate and amplify the benefits of global innovation and related cooperation?

First, measurable evidence regarding the organization and outcomes of the current global innovation model is missing. Although empirical economic work has gone a long way towards supporting international trade as a win-win strategy and in constructing appropriate indicators, the same is not true for global innovation. Additional analysis is required to understand the circumstances under which the globalization of innovation is positive and what obstacles need addressing.

Second, and building on the above, business strategies and public policies need to better approach innovation as a global positive—rather than as zero-sum proposition—and better complement the realm of national innovation systems.

Providing reliable evidence of the extent and impact of global innovation

Although the process of ever-more globalized innovation is not new, metrics and studies needed to study its extent, characteristics, and main impacts are missing.

Over the last few decades, significant progress has taken place to document the rising extent of the scientific and innovation capacity of particular nations; this is now measured in terms of R&D levels, researchers or graduates, publications or patents worldwide. A majority of countries now collect R&D, innovation, or IP data thanks both to the work of a number of international organizations devising survey manuals and questionnaires and to national statistical offices collecting data.[19] In contrast, measuring within-country innovation flows as well as measuring global innovation flows between countries—the topic of this GII—remains notoriously difficult.

It is still a challenge to capture cross-border knowledge flows and technology transfer, and to assess their impact and effectiveness. Clearly the levels of the main market-based channels of international technology transfer—classically trade, FDI, and technology payments for IP—are now better captured by official international data sources than they used to be. In the case of trade, disentangling high-tech from low-tech exports and establishing the knowledge-intensity of domestic value-added have become easier.[20] In the case of FDI, the overall volume of inbound and outbound investments is also available today.[21] Yet determining the exact industrial sector into which FDI flows, and how rich in R&D and technology these investments are, remains mostly infeasible on the basis of available data.

In the case of international licensing of IP and technologies, important data progress has been made to reflect cross-border payments for proprietary rights, such as patents or trade secrets.[22] Even so, these metrics are hardly available at the sectoral level, and for various methodological reasons these data are fraught with problems and hard to use as a comprehensive and reliable indicator of IP-based technology transfer.[23]

Worse, more directly innovation-related data—on indicators such as international R&D joint ventures and foreign R&D investments, including the setting up of R&D centres abroad—are available only in a patchy manner and often from non-official sources only. Indeed, firms are not asked to report on these critical activities when they

Box 2: Global Innovation and the UN 2030 Agenda for Sustainable Development

In July 2015, the Member States of the United Nations (UN) adopted the Addis Ababa Action Agenda on Financing for Development, focusing on the need to address the uneven distribution of innovative capacity.

In addition, in September 2015, the UN Member States adopted the 2030 Agenda for Sustainable Development, comprising 17 Sustainable Development Goals (SDGs) and 169 targets that will shape global development in the period 2015–30 (see Box 1 in Chapter 2 of the GII 2015). Most of the SDGs are directly or indirectly related to or influenced by technological upgrading, innovation, and related polices. Goal 9, for example—'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation'—refers to several factors referenced in the GII: infrastructure, research, and technology.

In both UN processes, sound national innovation systems and effective global innovation flows are seen as key to promoting scientific, technological, and policy solutions.

In particular, the SDGs and their targets provide the framework for monitoring, reviewing, and ensuring the accountability of the 2030 Agenda at global, regional, and national levels. This process is based on statistical indicators established through an international consultative process. Disaggregated data—including better metrics of global innovation flows and technology transfers called for in earlier sections of this chapter—are important for monitoring SDG progress and making a clearer determination of the challenges and opportunities.

Although the GII is not part of the official list of indicators for implementation, it provides countries with an additional data-based tool for evidence-based policy making. On the basis of the GII, numerous workshops are taking place in different countries to bring innovation actors together to improve data availability, to boost the country's innovation performance, and to design fresh policy actions. Also collaborations are ongoing between the GII publishers and many UN organizations, in particular the United Nations Educational, Scientific and Cultural Organization (UNESCO), as well as private data providers, to optimize innovation metrics to monitor innovation performance. Countries are free to use these data to work towards the SDGs and to help foster global innovation flows.

follow standard reporting requirements. Yet, generally, understanding the role of multinational corporations in technology transfer and local spillovers in terms of scaling up domestic innovation capacity and skills is critical.[24] In sum, the internationalization of corporate R&D and its exact dynamics of technological upgrading as a result are insufficiently studied and understood.

Another type of 'embodied knowledge' flows is the migration of graduates, skilled scientists, and entrepreneurs. Vital work to better document the migration of highly skilled graduates or foreign-born inventors has taken place,[25] yet more needs to be done on this front.

Furthermore, a significant share of knowledge is accessible at no cost and diffuses freely, not through market-based mechanisms. Examples are the knowledge obtained through imitation and reverse engineering and knowledge obtained via distance learning courses, patent documents, or scientific publications. One can conjecture that the related benefits of these forms of knowledge transfer are large, if not huge. Yet neither the flows nor the gains can be suitably assessed.[26]

More importantly, assessing the quality and effectiveness of these market- and non-market based channels based on available data is mostly infeasible without further empirical validation.[27] Assessing the barriers to knowledge transfer and trade in ideas is also a relatively new area of research.[28] Issues to be addressed include what developing countries can do in terms of institutions, regulations, and their innovation systems to benefit more from R&D spillovers.

Finally, mostly available assessments of collaboration are still narrowly limited to assessing international co-ownership of patents or scientific papers by people in different countries. These data come with a number of methodological shortcomings.[29] More critically, they convey a merely one-dimensional, narrow view on international collaboration by documenting joint intermediate R&D-related outputs but not commercialized innovation or the benefits associated with this collaboration. As noted by Bound in Chapter 4, these popular collaboration data are also lagging and static indicators. International collaboration in science and innovation happen instead in fluid networks with their own internal dynamics, requiring the development of more networked-based metrics and approaches.

The same is true for efforts of governments or public research organizations to encourage international R&D collaboration. Although high-income countries pledge to collaborate more internationally, in particular on global challenges, the extent and impact of these collaborations are poorly documented.[30] In the same vein, exciting new efforts by public-private partnerships and

non-governmental organizations fostering global R&D and innovation collaboration are in progress. They bring together an array of innovation actors to solve global challenges—examples include joint research efforts on neglected diseases.[31] Yet it is hard to put an overall aggregate figure on their aggregate impact, particularly because these global efforts occur in a decentralized fashion. Although attempts are underway to document the overall impact of innovation, little evidence is available to document the benefits of international collaboration and the benefits of global R&D spillovers.

Finally, a lot has been written on the potential for South–South innovation flows or reverse innovations in which technology flows from developing to developed countries.[32] With some exceptions (see Chapter 3), most of the related evidence is based on anecdotes but certainly not robust data. Thus, in Chapter 4 Bound argues that the potential of these new innovation flows veers from 'wildly romanticized' to 'dangerously underestimated'.

This lack of transparency undermines the trust needed to build win-win alliances, as they typically involve local and global (external) innovators, as noted by von Zedtwitz and Gassman in Chapter 9. The lack of available data on global innovation flows and aggregate impacts is also crucially missing in debates around the UN Sustainable Development Goals (SDGs) (see Box 2) and in debates surrounding the topic of 'technology transfer'.

Better business strategies and innovation policy approaches to maximize benefits

Better business strategies and policy approaches, along with fresh approaches to encourage global innovation cooperation and its governance, are required to maximize the benefits of global innovation.

When trying to identify how business strategies and public policies can be better attuned to reflect and leverage the advantages of global innovation, an array of 'horizontal challenges' presents itself:

First, as noted in this year's *Science and Engineering Indicators* report and the *UNESCO Science Report,* a multipolar world of research and innovation has emerged rather than one where the global innovation divide has been overcome (see also Box 3 on page 10).[33] Despite the increasingly global nature of research and innovation activities, the majority of activities are still concentrated in high-income economies and select middle-income economies such as Brazil, China, and India.

Second, as noted in Chapter 2, even most middle-income countries still depend on technology transfers from developed economies for solutions to mainly domestic problems (e.g., combatting diseases such as malaria or securing cheaper energy sources). Better technology diffusion to and within developing countries will help these countries to narrow the gap with advanced countries.[34] This must be a priority for all stakeholders in order to reap the fruits of innovation.

Third, appropriate research and innovation for and from lower- and lower-middle-income economies are desperately needed. Worryingly, some experts are raising concerns that global innovation might harm rather than and help this goal.[35] As increasing numbers of prominent scholars work together across borders, top innovators are drawn away from focusing on local needs. As a result, fewer global research results are being assimilated locally. As noted by Katragadda and Bharadwaj in Chapter 12 and Gokhberg and Roud in Chapter 13, developing countries need to clearly spell out their own innovation needs and strategically pursue them, rather than only feeding into globalized corporate innovation networks.

Fourth, although difficult to measure, there seems to be ample scope to expand global corporate and public R&D cooperation. In particular, much underused potential for innovation collaboration exists at the regional level—within Africa, within Asia, within Latin America and other regions.[36] The same is true for technology diffusion and cooperative research between rich and poorer countries.

Some of the resulting opportunities and challenges of global innovation can be outlined, both for firms and governments.

Firms: Embracing global corporate innovation networks and overcoming related complexities

For firms, perceiving global innovation as a win-win opportunity has been a long time in the making. Multinational corporations have started to move R&D resources across the world. They have located R&D resources in emerging countries for more than a decade, playing a critical role in bridging the technological gap between high- and middle-income countries and often leveraging the low-cost access to exceptional talent (see particularly Chapters 3, 7, 9, and 12 in this edition of the GII). Rather than only adapting products to local markets, more and more frequently research is conducted that helps to solve local problems in developed and developing countries alike.

Yet, despite a broadly positive trend, the extent of globalized R&D is still mostly incipient; untapped potential exists according to the

Box 3: The global innovation divide: China among top 25 and the narrowing gap between low- and middle-income countries

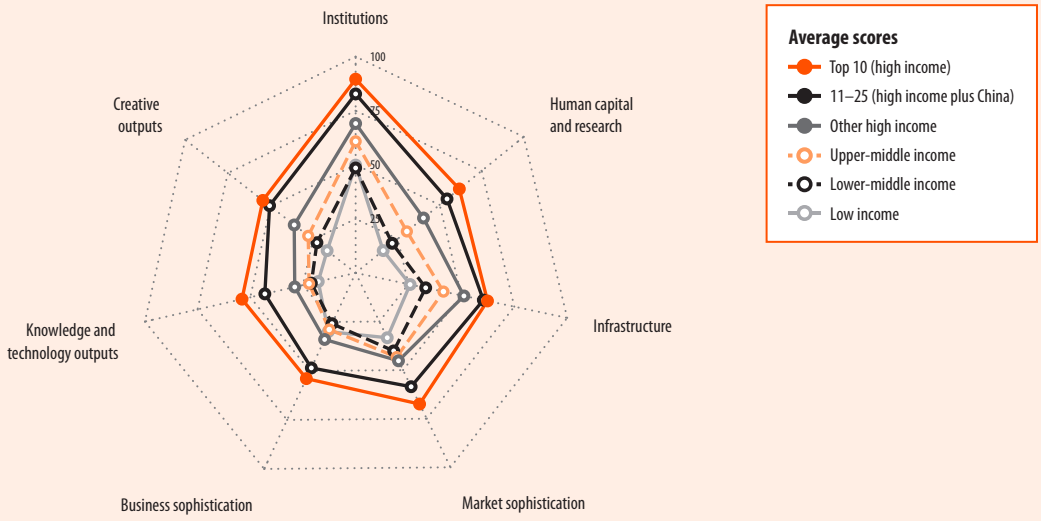
The top 25 GII slots are occupied by a stable set of high-income countries that consistently lead in innovation. In past years, hardly any country moved in or out of this group of top performers. This year some notable changes take place within the top 25, in part because of the inclusion of new indicators. Notably, for the first time a middle-income country—China—is among the top 25.

In the top 10, Switzerland remains at number 1 for the sixth consecutive year. Germany is in the top 10 in this year's GII, at 10th place, with Luxembourg (12th) exiting. Germany's entrance into the top 10 relies on its consistent performance in areas such as Research and development (sub-pillar 2.3) and Knowledge creation (sub-pillar 6.1), and it attains top indicator rankings in logistics performance (3.2.2), patent applications by origin (6.1.1), and country-code top-level domains (7.3.2). In addition, top scores in newly introduced indicators such as the average expenditure of top 3 global R&D companies (2.3.3) explain this rise.

The Czech Republic drops out of the top 25 this year. At the same time, China joins the top 25 group. This inclusion is driven not only by China's innovation performance but also by methodological considerations, such as the addition of four new indicators where China does particularly well. For example, the country has a particularly high number of R&D-intensive firms among the top global corporate R&D spenders (see Annex 2). China's innovation rankings this year also reflect high scores in both the Business sophistication and Knowledge and technology outputs pillars, in which it scores above the average of the overall ranked 11–25 group to which it now belongs. Top scores in indicators such as patent applications by origin (6.1.1), utility model applications by origin (6.1.3), high-tech exports (6.3.2), and creative goods exports (7.2.5), as well as in the new indicators, global R&D companies (2.3.3), domestic market scale (4.3.3), research talent in business enterprise (5.3.5), and industrial designs by origin (7.1.2) are all factors behind this high ranking.

The distance between the top 25 and the groups that follow is still evident. Figure 3.1 shows the average scores for six groups of economies: (1) the top 10, which are all high-income economies; (2) ranks 11–25, which are high-income plus China; (3) other high-income; (4) upper-middle-income (excluding China); (5) lower-middle-income; and (6) low-income economies.

Figure 3.1 Innovation divide bridged: China reaches the top 25



Note: Countries/economies are classified according to the World Bank Income Group Classification (July 2015).

Box 3: The global innovation divide *(cont'd.)*

Distinction between the top 10 innovation leaders and others in the top 25

The top 10 high-income economies perform above the 11–25 group in all pillars. This group's strengths are in Human capital and research (pillar 2), Market sophistication (pillar 4), and Knowledge and technology outputs (pillar 6). Past performance shows that the gap between both groups is currently larger in all the input-side pillars of the GII with the sole exception of Business sophistication (pillar 5). Conversely, this contrast also shows that variations in performance are now more narrow in Knowledge and technology outputs (pillar 6) and in Creative outputs (pillar 7), both of the pillars in the output-side of the GII.

That said, a number of high-income countries that rank in the 11–25 range—such as the Republic of Korea (11th), Canada (15th), Japan (16th), and Estonia (24th)—perform above the average of the top 10 in various pillars (i.e., Institutions, Infrastructure, and Creative outputs). China is not yet on par with any of the top 10 countries in any pillar. However, China scores higher in Business sophistication (pillar 5) and Knowledge and technology outputs (pillar 6) than its peers in the 11–25 group.

Middle-income economies: China closest to high-income countries, with Malaysia now at greater distance

Last year, China and Malaysia were the only two middle-income economies close to the top 25 group. Except for these two countries, the divide between the group of upper-middle-income economies and the group of other high-income 11–25 ranked economies was large, especially in the Institutions, Human capital and research, Infrastructure, and Creative outputs pillars.

On the variable level, and both in absolute and relative terms in relation to other countries, China has demonstrated the strongest improvement over the years in various key indicators, including gross expenditure in R&D (2.3.2), ICT services imports (5.3.3), the number of patent applications filed by residents (6.1.1), and citable documents H index (6.1.5) as well as other variables associated with the development and creation of human capital in innovation, such as tertiary enrolment (2.2.1), school life expectancy (2.1.3), tertiary inbound mobility (2.2.3), and the ranking average score of its top 3 universities (2.3.4).

With China part of the top 25, Malaysia (at 35th) is the closest middle-income economy to China in terms of its ranking, yet the distance between them has widened. Bulgaria, at 38th place, is the second middle-income economy in line. Indeed, Malaysia and Bulgaria show similar or higher pillar scores than those of the high-income economies group that are not in the top 25, especially in the Business sophistication and Knowledge and technology outputs pillars. A few middle-income countries—such as Turkey (42nd), Costa Rica (45th), the Republic of Moldova (46th), and Romania (48th)—are in the top 50.

On average, however, the divide between middle-income and high-income economies stays large, and continues to hold mostly in Institutions (pillar 1), Human capital and research (2), Infrastructure (3), and Creative outputs (7). Relative to last year, and possibly in part because of methodological considerations, the divide between these groups has also increased more notably in the Human capital and research and in Business sophistication and Knowledge and technology outputs pillars.

Low-income economies: Closing the gap with middle-income economies

Confirming a trend first spotted in the GII in 2014, on average, low-income economies successfully continue to close the innovation divide that separates them from middle-income economies. On average, and possibly related to the GII model changes, the gap is still significant especially in some pillars: Human capital and research, Infrastructure, Market sophistication, Knowledge and technology outputs, and Creative outputs. But the gap between the low- and lower-middle-income clusters in two pillars—Institutions and Business sophistication—has now disappeared. In fact, low-income economies now outperform even the upper-middle-income group on average in business sophistication. Efforts to bolster solid institutions and to enable businesses to thrive have seen considerable impact. Effectively this also means the old boundaries and innovation glass ceilings are further eroding. Countries such as Rwanda (83rd), Cambodia (95th), Malawi (98th), Uganda (99th), Benin (121st), and Burkina Faso (122nd) are a few of the low-income countries helping bridge the divide by shining above the average middle-income scores in more than one pillar.

Stability in regional innovation divides

The overall regional rankings based on the GII average scores show that the Northern America region is at the top (58.1), followed closely by Europe (46.9) and South East Asia, East Asia, and Oceania (44.6). Northern Africa and Western Asia (33.9) and Latin America and the Caribbean (30.3) are closing in on each other's scores, while this year the Central and Southern Asia average score (27.7) is marginally above that of Sub-Saharan Africa's average scores (25.6).[1]

Note

1 Regional groups are defined based on the United Nations classification, United Nations Statistics Division, revision of 13 October 2013.

chapters presented in this report. Most companies in high-income countries—particularly small- and medium-sized enterprises—and nearly all firms in emerging economies run all of their product development and innovation activities from their corporate centre (see Chapter 9). Other companies are on the verge of spanning more globalized networked innovation models, but still have the majority of their R&D centralized at home (Chapter 6).

In part this is because costs and benefits of geographic decentralization are still being explored. Many of the chapters in this year's GII illustrate the complexity of conducting globalized corporate innovation models, the difficulty of coordination between various departments and locations, and the centrality of improved governance and processes. As noted by von Zedtwitz and Gassman in Chapter 9, 'managing global R&D is more than just … coordinating foreign R&D teams—it is about managing the flow of innovation regardless of corporate allegiances and ownership, and appropriating the benefits irrespective of headquarter locations.' The greater division of work and increased specialization make the coordination of global innovation more demanding.

For most companies, building diverse local and international partnerships is challenging. As noted by Engel et al. in Chapter 8, the majority of firms have insufficient processes to identify, select, build and operate, and exit innovation partnerships globally. Yet organizations that systematically harness these relationships—including relationships with domestic start-ups, small- and medium-sized enterprises, and customers—will be best prepared to capture the next wave of growth. This nurturing of relationships requires experimentation with new customized partnership models and open innovation platforms, as illustrated by Poh in Chapter 10.

Moreover, as noted especially in Chapters 6, 7, 8, and 12, a new innovation culture is required to benefit from global innovation. This entails flatter hierarchies; increased cross-functional collaboration across R&D, supply chain management, and marketing; a diversified talent pool that brings in fresh perspectives and skills unencumbered by traditional approaches; an environment that encourages risk-taking and failure and learning from it; and cooperation with external players and customers to complement internal innovation.

Firms also need to walk a careful line between globalization and localization. As noted by Kim et al. in Chapter 6 and Katragadda and Bharadwaj in Chapter 12, firms need to simultaneously build global R&D capacity and develop localized solutions after having understood local customers' needs.

Finally, rolling out innovation globally is challenging. No matter how large or small a firm is, the execution of ideas and innovations in the global market place remains arduous and is largely guided by trial-and-error approaches. As noted in Chapter 9, this is particularly true when firms try to transfer innovative products from a developing country to an advanced one.

Governance and policy: Adjusting to the reality of global innovation

For governments and national policy making, facilitating increased international collaboration and complementing inward with more outward-looking approaches is now key to sustained success in innovation.

To be clear, there is no reason to believe that past national innovation approaches were misguided. On the contrary, throughout history nationally conducted innovation efforts and policies have largely been good for the world. This is partly because innovation is a global public good: regardless of who invests heavily in bringing about new scientific discoveries or innovations, they often diffuse beyond boarders to enrich other countries as well. In the same spirit, the national innovation policies of different countries—whose innovators and firms often compete against one another—have and will continue to create largely positive effects.

Rather the point is that the more globalized innovation processes offer new possibilities that countries are only learning to seize. In this context, Wagner et al. (2015) emphasize that

> The global network presents opportunities for … policy-makers to seek efficiencies that were not available when a few nations dominated science. With improved scanning of research and more effective communications, it may be possible to leverage foreign research, data, equipment, and know-how … . [Nations] must learn to manage and benefit from a network. Networks operate by reciprocity, exchange, incentives, trust, and openness, so explicit policies of support for complementary links [are desirable].[37]

In addition, an increasingly vast array of global challenges requires more internationally coordinated efforts to seek fitting and timely solutions.

For a start, policies need to further support openness, as suggested by Poh in Chapter 10. Identifying barriers to global cooperation and the flow of ideas should be a new global innovation policy priority. Removing barriers to mobility and fostering the cross-border flows of knowledge and people matters greatly in this context. Avoiding the

creation of new techno-nationalist barriers is also critically important.

In addition, national policies and related incentives should avoid focusing on domestic players alone to full reap the benefits of global innovation. Fiscal incentives, grants, and other national innovation policies could more explicitly favour international collaboration and the diffusion and integration of knowledge across borders. Calls for proposals could, more often, be jointly issued by multiple countries, particularly when convening large-scale, multi-disciplinary programmes. The programmes implemented at the European Union level have garnered experience and could serve as useful starting point.[38]

National and international science and innovation policies should also become more inclusive of developing countries. Fortunately, these countries have gained recent experience with programmes explicitly focused on research cooperation with developing counties—see, for example, the US Agency for International Development (USAID), the National Science Foundation (NSF), and the National Cancer Institute (NCI) joint research projects in the USA; in Switzerland, see the Commission for Research Partnerships with Developing Countries aimed at 'North-South' research.[39] Revamping official development assistance with the inclusion of R&D and innovation components is a welcome development. Guidance, too, is emerging on how to structure such cooperation between the developed and the developing world too.[40]

Edler in Chapter 5 and Finkel and Bell in Chapter 10 also emphasize the need to craft globally focused demand-side innovation policies. In their view, traditional supply-side innovation policies have failed to deliver progress for most developing countries. Demand-side policies and instruments need to be expanded and deployed broadly across the developing world to support the generation and diffusion of innovation for the benefit of local and global needs. Appropriate areas for such policies include government procurement, price-based measures, and demonstration projects.

There is a need for a global innovation mindset and discussions on fresh governance frameworks

Are new governance systems needed to improve global innovation cooperation? Are the current frameworks insufficient? These questions should be at the centre of future innovation policy debates.

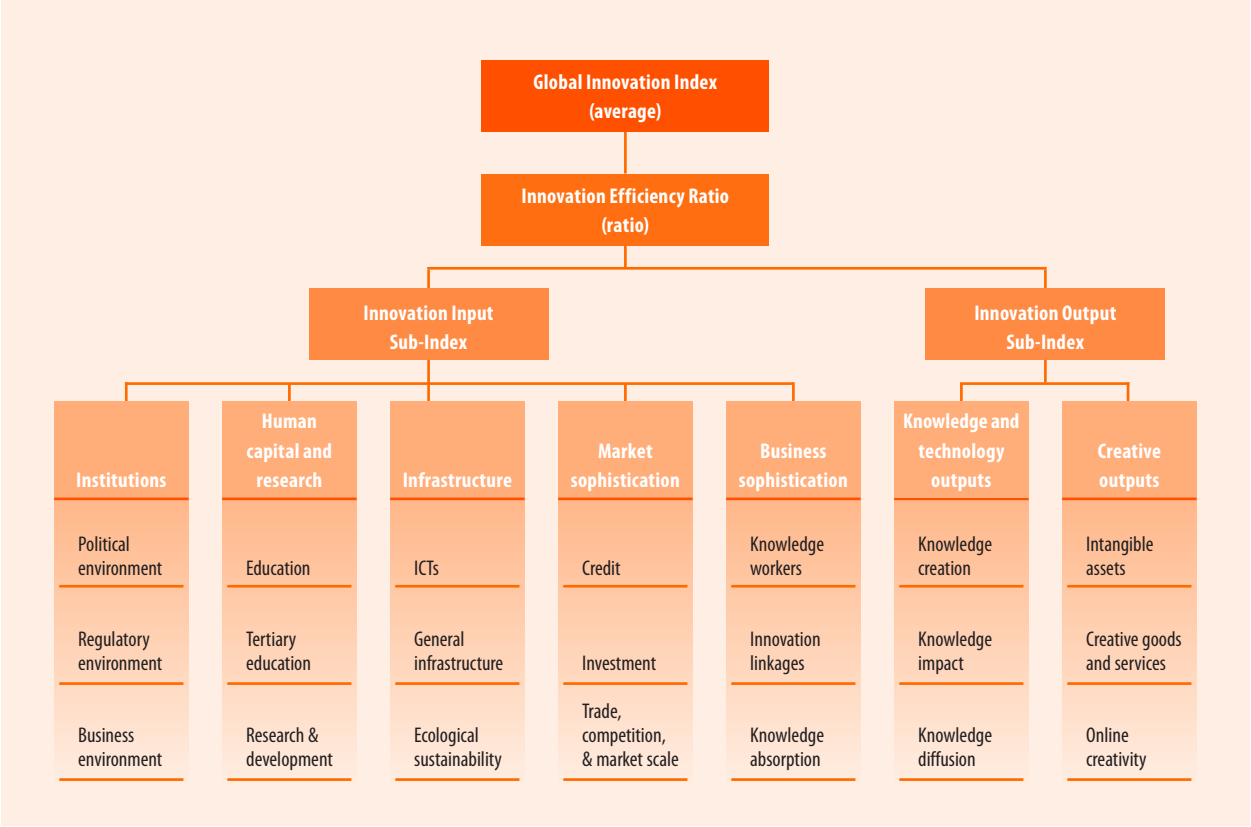
On the one hand, it can be argued that, for many innovation questions, there already is a global governance framework through organizations such as the International Telecommunication Union (ITU) for telecommunication issues, the International Organization for Standardization (ISO) for standardization issues, the World Intellectual Property Organization (WIPO) for IP matters, and the World Health Organization (WHO) for health-related matters, for example. There are also a number of ad-hoc or more specific regional and plurilateral initiatives such as CERN, the European Organization for Nuclear Research. Some fora, such as the Global Science Forum, are described in Chapter 11; similar initiatives for global science and R&D cooperation exist in the G7 process. As noted in Chapter 13 by Gokhberg and Roud, other opportunities arise through bilateral or plurilateral funding for R&D partnerships, policy dialogues such as the US-India Strategic and Commercial Dialogue,[41] and global coalitions such as the Mission Innovation as part of the United Nations Conference on Climate Change in Paris (COP21). Regional efforts such as China's Belt and Road Initiative also hold potential (see Box 7 on page 41).

On the other hand, scholars and institutions have called for complementary global governance mechanisms more focused on improving international science and R&D cooperation.[42] The argument is that innovation needs to be treated on par with trade, health, and immigration issues that have a dedicated international governance framework. Yet neither the exact scope of such international governance systems nor the proper institutional anchors have been fully elaborated. Importantly, such frameworks will need to be flexible and timely enough to accommodate the dynamic nature of innovation processes. Topics of coordination would include facilitating the mobility of scientists, establishing new funding or co-financing schemes for particular technologies, and designing programmes for improved international R&D collaboration.[43] Another important topic is the development of global research infrastructures and how to best design and implement their optimal prioritization and sharing modalities.[44]

In both cases, the challenge is to move towards increased global innovation cooperation via more inclusive governance mechanisms producing measurable outcomes that are evaluated and more clearly communicated over time. Better cooperation will help inform all stakeholders more broadly about the merits of global innovation, simultaneously pre-empting the formation of new barriers in this regard.

The next sections present the GII 2016 framework and results.

Figure 2: Framework of the Global Innovation Index 2016



The GII 2016 conceptual framework

The GII helps to create an environment in which innovation factors are continually evaluated. It provides a key tool of detailed metrics for 128 economies this year, representing 92.8% of the world's population and 97.9% of the world's GDP (in current US dollars).

Four measures are calculated: the overall GII, the Input and Output Sub-Indices, and the Innovation Efficiency Ratio (Figure 2).

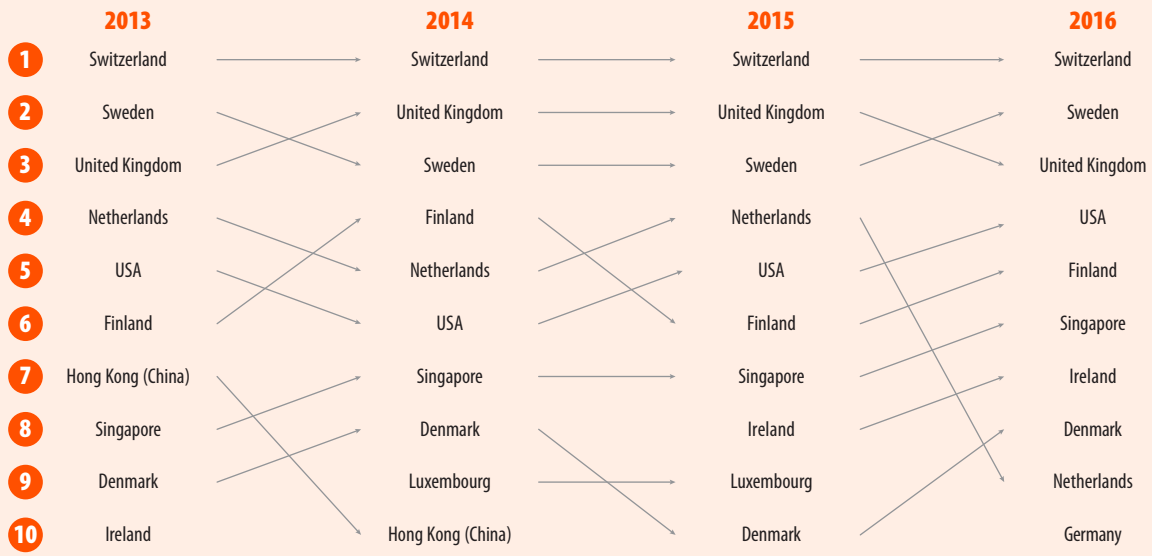
- **The overall GII score** is the simple average of the Input and Output Sub-Index scores.
- **The Innovation Input Sub-Index** is comprised of five input pillars that capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication.
- **The Innovation Output Sub-Index** provides information about outputs that are the results of innovative activities within the economy. There are two output pillars: (6) Knowledge and technology outputs and (7) Creative outputs.
- **The Innovation Efficiency Ratio** is the ratio of the Output Sub-Index score over the Input Sub-Index score. It shows how much innovation output a given country is getting for its inputs.

Each pillar is divided into three sub-pillars and each sub-pillar is composed of individual indicators, for a total of 82 indicators this year.

Further details on the GII framework and the indicators used are provided in Annex 1. It is important to note that each year the variables included in the GII computation are reviewed and updated to provide the best and most current assessment of global innovation. Other methodological issues—such as missing data, revised scaling factors, and new countries added to the sample—also impact year-on-year comparability of the rankings (details of these changes to the framework and factors impacting year-on-year comparability are provided in Annex 2).

Most notably, a more stringent criterion for the inclusion of countries in the GII was adopted this year, following the Joint Research Centre

Figure 3: Movement in the top 10 of the GII



Note: Year-on-year GII rank changes are influenced by performance and methodological considerations; see Annex 2.

(JRC) recommendation of past GII audits (see Annex 3 in this report and in previous years). Economies and countries were included in the GII 2016 only if 60% of data were available within each of the two sub-indices and if at least two of the three sub-pillars in each pillar could be computed. This more stringent criterion for inclusion in the GII ensures that country scores for the GII and for the two Input and Output Sub-Indices are not particularly sensitive to the missing values. As noted by the audit, this more stringent threshold has notably improved the confidence in the country ranks for the GII and the two sub-indices, and thus the reliability of the GII rankings (see Annex 3).

The Global Innovation Index 2016 results

The GII 2016 results have shown consistency in areas such as top rankings and the innovation divide. However, there also have been some new high-level developments as described below.

Stability at the top, led by Switzerland, Sweden, and the UK

In 2016, the GII remains relatively stable at the top. Switzerland leads the rankings for the sixth consecutive year, but for the first time Switzerland sees its distance from the second-best-scoring country narrowing, potentially reflecting a mix of methodological but also performance-related drivers. Sweden regains the 2nd place, last held in 2013, moving the United Kingdom (UK) down to 3rd. The USA and Finland each move up one spot to take the 4th and 5th spots, respectively. Singapore, Ireland, and Denmark also improved upon their 2015 rankings and remain in the top 10, while the Netherlands falls five ranks to 9th place, mostly driven by an FDI-related variable and missing data points. Germany enters the top 10 this year as Luxembourg moves out, making it the only new entrant among the top 10 this year.

Figure 3 shows movement in the top 10 ranked economies over the last four years:

1. *Switzerland*
2. *Sweden*
3. *United Kingdom*
4. *United States of America*
5. *Finland*
6. *Singapore*
7. *Ireland*
8. *Denmark*
9. *Netherlands*
10. *Germany*

Furthermore, stability remains across the top 25 economies with one exception: the Czech Republic drops from 25th to 27th in 2016 as China becomes the first middle-income economy to enter the top 25 (see Box 3 on page 10). Within

the top 25 group, several other economies move up by two or more spots, including the Republic of Korea (11th), Japan (16th), France (18th), and Belgium (23rd).

Innovation is becoming more global but divides remain

The GII rankings have shown a remarkable level of global diversity among innovation leaders over the years. Among the top-ranked 25 innovative nations this year are not only economies from Northern America (such as Canada and the USA) and Europe (such as Germany, Switzerland, and the UK) but also from South East Asia, East Asia, and Oceania (such as Australia, Japan, Korea, and Singapore) and Northern Africa and Western Asia (Israel).

Economies that perform at least 10 percent higher than their peers for their level of GDP are labelled 'innovation achievers'; they include many economies from Sub-Saharan Africa, such as Kenya, Madagascar, Malawi, Rwanda, and Uganda; one from Northern Africa and Western Asia (Armenia); one from South East Asia, East Asia, and Oceania (Viet Nam); and several from Central and Southern Asia (such as India and Tajikistan). A wide variety of countries outperform their income group in at least four of the seven GII pillars; these include countries such as Bhutan, Brazil, Cambodia, Costa Rica, Georgia, Indonesia, Mexico, Morocco, the Philippines, South Africa, and others.

Yet, rather than levelling the playing field, a multipolar world of research and innovation has emerged. The majority of activities are still concentrated in high-income economies and select middle-income economies such as Brazil, China, India, and South Africa. Only China has seen its R&D expenditures or other innovation input and output metrics move closer to rich countries such as the USA. Other middle-income economies remain distant; Malaysia slipped further away this year. The divide between the group of upper-middle-income economies and the group of high-income economies is large, especially in the Institutions, Human capital and research, Infrastructure, and Creative outputs pillars.

Innovation divides remain according to the GII 2016 (see Box 3 on page 10). The distance between the performance of the top 10 ranked innovation nations and all others is still wide. However, this year a mix of innovation performance and methodological considerations allows China, a middle-income economy, to join the 11–25 ranked group, traditionally composed of high-income countries.

However, other middle-income economies that were identified in the past as being on the heels of the richer countries in the top rankings either remain far from these groups or are moving away from them. Malaysia (35th) and Bulgaria (38th) are the only two remaining middle-income economies (other than China) still close to top high-income groups.[45] Both of these economies, however, show a ranking that is similar or higher than those of the high-income economies that are not in the top 25. This is especially evident in the Business sophistication and Knowledge and technology outputs pillars. Although for some economies this divide seems to be reducing, on average, the high-income economies rank above middle-income in Institutions (pillar 1), Human capital and research (2), Infrastructure (3), and Creative outputs (7).

At lower levels of income, the innovation divide between middle- and low-income economies continues to close (see Box 3 on page 10), partly driven by potential methodological but also partly driven by performance-related factors. This year, on average, lower-income economies are more similar to lower-middle-income economies in Institutions and Business sophistication. Yet in some pillars low-income economies still lag behind; this is especially the case in the Human capital and research, Infrastructure, Market sophistication, Knowledge and technology outputs, and Creative outputs pillars.

High-quality innovation continues to matter and China is catching up

As noted over the past four years, quality is as important an element of innovation as quantity (see Box 4 on page 18). Since the 2013 edition of the GII, quality has been measured by (1) quality of local universities (2.3.4, QS university rankings average score of top 3 universities); (2) internationalization of local inventions (5.2.5, patent families filed in three offices, changed to patent families filed in two offices in the GII 2016); and (3) the number of citations that local research documents receive abroad (6.1.5, citable documents H index). This year Japan, the USA, the UK, and Germany remain at the top of the composite indicator that combines these three indicators among the high-income economies. Japan takes over the top position, boosted by high scores in the new measurement of patent families; both the USA and the UK take the top two spots, respectively, in the quality of local universities while sharing top place in the number of citations (see Box 4). China is both top in the group of middle-income economies and has scores in the quality of local universities and the number of citations that are above the high-income

group average and on par or above those of some economies in the top 10 quality of innovation for that income group. In patents filed, however, China remains below this average. Yet the innovation quality scores for China are the only ones among its group that display a balance similar to that of high-income economies.

When not considering China, other top-scoring middle-income economies are also helping close the gap between these two income groups. India, Brazil, and South Africa this year have scores in the quality of universities and number of citations that are close to those of China, and similar to or above the high-income group averages. Although India and Brazil still rank below China on the patent family metric, their scores are beginning to approach those of China and thus helping reduce this income group divide. This year South Africa's scores in all three indicators are higher, especially in the revised patent files, giving it a higher overall position in quality of innovation, just below Brazil. Russia, now a high-income economy, has an overall score for this composite indicator that places this country between the quality of innovation rankings of India and Brazil. This fact puts four out of five BRICS economies in similar overall rankings in this composite indicator.

This year Seychelles, Argentina, and Hungary are no longer part of the top 10 group of middle-income economies in innovation quality because of low data coverage in the case of Seychelles (see Annex 2), and because of changes in income group classification in the case of Argentina and Hungary. These changes lead Mexico, Malaysia, and Turkey—all three economies among the top 10 middle-income economies since this innovation quality metric was introduced—to move ahead in the rankings. Furthermore, these shifts also give Thailand, Colombia, and Ukraine the opportunity to enter the top 10 ranking of middle-income economies this year.

These results lead us directly into the main GII rankings.

2016 results: The world's top innovators

The following section describes and analyses the prominent features of the GII 2016 results for the global leaders in each index and the best performers in light of their income level.[46] A short discussion of the rankings at the regional level follows.[47]

Tables 1 through 3 on pages 20–25 present the rankings of all economies included in the GII 2016 for the GII and the Input and Output Sub-Indices.

The top 10 in the Global Innovation Index

Switzerland has earned the number 1 position in the GII for the sixth consecutive year. It has maintained this top spot in the GII since 2011, as well as its number 1 position in the Innovation Output Sub-Index and in the Knowledge and technology outputs pillar since 2012. It ranks among the top 25 in all pillars and sub-pillars with only three exceptions on the sub-pillar side: Business environment (31st), Education (32nd), and Information and communication technologies (39th).

Switzerland, a knowledge-based economy of 8.3 million people with one of the highest GDP per capita in the world (PPP$58,551), ranks in the top 10 for all pillars with the exception of Infrastructure (15th). Its high Innovation Efficiency Ratio (5th among all economies included in the GII 2016, and 1st among the GII 2016 top 10) allows Switzerland to benefit from its solid innovation capabilities and help transform its resources into high-level innovation outputs.

Sweden regains the second highest position in the GII, a rank it held from 2011 to 2013. Sweden remains the top Nordic economy, showing improvements in both the Input (5th) and Output (2nd) Sub-Indices of the GII. This higher ranking is led by gains in Investment (7th) and Creative goods and services (14th). With improved rankings in 11 of the 21 sub-pillars this year, Sweden continues to rank among the top 25 economies in all sub-pillars. Overall, Sweden shows top 10 rankings in all pillars with the exception of Institutions (11th).

Ranking 3rd in the GII this year, the **United Kingdom** (UK) maintains its position among the top 3 ranks, after a rise from 11th in 2011 to 2nd in both 2014 and 2015. The UK ranks 7th overall in the Innovation Input Sub-Index and 4th overall in the Innovation Output Sub-Index, up one spot from 2015. It ranks in the top 10 economies on all pillars with two exceptions: Institutions and Business sophistication. On the sub-pillar side, the UK ranks in the top 25 economies across the Input and Output Sub-Indices with only four exceptions: Education (28th), General infrastructure (34th), Knowledge absorption (33rd), and Knowledge diffusion (34th). Although the UK is still distant to the performance of the top 25 in sub-pillar 3.2 (General infrastructure), the rank increase of the UK on general infrastructure was its largest rank increase on the input side, up by 14 positions since 2015.

The United States of America (USA) reaches the 4th position. It increases its rank in both the Input Innovation Sub-Index (3rd) and the Output Innovation Sub-Index (7th).

Box 4: Innovation quality: Japan, the USA, and the UK at the top

Measuring the quality of innovation-related input and output indicators as well as their quantity is critical for an accurate assessment. Indeed, some economies have managed to ramp up the quantity of specific indicators—such as education expenditures, patents, and publications—without making much impact. To address this issue, and to better measure the quality of innovation, three indicators were introduced into the GII in 2013: first, the quality of local universities (determined through indicator 2.3.4, QS university rankings average score of top 3 universities); second, the internationalization of local inventions (indicator 5.2.5, patent families filed in three offices; this indicator was changed to patent families filed in two or more offices in the 2016 GII); and third, the number of citations that local research documents receive abroad (indicator 6.1.5, citable documents H index). Figure 4.1 shows the sum of the scores of these three indicators and captures the top 10 highest-performing high- and middle-income economies for this combined indicator.

Top 10 high-income economies: Japan, the USA, the UK, and Germany continue to lead

Among the high-income group, four economies—Japan, the United States of America (USA), the United Kingdom (UK), and Germany—have stood at the top positions in this innovation quality metric since its introduction. This year Japan is number 1 in this ranking. Its scores for the quality of universities and citable documents remain almost unchanged for the past two years. Japan achieves this position mainly as a result of its high score in the modified patent family indicator. The USA and the UK share the top positions in the quality of papers and universities for the fourth consecutive year. In 2016, however, the USA takes the top spot from the UK in the quality of universities.

Like Japan, the Republic of Korea (Korea) and Sweden are high-income economies that have improved their ranking on this combined innovation quality indicator. Korea moves up two spots to replace Canada at the 6th position, above France in the 7th. This upward movement is explained mostly by Korea's better scores in patent families and by Canada's lower scores in university quality and patent families. France scores better this year in citable documents and keeps its 7th position in the innovation quality indicator. Although Sweden shows marginally lower scores in the quality of universities than last year, a stronger score in patent families drives its upward movement. Along with Canada, the Netherlands falls in this quality ranking by one position to 10th. Although the Netherlands this year ranks among the high-income economies with 11th place in university rankings and 12th in patent families, its lower score on the latter indicator is the main culprit for this drop.

Top 10 middle-income economies: China leads and India overtakes Brazil

Overall, the gap between high- and middle-income economies is still considerable. When excluding China, the gap in average scores between these two groups in both the quality of universities (33.1 points) and in citable documents (26.6 points) is expanding, while it is slightly narrower in patent families (28.8 points).

China moves to 17th place in innovation quality this year, allowing it to retain its position at the top of the middle-income economies and further narrowing the distance between these and the high-income group. This upward movement can be attributed to China's higher overall scores in university rankings (7th) and citable documents (16th).

China is now the only middle-income economy with innovation quality scores that display a balance similar to that of high-income economies. The rest of the middle-income economies still depend on their top university rankings to improve their combined quality scores.

India (ranked 66th overall in the GII) swaps the 3rd for the 2nd position with Brazil (ranked 69th in the GII) this year. India's positive move is the result of its performance in university rankings, where it comes in 2nd among middle-income economies and 20th overall; and in patent families, where—also because of methodological changes—it now ranks 3rd among middle-income economies and 37th overall for this indicator. Brazil's performance, on the other hand, shows a slightly better score in citable documents but is affected by lower scores in the quality of universities and in the new patent family indicator.

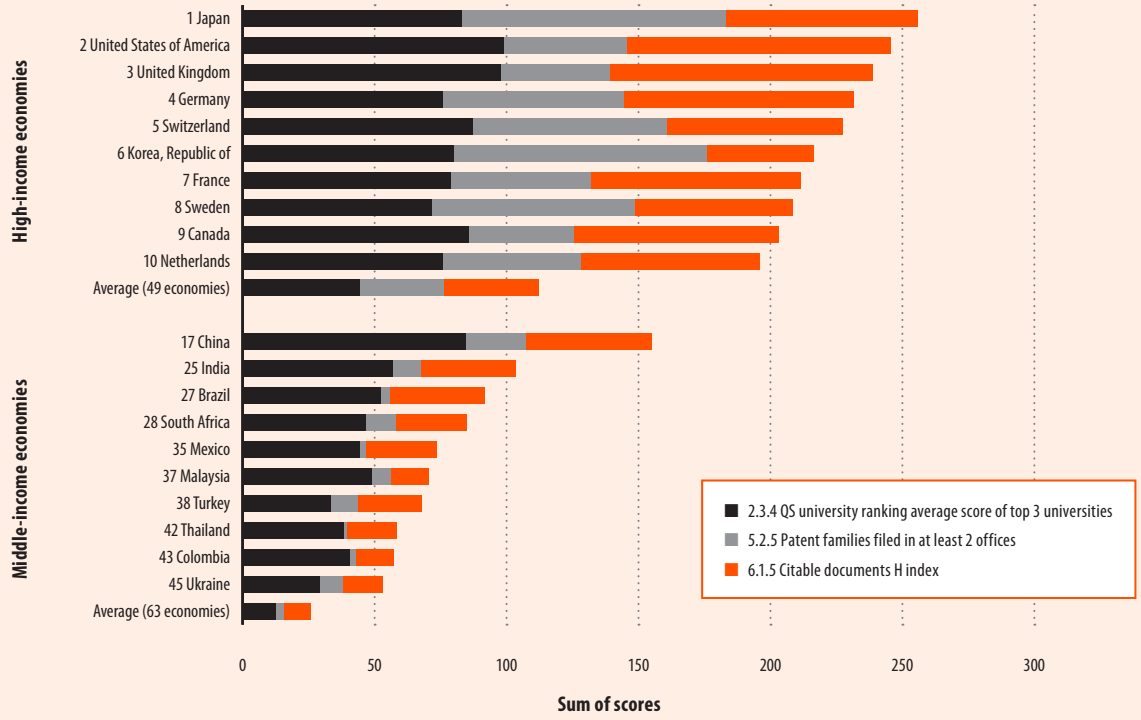
Although most economies at this level of development still display a weak relative performance in patent families, India and Brazil are now beginning to approach the performance shown by China.

South Africa, another large middle-income country, also moves upwards in both the GII and in the overall quality of innovation this year. This progress is the result of higher scores in all three quality-measuring indicators, but is mostly a consequence of a better score in patent families. This advance places South Africa at 35th in that indicator and in 28th position overall in innovation quality. Although no longer part of the middle-income bracket since 2014,

(Continued)

Box 4: Innovation quality: Japan, the USA, and the UK at the top *(continued)*

Figure 4.1: Metrics for quality of innovation: Top 10 high- and top 10 middle-income economies



Notes: Numbers to the left of the economy name are the innovation quality rank. Economies are classified by income according to the World Bank Income Group Classification (July 2014). Upper- and lower-middle income categories are grouped together as middle-income economies.

the Russian Federation, now a high-income economy, improves in both the GII overall and in the quality of innovation rankings this year. The Russian Federation's overall score for this composite indicator places this country in the 26th spot among all other economies, just between the rankings of India and Brazil.

This year Seychelles, Argentina, and Hungary are no longer part of the top 10 group of middle-income economies in innovation quality. Seychelles is not included in the GII 2016 as a result of insufficient data coverage, and Argentina and Hungary are now being classified as high-income economies.[1] These shifts lead Mexico, Malaysia, and Turkey—three economies that have been in the middle-income top 10 since this innovation quality metric was introduced—to move ahead in the rankings. In particular, their rise can be credited to higher scores in the quality of universities for Mexico; a constant performance in all three innovation quality indicators for Malaysia; and an improved score in patent families for Turkey. These shifts also allow Thailand, Colombia, and Ukraine to enter the top 10 rankings of middle-income economies this year.

Note

1 This classification is according to the World Bank's estimates of gross national income (GNI) per capita for the previous year.

Table 1: Global Innovation Index rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.65
Switzerland	66.28	1	HI	1	EUR	1	0.94	5	
Sweden	63.57	2	HI	2	EUR	2	0.86	10	
United Kingdom	61.93	3	HI	3	EUR	3	0.83	14	
United States of America	61.40	4	HI	4	NAC	1	0.79	25	
Finland	59.90	5	HI	5	EUR	4	0.75	32	
Singapore	59.16	6	HI	6	SEAO	1	0.62	78	
Ireland	59.03	7	HI	7	EUR	5	0.89	8	
Denmark	58.45	8	HI	8	EUR	6	0.74	34	
Netherlands	58.29	9	HI	9	EUR	7	0.82	20	
Germany	57.94	10	HI	10	EUR	8	0.87	9	
Korea, Rep.	57.15	11	HI	11	SEAO	2	0.80	24	
Luxembourg	57.11	12	HI	12	EUR	9	1.02	1	
Iceland	55.99	13	HI	13	EUR	10	0.98	3	
Hong Kong (China)	55.69	14	HI	14	SEAO	3	0.61	83	
Canada	54.71	15	HI	15	NAC	2	0.67	57	
Japan	54.52	16	HI	16	SEAO	4	0.65	65	
New Zealand	54.23	17	HI	17	SEAO	5	0.73	40	
France	54.04	18	HI	18	EUR	11	0.73	44	
Australia	53.07	19	HI	19	SEAO	6	0.64	73	
Austria	52.65	20	HI	20	EUR	12	0.73	43	
Israel	52.28	21	HI	21	NAWA	1	0.81	23	
Norway	52.01	22	HI	22	EUR	13	0.68	55	
Belgium	51.97	23	HI	23	EUR	14	0.78	27	
Estonia	51.73	24	HI	24	EUR	15	0.91	6	
China	50.57	25	UM	1	SEAO	7	0.90	7	
Malta	50.44	26	HI	25	EUR	16	0.98	2	
Czech Republic	49.40	27	HI	26	EUR	17	0.82	21	
Spain	49.19	28	HI	27	EUR	18	0.72	48	
Italy	47.17	29	HI	28	EUR	19	0.74	33	
Portugal	46.45	30	HI	29	EUR	20	0.75	31	
Cyprus	46.34	31	HI	30	NAWA	2	0.79	26	
Slovenia	45.97	32	HI	31	EUR	21	0.74	39	
Hungary	44.71	33	HI	32	EUR	22	0.83	17	
Latvia	44.33	34	HI	33	EUR	23	0.78	28	
Malaysia	43.36	35	UM	2	SEAO	8	0.67	59	
Lithuania	41.76	36	HI	34	EUR	24	0.63	75	
Slovakia	41.70	37	HI	35	EUR	25	0.74	36	
Bulgaria	41.42	38	UM	3	EUR	26	0.83	16	
Poland	40.22	39	HI	36	EUR	27	0.65	66	
Greece	39.75	40	HI	37	EUR	28	0.61	84	
United Arab Emirates	39.35	41	HI	38	NAWA	3	0.44	117	
Turkey	39.03	42	UM	4	NAWA	4	0.84	13	
Russian Federation	38.50	43	HI	39	EUR	29	0.65	69	
Chile	38.41	44	HI	40	LCN	1	0.59	91	
Costa Rica	38.40	45	UM	5	LCN	2	0.71	50	
Moldova, Rep.	38.39	46	LM	1	EUR	30	0.94	4	
Croatia	38.29	47	HI	41	EUR	31	0.65	68	
Romania	37.90	48	UM	6	EUR	32	0.72	46	
Saudi Arabia	37.75	49	HI	42	NAWA	5	0.61	85	
Qatar	37.47	50	HI	43	NAWA	6	0.56	97	
Montenegro	37.36	51	UM	7	EUR	33	0.62	80	
Thailand	36.51	52	UM	8	SEAO	9	0.70	53	
Mauritius	35.86	53	UM	9	SSF	1	0.57	95	
South Africa	35.85	54	UM	10	SSF	2	0.55	99	
Mongolia	35.74	55	UM	11	SEAO	10	0.72	47	
Ukraine	35.72	56	LM	2	EUR	34	0.84	12	
Bahrain	35.48	57	HI	44	NAWA	7	0.58	92	
TFYR of Macedonia	35.40	58	UM	12	EUR	35	0.67	56	
Viet Nam	35.37	59	LM	3	SEAO	11	0.84	11	
Armenia	35.14	60	LM	4	NAWA	8	0.83	15	
Mexico	34.56	61	UM	13	LCN	3	0.63	76	
Uruguay	34.28	62	HI	45	LCN	4	0.62	81	
Colombia	34.16	63	UM	14	LCN	5	0.56	96	
Georgia	33.86	64	LM	5	NAWA	9	0.65	67	

Table 1: Global Innovation Index rankings *(continued)*

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.65
Serbia	33.75	65	UM	15	EUR	36	0.65	70	
India	33.61	66	LM	6	CSA	1	0.66	63	
Kuwait	33.61	67	HI	46	NAWA	10	0.73	42	
Panama	33.49	68	UM	16	LCN	6	0.66	61	
Brazil	33.19	69	UM	17	LCN	7	0.55	100	
Lebanon	32.70	70	UM	18	NAWA	11	0.73	41	
Peru	32.51	71	UM	19	LCN	8	0.51	109	
Morocco	32.26	72	LM	7	NAWA	12	0.66	64	
Oman	32.21	73	HI	47	NAWA	13	0.53	103	
Philippines	31.83	74	LM	8	SEAO	12	0.71	49	
Kazakhstan	31.51	75	UM	20	CSA	2	0.51	108	
Dominican Republic	30.55	76	UM	21	LCN	9	0.62	82	
Tunisia	30.55	77	UM	22	NAWA	14	0.60	86	
Iran, Islamic Rep.	30.52	78	UM	23	CSA	3	0.71	51	
Belarus	30.39	79	UM	24	EUR	37	0.45	116	
Kenya	30.36	80	LM	9	SSF	3	0.76	30	
Argentina	30.24	81	HI	48	LCN	10	0.56	98	
Jordan	30.04	82	UM	25	NAWA	15	0.67	58	
Rwanda	29.96	83	LI	1	SSF	4	0.38	123	
Mozambique	29.84	84	LI	2	SSF	5	0.73	45	
Azerbaijan	29.64	85	UM	26	NAWA	16	0.54	101	
Tajikistan	29.62	86	LM	10	CSA	4	0.77	29	
Bosnia and Herzegovina	29.62	87	UM	27	EUR	38	0.46	115	
Indonesia	29.07	88	LM	11	SEAO	13	0.71	52	
Jamaica	28.97	89	UM	28	LCN	11	0.53	104	
Botswana	28.96	90	UM	29	SSF	6	0.42	119	
Sri Lanka	28.92	91	LM	12	CSA	5	0.70	54	
Albania	28.38	92	UM	30	EUR	39	0.40	121	
Namibia	28.24	93	UM	31	SSF	7	0.54	102	
Paraguay	28.20	94	UM	32	LCN	12	0.62	77	
Cambodia	27.94	95	LI	3	SEAO	14	0.59	90	
Bhutan	27.88	96	LM	13	CSA	6	0.28	128	
Guatemala	27.30	97	LM	14	LCN	13	0.62	79	
Malawi	27.26	98	LI	4	SSF	8	0.74	38	
Uganda	27.14	99	LI	5	SSF	9	0.52	106	
Ecuador	27.11	100	UM	33	LCN	14	0.60	87	
Honduras	26.94	101	LM	15	LCN	15	0.53	105	
Ghana	26.66	102	LM	16	SSF	10	0.60	88	
Kyrgyzstan	26.62	103	LM	17	CSA	7	0.50	110	
El Salvador	26.56	104	LM	18	LCN	16	0.48	113	
Tanzania, United Rep.	26.35	105	LI	6	SSF	11	0.81	22	
Senegal	26.14	106	LM	19	SSF	12	0.66	62	
Egypt	25.96	107	LM	20	NAWA	17	0.63	74	
Côte d'Ivoire	25.80	108	LM	21	SSF	13	0.82	19	
Bolivia, Plurinational St.	25.24	109	LM	22	LCN	17	0.59	89	
Ethiopia	24.83	110	LI	7	SSF	14	0.83	18	
Madagascar	24.79	111	LI	8	SSF	15	0.74	35	
Mali	24.77	112	LI	9	SSF	16	0.74	37	
Algeria	24.46	113	UM	34	NAWA	18	0.49	111	
Nigeria	23.15	114	LM	23	SSF	17	0.67	60	
Nepal	23.13	115	LI	10	CSA	8	0.58	94	
Nicaragua	23.06	116	LM	24	LCN	18	0.41	120	
Bangladesh	22.86	117	LM	25	CSA	9	0.52	107	
Cameroon	22.82	118	LM	26	SSF	18	0.58	93	
Pakistan	22.63	119	LM	27	CSA	10	0.64	71	
Venezuela, Bolivarian Rep.	22.32	120	HI	49	LCN	19	0.46	114	
Benin	22.25	121	LI	11	SSF	19	0.43	118	
Burkina Faso	21.05	122	LI	12	SSF	20	0.28	127	
Burundi	20.93	123	LI	13	SSF	21	0.39	122	
Niger	20.44	124	LI	14	SSF	22	0.36	125	
Zambia	19.92	125	LM	28	SSF	23	0.64	72	
Togo	18.42	126	LI	15	SSF	24	0.36	124	
Guinea	17.24	127	LI	16	SSF	25	0.49	112	
Yemen	14.55	128	LM	29	NAWA	19	0.34	126	

Note: World Bank Income Group Classification (July 2015): LI = low income; LM = lower-middle income; UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

Table 2: Innovation Input Sub-Index rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 41.87
Singapore	72.94	**1**	HI	**1**	SEAO	**1**	
Hong Kong (China)	69.15	2	HI	2	SEAO	2	
United States of America	68.71	3	HI	3	NAC	**1**	
Finland	68.49	4	HI	4	EUR	**1**	
Sweden	68.48	5	HI	5	EUR	2	
Switzerland	68.38	6	HI	6	EUR	3	
United Kingdom	67.50	7	HI	7	EUR	4	
Denmark	67.06	8	HI	8	EUR	5	
Japan	66.00	9	HI	9	SEAO	3	
Canada	65.41	10	HI	10	NAC	2	
Australia	64.85	11	HI	11	SEAO	4	
Netherlands	64.03	12	HI	12	EUR	6	
Korea, Rep.	63.54	13	HI	13	SEAO	5	
New Zealand	62.64	14	HI	14	SEAO	6	
France	62.56	15	HI	15	EUR	7	
Ireland	62.44	16	HI	16	EUR	8	
Norway	61.98	17	HI	17	EUR	9	
Germany	61.91	18	HI	18	EUR	10	
Austria	60.86	19	HI	19	EUR	11	
Belgium	58.23	20	HI	20	EUR	12	
Israel	57.78	21	HI	21	NAWA	**1**	
Spain	57.26	22	HI	22	EUR	13	
Luxembourg	56.64	23	HI	23	EUR	14	
Iceland	56.64	24	HI	24	EUR	15	
United Arab Emirates	54.53	25	HI	25	NAWA	2	
Czech Republic	54.28	26	HI	26	EUR	16	
Estonia	54.15	27	HI	27	EUR	17	
Italy	54.07	28	HI	28	EUR	18	
China	53.12	29	UM	**1**	SEAO	7	
Portugal	53.05	30	HI	29	EUR	19	
Slovenia	52.99	31	HI	30	EUR	20	
Malaysia	52.05	32	UM	2	SEAO	8	
Cyprus	51.88	33	HI	31	NAWA	3	
Lithuania	51.18	34	HI	32	EUR	21	
Malta	51.01	35	HI	33	EUR	22	
Latvia	49.73	36	HI	34	EUR	23	
Greece	49.42	37	HI	35	EUR	24	
Hungary	48.94	38	HI	36	EUR	25	
Poland	48.71	39	HI	37	EUR	26	
Chile	48.25	40	HI	38	LCN	**1**	
Qatar	48.05	41	HI	39	NAWA	4	
Slovakia	47.96	42	HI	40	EUR	27	
Saudi Arabia	46.99	43	HI	41	NAWA	5	
Russian Federation	46.69	44	HI	42	EUR	28	
Croatia	46.38	45	HI	43	EUR	29	
Montenegro	46.13	46	UM	3	EUR	30	
South Africa	46.12	47	UM	4	SSF	**1**	
Mauritius	45.75	48	UM	5	SSF	2	
Bulgaria	45.30	49	UM	6	EUR	31	
Costa Rica	44.94	50	UM	7	LCN	2	
Bahrain	44.79	51	HI	44	NAWA	6	
Romania	43.99	52	UM	8	EUR	32	
Colombia	43.78	53	UM	9	LCN	3	
Bhutan	43.46	54	LM	**1**	CSA	**1**	
Rwanda	43.40	55	LI	**1**	SSF	3	
Peru	43.18	56	UM	10	LCN	4	
Thailand	42.98	57	UM	11	SEAO	9	
Brazil	42.73	58	UM	12	LCN	5	
Turkey	42.54	59	UM	13	NAWA	7	
Mexico	42.52	60	UM	14	LCN	6	
Uruguay	42.33	61	HI	45	LCN	7	
TFYR of Macedonia	42.31	62	UM	15	EUR	33	
Oman	42.10	63	HI	46	NAWA	8	
Belarus	41.99	64	UM	16	EUR	34	

Table 2: Innovation Input Sub-Index rankings *(continued)*

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 41.87
Kazakhstan	41.75	65	UM	17	CSA	2	
Mongolia	41.56	66	UM	18	SEAO	10	
Georgia	41.02	67	LM	2	NAWA	9	
Serbia	40.94	68	UM	19	EUR	35	
Botswana	40.93	69	UM	20	SSF	4	
Bosnia and Herzegovina	40.54	70	UM	21	EUR	36	
Albania	40.53	71	UM	22	EUR	37	
India	40.49	72	LM	3	CSA	3	
Panama	40.31	73	UM	23	LCN	8	
Moldova, Rep.	39.57	74	LM	4	EUR	38	
Morocco	38.93	75	LM	5	NAWA	10	
Ukraine	38.91	76	LM	6	EUR	39	
Argentina	38.86	77	HI	47	LCN	9	
Kuwait	38.84	78	HI	48	NAWA	11	
Viet Nam	38.45	79	LM	7	SEAO	11	
Armenia	38.40	80	LM	8	NAWA	12	
Azerbaijan	38.39	81	UM	24	NAWA	13	
Tunisia	38.10	82	UM	25	NAWA	14	
Jamaica	37.96	83	UM	26	LCN	10	
Dominican Republic	37.80	84	UM	27	LCN	11	
Lebanon	37.78	85	UM	28	NAWA	15	
Philippines	37.23	86	LM	9	SEAO	12	
Namibia	36.66	87	UM	29	SSF	5	
Jordan	36.01	88	UM	30	NAWA	16	
El Salvador	35.92	89	LM	10	LCN	12	
Iran, Islamic Rep.	35.72	90	UM	31	CSA	4	
Uganda	35.63	91	LI	2	SSF	6	
Kyrgyzstan	35.61	92	LM	11	CSA	5	
Honduras	35.33	93	LM	12	LCN	13	
Cambodia	35.06	94	LI	3	SEAO	13	
Paraguay	34.75	95	UM	32	LCN	14	
Mozambique	34.55	96	LI	4	SSF	7	
Kenya	34.44	97	LM	13	SSF	8	
Sri Lanka	34.08	98	LM	14	CSA	6	
Indonesia	34.04	99	LM	15	SEAO	14	
Ecuador	33.92	100	UM	33	LCN	15	
Guatemala	33.69	101	LM	16	LCN	16	
Tajikistan	33.51	102	LM	17	CSA	7	
Ghana	33.37	103	LM	18	SSF	9	
Algeria	32.80	104	UM	34	NAWA	17	
Burkina Faso	32.78	105	LI	5	SSF	10	
Nicaragua	32.78	106	LM	19	LCN	17	
Egypt	31.76	107	LM	20	NAWA	18	
Bolivia, Plurinational St.	31.66	108	LM	21	LCN	18	
Senegal	31.47	109	LM	22	SSF	11	
Malawi	31.41	110	LI	6	SSF	12	
Benin	31.16	111	LI	7	SSF	13	
Venezuela, Bolivarian Rep.	30.52	112	HI	49	LCN	19	
Niger	30.08	113	LI	8	SSF	14	
Burundi	30.04	114	LI	9	SSF	15	
Bangladesh	30.02	115	LM	23	CSA	8	
Nepal	29.31	116	LI	10	CSA	9	
Tanzania, United Rep.	29.05	117	LI	11	SSF	16	
Cameroon	28.88	118	LM	24	SSF	17	
Mali	28.53	119	LI	12	SSF	18	
Madagascar	28.45	120	LI	13	SSF	19	
Côte d'Ivoire	28.29	121	LM	25	SSF	20	
Nigeria	27.80	122	LM	26	SSF	21	
Pakistan	27.51	123	LM	27	CSA	10	
Ethiopia	27.19	124	LI	14	SSF	22	
Togo	27.11	125	LI	15	SSF	23	
Zambia	24.25	126	LM	28	SSF	24	
Guinea	23.18	127	LI	16	SSF	25	
Yemen	21.67	128	LM	29	NAWA	19	

Note: World Bank Income Group Classification (July 2015): LI = low income; LM = lower-middle income; UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

Table 3: Innovation Output Sub-Index rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 26.35
Switzerland	64.19	**1**	HI	**1**	EUR	**1**	
Sweden	58.66	2	HI	2	EUR	2	
Luxembourg	57.57	3	HI	3	EUR	3	
United Kingdom	56.35	4	HI	4	EUR	4	
Ireland	55.63	5	HI	5	EUR	5	
Iceland	55.35	6	HI	6	EUR	6	
United States of America	54.08	7	HI	7	NAC	**1**	
Germany	53.97	8	HI	8	EUR	7	
Netherlands	52.54	9	HI	9	EUR	8	
Finland	51.32	10	HI	10	EUR	9	
Korea, Rep.	50.75	11	HI	11	SEAO	**1**	
Malta	49.86	12	HI	12	EUR	10	
Denmark	49.84	13	HI	13	EUR	11	
Estonia	49.31	14	HI	14	EUR	12	
China	48.02	15	UM	**1**	SEAO	2	
Israel	46.77	16	HI	15	NAWA	**1**	
New Zealand	45.82	17	HI	16	SEAO	3	
Belgium	45.71	18	HI	17	EUR	13	
France	45.51	19	HI	18	EUR	14	
Singapore	45.38	20	HI	19	SEAO	4	
Czech Republic	44.53	21	HI	20	EUR	15	
Austria	44.44	22	HI	21	EUR	16	
Canada	44.00	23	HI	22	NAC	2	
Japan	43.04	24	HI	23	SEAO	5	
Hong Kong (China)	42.22	25	HI	24	SEAO	6	
Norway	42.04	26	HI	25	EUR	17	
Australia	41.28	27	HI	26	SEAO	7	
Spain	41.11	28	HI	27	EUR	18	
Cyprus	40.80	29	HI	28	NAWA	2	
Hungary	40.47	30	HI	29	EUR	19	
Italy	40.28	31	HI	30	EUR	20	
Portugal	39.85	32	HI	31	EUR	21	
Slovenia	38.95	33	HI	32	EUR	22	
Latvia	38.92	34	HI	33	EUR	23	
Bulgaria	37.53	35	UM	2	EUR	24	
Moldova, Rep.	37.21	36	LM	**1**	EUR	25	
Turkey	35.52	37	UM	3	NAWA	3	
Slovakia	35.43	38	HI	34	EUR	26	
Malaysia	34.66	39	UM	4	SEAO	8	
Ukraine	32.53	40	LM	2	EUR	27	
Lithuania	32.34	41	HI	35	EUR	28	
Viet Nam	32.29	42	LM	3	SEAO	9	
Armenia	31.89	43	LM	4	NAWA	4	
Costa Rica	31.87	44	UM	5	LCN	**1**	
Romania	31.81	45	UM	6	EUR	29	
Poland	31.73	46	HI	36	EUR	30	
Russian Federation	30.31	47	HI	37	EUR	31	
Croatia	30.19	48	HI	38	EUR	32	
Greece	30.09	49	HI	39	EUR	33	
Thailand	30.04	50	UM	7	SEAO	10	
Mongolia	29.93	51	UM	8	SEAO	11	
Montenegro	28.59	52	UM	9	EUR	34	
Chile	28.57	53	HI	40	LCN	2	
Saudi Arabia	28.51	54	HI	41	NAWA	5	
TFYR of Macedonia	28.49	55	UM	10	EUR	35	
Kuwait	28.37	56	HI	42	NAWA	6	
Lebanon	27.62	57	UM	11	NAWA	7	
Qatar	26.88	58	HI	43	NAWA	8	
India	26.73	59	LM	5	CSA	**1**	
Georgia	26.71	60	LM	6	NAWA	9	
Panama	26.67	61	UM	12	LCN	3	
Mexico	26.60	62	UM	13	LCN	4	
Serbia	26.57	63	UM	14	EUR	36	
Philippines	26.43	64	LM	7	SEAO	12	

Table 3: Innovation Output Sub-Index rankings *(continued)*

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 26.35
Kenya	26.28	65	LM	8	SSF	1	
Uruguay	26.22	66	HI	44	LCN	5	
Bahrain	26.17	67	HI	45	NAWA	10	
Mauritius	25.97	68	UM	15	SSF	2	
Tajikistan	25.74	69	LM	9	CSA	2	
Morocco	25.58	70	LM	10	NAWA	11	
South Africa	25.58	71	UM	16	SSF	3	
Iran, Islamic Rep.	25.33	72	UM	17	CSA	3	
Mozambique	25.13	73	LI	1	SSF	4	
Colombia	24.55	74	UM	18	LCN	6	
United Arab Emirates	24.18	75	HI	46	NAWA	12	
Indonesia	24.10	76	LM	11	SEAO	13	
Jordan	24.06	77	UM	19	NAWA	13	
Sri Lanka	23.77	78	LM	12	CSA	4	
Brazil	23.65	79	UM	20	LCN	7	
Tanzania, United Rep.	23.65	80	LI	2	SSF	5	
Côte d'Ivoire	23.31	81	LM	13	SSF	6	
Dominican Republic	23.31	82	UM	21	LCN	8	
Malawi	23.11	83	LI	3	SSF	7	
Tunisia	23.00	84	UM	22	NAWA	14	
Ethiopia	22.48	85	LI	4	SSF	8	
Oman	22.32	86	HI	47	NAWA	15	
Peru	21.84	87	UM	23	LCN	9	
Paraguay	21.64	88	UM	24	LCN	10	
Argentina	21.62	89	HI	48	LCN	11	
Kazakhstan	21.27	90	UM	25	CSA	5	
Madagascar	21.13	91	LI	5	SSF	9	
Mali	21.02	92	LI	6	SSF	10	
Guatemala	20.91	93	LM	14	LCN	12	
Azerbaijan	20.88	94	UM	26	NAWA	16	
Cambodia	20.82	95	LI	7	SEAO	14	
Senegal	20.81	96	LM	15	SSF	11	
Ecuador	20.30	97	UM	27	LCN	13	
Egypt	20.16	98	LM	16	NAWA	17	
Jamaica	19.98	99	UM	28	LCN	14	
Ghana	19.94	100	LM	17	SSF	12	
Namibia	19.83	101	UM	29	SSF	13	
Bolivia, Plurinational St.	18.83	102	LM	18	LCN	15	
Belarus	18.79	103	UM	30	EUR	37	
Bosnia and Herzegovina	18.70	104	UM	31	EUR	38	
Uganda	18.65	105	LI	8	SSF	14	
Honduras	18.56	106	LM	19	LCN	16	
Nigeria	18.50	107	LM	20	SSF	15	
Pakistan	17.75	108	LM	21	CSA	6	
Kyrgyzstan	17.63	109	LM	22	CSA	7	
El Salvador	17.19	110	LM	23	LCN	17	
Botswana	16.99	111	UM	32	SSF	16	
Nepal	16.94	112	LI	9	CSA	8	
Cameroon	16.76	113	LM	24	SSF	17	
Rwanda	16.53	114	LI	10	SSF	18	
Albania	16.24	115	UM	33	EUR	39	
Algeria	16.13	116	UM	34	NAWA	18	
Bangladesh	15.71	117	LM	25	CSA	9	
Zambia	15.58	118	LM	26	SSF	19	
Venezuela, Bolivarian Rep.	14.12	119	HI	49	LCN	18	
Nicaragua	13.35	120	LM	27	LCN	19	
Benin	13.33	121	LI	11	SSF	20	
Bhutan	12.30	122	LM	28	CSA	10	
Burundi	11.82	123	LI	12	SSF	21	
Guinea	11.30	124	LI	13	SSF	22	
Niger	10.80	125	LI	14	SSF	23	
Togo	9.73	126	LI	15	SSF	24	
Burkina Faso	9.31	127	LI	16	SSF	25	
Yemen	7.43	128	LM	29	NAWA	19	

Note: World Bank Income Group Classification (July 2015): LI = low income; LM = lower-middle income; UM = upper-middle income; and HI = high income. Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

The introduction of more accurate innovation indicators this year helps the USA's upward momentum. The USA keeps its top ranking in pillar 4, Market sophistication, and also this year in each of its three sub-pillars. In all other sub-pillars, the USA ranks in the top 25 with just four exceptions: Education (39th), Tertiary education (50th), Ecological sustainability (60th), and Intangible assets (45th). At the indicator level, the USA takes the top spot in 10 different indicators, including QS university rankings, venture capital deals, computer software spending, and cultural and creative services exports. In two new indicators—global R&D companies and domestic market scale—it ranks 2nd. This year the country also ranks 2nd in the quality of innovation composite indicator for the first time since its introduction in 2013, although this is largely the result of methodological considerations (see Box 4 on page 18). Box 5 on page 36 dives deeper into opportunities for the USA.

Finland re-enters the top 5 in the GII this year at 5th place. Its ranking of 4th in the Innovation Input Sub-Index can be partially attributed to Finland's place within the top 5 for three of its pillars: Institutions (2nd), Human capital and research (1st), and Business sophistication (4th). Nine of Finland's 16 relative strengths across pillars, sub-pillars, and indicators lie within Institutions and Human capital and research. The country takes the top spot in two indicators here: rule of law and ease of resolving insolvency. Finland's performance as part of the top 10 group relies on 16 of the 21 sub-pillars ranking in the top 10, including Business environment (1st), Knowledge workers (4th), Investment (8th), Innovation linkages (7th), Knowledge creation (8th), Knowledge diffusion (10th), and Knowledge absorption (10th). Improvement opportunities for Finland are seen in Trade, competition, and market scale (48th), Knowledge impact (41st), Ecological sustainability (31st), and Creative goods and services (30th).

Singapore moves up one position to 6th in this year's GII, earning the top rank in the South East Asia, East Asia, and Oceania region. It also earns the top spot in the Innovation Input Sub-Index, led by its ranking in the top 5 for all Input pillars and 1st place in three input pillars: Institutions, Infrastructure, and Business sophistication. Singapore maintains its rank of 20th in the Innovation Output Sub-Index, moving up two spots in the Knowledge and technology pillar to reach the top 10. In addition to ranking 1st in three pillars, Singapore also takes the top spot in three sub-pillars: Political environment, Regulatory environment, and Knowledge absorption. At the indicator level, Singapore sees relative stability across pillars, with the most significant improvements since 2015 in five indicators: expenditure on education (up 9 spots), ICT services imports (up by 47 spots), intellectual property receipts (up by 6 spots), ICT services exports (up by 11 spots), and trademarks by origin (up by 11 spots).

Ireland is ranked 7th this year after entering the top 20 in 2010 and the top 10 in 2012. Ireland's rank rose this year in overall Innovation Outputs (5th) and is perceived as a more efficient economy in terms of innovation, as captured by an improved Innovation Efficiency Ratio (8th). Ireland ranks in the top 20 across all pillars, with the greatest improvement in Infrastructure (19th). This is the result of a better performance in gross capital formation, although this indicator remains a relative weakness for the economy. Conversely, Ireland sees its largest drop in Market sophistication (19th); this shift can be attributed to two variables moving out of the top 25 in that sub-pillar: ease of getting credit and domestic credit to private sector, ranking now at 27th and 35th, respectively.

Denmark ranks 8th in this year's GII, a spot it also held in 2014. Denmark's improved positioning comes as it ranks in the top 25 economies across all pillars. At the sub-pillar level, Denmark improves in Tertiary education (17th), Investment (5th), Knowledge absorption (32nd), and Intangible assets (29th). It has also achieved a spot in the top 25 economies in 15 of the 21 sub-pillars. Although the country has a number of strengths in both the input and output sides of the GII, Denmark's most notable areas of opportunity are also in both sub-indices: Trade, competition, and market scale (36th), Knowledge absorption (32nd), and Knowledge impact (32nd).

The Netherlands has been ranked in the top 10 economies of the GII since 2008, and the country remains there in 2016 at 9th position. However, in part because of methodological considerations (see below), this year its ranking is affected by its lower ranks on both the Innovation Input Sub-Index (12th) and the Innovation Output Sub-Index (9th). The Netherlands achieves a top 25 ranking among all economies for all pillars of the GII, with a better ranking this year in Infrastructure (12th) and Business sophistication (9th). Conversely, the Netherlands' performance falls at the pillar level in Knowledge and technology outputs, where it ranks 16th overall. This change is mainly a consequence of lower rankings in the Knowledge diffusion sub-pillar (114th) and the indicator FDI net outflows (118th).

The latter indicator, identified as highly volatile in previous GII editions, partly drives the fall in the ranking of the Netherlands. Also, for some new variables—namely, IP receipts and ICT services exports—the Netherlands lacks data.

Germany rounds out the top 10 economies of the GII, moving into this group for the first time since 2009. Germany's ranking increases are notable across five pillars: Institutions (18th), Market sophistication (16th), Business sophistication (15th), Knowledge and technology outputs (8th), and Creative outputs (7th). Germany shows stability in its ranks in both the Innovation Input Sub-Index (18th) and the Innovation Output Sub-Index (8th), and improves in its Innovation Efficiency Ratio (9th). Ranking in the top 25 economies across all pillars, and in the top 10 economies for both output pillars, Germany shows improvements on the output side in Knowledge impact (26th), Intangible assets (8th), and Creative goods and services (29th). In addition, specific strengths at the indicator level on the output side are behind the upward drive that now has Germany among the top 10. These include patents by origin (1st), Citable documents H index (3rd), industrial designs by origin (5th), and country-code top-level domains (1st).

The top 10 in the Innovation Input Sub-Index

The Innovation Input Sub-Index considers the elements of an economy that enable innovative activity through five pillars. The top 10 economies in the Innovation Input Sub-Index are Singapore, Hong Kong (China), the USA, Finland, Sweden, Switzerland, the UK, Denmark, Japan, and Canada. Hong Kong (China), Japan, and Canada are the only economies in this group that are not also in the GII top 10.

Hong Kong (China) is ranked 14th in the GII overall, down from 11th in 2015. It ranks in the top 25 economies for all pillars except for Knowledge and technology outputs (30th). With particularly high rankings in Institutions (4th), Infrastructure (2nd), and Market sophistication (2nd), Hong Kong (China) has the second spot in the Innovation Input Sub-Index. In 9 of the 15 Input sub-pillars, Hong Kong (China) ranks in the top 10, with either stable or improved rankings from 2015 in 14 of these sub-pillars. In addition to improvements in the Institutions pillar, its top performance in Market sophistication can be noted. This is where most of the economy's individual strengths are identified—ease of protecting minority investors, market capitalization, total value of stocks traded, and applied weighted tariff are all ranked 1st. Conversely, despite improving in rank in two indicators in the Education sub-pillar, expenditure on education (89th) and government expenditure on education per pupil (60th) are both relative areas of opportunity for improvement. The introduction of new indicators is also a factor to consider when assessing Hong Kong (China)'s drop from the top 10 this year (see Annex 2).

Japan moves up three spots in the Innovation Input Sub-Index to 9th and up three spots in its overall GII ranking to 16th. Ranking in the top 15 economies for all five input pillars, Japan improved most in Market sophistication (8th) and Business sophistication (10th). Within Market sophistication, Japan shows progress in market capitalization (13th) and total value of stocks traded (4th). Within Business sophistication, Japan improves in ICT services imports (49th) and in overall Knowledge absorption (11th). Other areas of strength for Japan on the input side include Research and development (2nd), ICTs (4th), and Trade, competition, and market scale (2nd).

Canada remains in the top 10 in the Innovation Input Sub-Index, ranking 10th in the sub-index and 15th overall, up one position from 2015 (see Box 5 on page 36 for more details on Canada). Canada's strengths on the input side come from having top 25 rankings in each of its pillars. Canada shows particular strengths in Institutions (6th) and Market sophistication (3rd). At the sub-pillar level, Canada performs at relative levels of strength and within the top 10 overall economy rankings in Political environment (8th), Business environment (2nd), General infrastructure (4th), Credit (8th), and Investment (4th).

The top 10 in the Innovation Output Sub-Index

The Innovation Output Sub-Index variables provide information on elements that are the result of innovation within an economy. Although scores on the Input and Output Sub-Indices might differ substantially, leading to important shifts in rankings from one sub-index to the other for particular countries, the data confirm that efforts made to improve enabling environments are rewarded with better innovation outputs. The top 10 economies in the Innovation Output Sub-Index this year are Switzerland, Sweden, Luxembourg, the UK, Ireland, Iceland, the USA, Germany, the Netherlands, and Finland.

The 10 economies leading the Innovation Output Sub-Index remain consistent with their ranking in 2015, with several shifts: four economies move upward in ranking

within the top 10 (Sweden, the UK, Ireland, and the USA), while two economies move downward in ranking within the top 10 (Luxembourg, the Netherlands). Eight of these economies are already in the GII top 10; the profiles of the other two economies are discussed below.

Luxembourg ranks 3rd in the Innovation Output Sub-Index in 2016 and 12th in the overall GII. On the output side, Luxembourg comes in 11th in Knowledge and technology outputs and 2nd in Creative outputs, improving and maintaining its position from 2015, respectively. Luxembourg ranks among the top five economies in four of the six output sub-pillars: Knowledge diffusion (5th), Intangible assets (1st), Creative goods and services (10th), and Online creativity (3rd); it ranks 1st in five indicators: PCT patent applications, FDI net outflows, cultural and creative services exports, national feature films, and generic top-level domains (TLDs). Luxembourg also achieves the top position in the Innovation Efficiency Ratio rankings while maintaining the second-highest GDP per capita (PPP$ GDP) of all GII 2016 economies (after Qatar).

Iceland ranks 6th in the Innovation Output-Sub Index in 2016 and 13th in the GII overall, maintaining its GII 2015 positioning in both. Although Iceland ranks 24th in the Innovation Input Sub-Index, down one spot from 2015, on the output side this year it shows its strength in its 1st place in Creative outputs, the same rank it held last year. Within this pillar, Iceland holds the top spot in two of its sub-pillars: Creative goods and services and Online creativity, while ranking 1st in four of its indicators: national feature films, printing and publishing manufactures, generic top-level domains (TLDs), and Wikipedia edits. Within the Knowledge and technology outputs pillar (22nd), Iceland ranks 1st in scientific and technical articles, while exhibiting opportunities for growth in its lower rankings in growth rate of GDP per worker (84th) and high- and medium-high-tech manufactures (85th).

Top performers by income group

Viewing economies among their income-group peers can illustrate important relative competitive advantages and help decision makers glean important lessons for improved performance that are applicable on the ground. The GII also assesses results relative to the development stages of countries.

Table 4 shows the 10 best-ranked economies in each index by income group. The top 24 positions in the GII are taken by high-income economies, a shift from 2015 as China (now in the upper-middle-income group) moves into the top 25 group in the GII (see Box 3 on page 10).

Switzerland, Sweden, and the UK are among the high-income top 10 on the three main indices, while Switzerland and Sweden are also in the top 10 in the Innovation Efficiency Ratio. Hungary, now in the high-income group, shows rank improvements across all three main indices, as well as in the Innovation Efficiency Ratio, where it is now among the top 10 ranked economies.

Among the 10 highest-ranked upper-middle-income economies, eight remain from 2015: China (25th this year), Malaysia (35th), Bulgaria (38th), Costa Rica (45th), Romania (48th), Montenegro (51st), Thailand (52nd), and Mauritius (53rd). Newcomers to this group of the 10 best upper-middle-income performers include Turkey (42nd) and South Africa (54th), which displace Belarus (79th) and TFYR of Macedonia (58th).

China, Malaysia, Bulgaria, Costa Rica, Romania, and Montenegro are among the 10 best-ranked upper-middle-income economies across all three main indices; of these, all except Malaysia and Montenegro also make it to the upper-middle-income top 10 in the Innovation Efficiency Ratio.

The same analysis for lower-middle-income countries shows that eight of the top 10 countries from 2015 remain in the top 10 this year. These include the Republic of Moldova (46th), Ukraine (56th), Viet Nam (59th), Armenia (60th), Georgia (64th), India (66th), Morocco (72nd), and the Philippines (74th). New this year to the top 10 lower-middle-income countries are Kenya (80th) and Tajikistan (86th), which displace Sri Lanka (91st) and Senegal (106th). All of the top 10 lower-middle-income countries have rankings in the top 10 for each of the three indices with the exceptions of Kenya and Tajikistan; the Republic of Moldova, Viet Nam, Ukraine, Armenia, and the Philippines also make it to the lower-middle-income top 10 in the Innovation Efficiency Ratio.

There has also been a strong consistency among low-income countries, with nine out of 10 economies remaining in the top 10. Rwanda is the top-ranked low-income country (83rd), having moved up 11 spots in the overall GII since 2015, and with ranking improvements in the Innovation Input-Sub-Index (55th), Innovation Output Sub-Index (114th), and Innovation Efficiency Ratio (123rd). This last ranking, however, is still identified as a weakness for that country. Following in the ranking of low-income countries are Mozambique (84th), Cambodia (95th), Malawi (98th), Uganda

Table 4: Ten best-ranked economies by income group (rank)

	Global Innovation Index	Innovation Input Sub-Index	Innovation Output Sub-Index	Innovation Efficiency Ratio
High-income economies (49 in total)				
1	**Switzerland (1)**	Singapore (1)	**Switzerland (1)**	Luxembourg (1)
2	**Sweden (2)**	Hong Kong (China) (2)	**Sweden (2)**	Malta (2)
3	**United Kingdom (3)**	United States of America (3)	Luxembourg (3)	Iceland (3)
4	United States of America (4)	Finland (4)	**United Kingdom (4)**	**Switzerland (5)**
5	Finland (5)	**Sweden (5)**	Ireland (5)	Estonia (6)
6	Singapore (6)	**Switzerland (6)**	Iceland (6)	Ireland (8)
7	Ireland (7)	**United Kingdom (7)**	United States of America (7)	Germany (9)
8	Denmark (8)	Denmark (8)	Germany (8)	**Sweden (10)**
9	Netherlands (9)	Japan (9)	Netherlands (9)	**United Kingdom (14)**
10	Germany (10)	Canada (10)	Finland (10)	Hungary (17)
Upper-middle-income economies (34 in total)				
1	**China (25)**	**China (29)**	**China (15)**	**China (7)**
2	Malaysia (35)	Malaysia (32)	**Bulgaria (35)**	Turkey (13)
3	**Bulgaria (38)**	Montenegro (46)	Turkey (37)	**Bulgaria (16)**
4	Turkey (42)	South Africa (47)	Malaysia (39)	Lebanon (41)
5	**Costa Rica (45)**	Mauritius (48)	**Costa Rica (44)**	**Romania (46)**
6	**Romania (48)**	**Bulgaria (49)**	**Romania (45)**	Mongolia (47)
7	Montenegro (51)	**Costa Rica (50)**	Thailand (50)	**Costa Rica (50)**
8	Thailand (52)	**Romania (52)**	Mongolia (51)	Iran, Islamic Rep. (51)
9	Mauritius (53)	Colombia (53)	Montenegro (52)	Thailand (53)
10	South Africa (54)	Peru (56)	TFYR of Macedonia (55)	TFYR of Macedonia (56)
Lower-middle-income economies (29 in total)				
1	**Moldova, Rep. (46)**	Bhutan (54)	**Moldova, Rep. (36)**	**Moldova, Rep. (4)**
2	**Ukraine (56)**	Georgia (67)	**Ukraine (40)**	**Viet Nam (11)**
3	**Viet Nam (59)**	India (72)	**Viet Nam (42)**	**Ukraine (12)**
4	**Armenia (60)**	**Moldova, Rep. (74)**	**Armenia (43)**	**Armenia (15)**
5	Georgia (64)	Morocco (75)	India (59)	Côte d'Ivoire (19)
6	India (66)	**Ukraine (76)**	Georgia (60)	Tajikistan (29)
7	Morocco (72)	**Viet Nam (79)**	**Philippines (64)**	Kenya (30)
8	**Philippines (74)**	**Armenia (80)**	Kenya (65)	**Philippines (49)**
9	Kenya (80)	**Philippines (86)**	Tajikistan (69)	Indonesia (52)
10	Tajikistan (86)	El Salvador (89)	Morocco (70)	Sri Lanka (54)
Low-income economies (16 in total)				
1	Rwanda (83)	Rwanda (55)	**Mozambique (73)**	Ethiopia (18)
2	**Mozambique (84)**	**Uganda (91)**	Tanzania, United Rep. (80)	Tanzania, United Rep. (22)
3	**Cambodia (95)**	**Cambodia (94)**	**Malawi (83)**	Madagascar (35)
4	**Malawi (98)**	**Mozambique (96)**	Ethiopia (85)	Mali (37)
5	**Uganda (99)**	Burkina Faso (105)	Madagascar (91)	**Malawi (38)**
6	Tanzania, United Rep. (105)	**Malawi (110)**	Mali (92)	**Mozambique (45)**
7	Ethiopia (110)	Benin (111)	**Cambodia (95)**	**Cambodia (90)**
8	Madagascar (111)	Niger (113)	**Uganda (105)**	**Nepal (94)**
9	Mali (112)	Burundi (114)	**Nepal (112)**	**Uganda (106)**
10	**Nepal (115)**	**Nepal (116)**	Rwanda (114)	Guinea (112)

Note: Economies with top 10 positions in the GII, the Input Sub-Index, and the Output Sub-Index within their income group are highlighted in bold.

Table 5: Innovation achievers and their income groups and regions

Economy	Income group	Region
Moldova, Rep.	Lower-middle	EUR
Mozambique	Low income	SSF
Rwanda	Low income	SSF
Viet Nam	Lower-middle	SEAO
Malawi	Low income	SSF
Tajikistan	Lower-middle	CSA
Kenya	Lower-middle	SSF
Ukraine	Lower-middle	EUR
India	Lower-middle	CSA
Uganda	Low income	SSF
Czech Republic	High income	EUR
Armenia	Lower-middle	NAWA
Malta	High income	EUR
Madagascar	Low income	SSF
Portugal	High income	EUR

Note: These countries appear 10% or more above the trend line and are listed here in order of distance.
Regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

(99th), the United Republic of Tanzania (105th), Ethiopia (110th), Madagascar (111th), Mali (112th), and Nepal (115th), which displaces Burkina Faso (122nd). Ranking well across all main indices of the GII, Rwanda, Mozambique, Cambodia, Malawi, Uganda, and Nepal are among the top 10 low-income countries. Of these, all except Rwanda are in the low-income top 10 in the Innovation Efficiency Ratio.

Maximizing innovation resources and synergies: The Innovation Efficiency Ratio

The Innovation Efficiency Ratio is calculated as the ratio of the Output Sub-Index score over the Input Sub-Index score. It assesses the effectiveness of innovation systems and policies. It must be noted, however, that economies might also reach a relatively high Innovation Efficiency Ratio as a result of particularly low input scores. Because of this, efficiency ratios must be analysed jointly with GII, Input, and Output scores, and with the development stages of the economies in mind.

The 10 countries with the highest Innovation Efficiency Ratios are countries that combine certain levels of innovation inputs with more robust output results (see Table 1 on page 20): Luxembourg, Malta, Iceland, the Republic of Moldova, Switzerland, Estonia, China, Ireland, Germany, and Sweden. Eight of the top 10 most efficient economies are high-income economies.

As in 2015, economies from Europe, South East Asia, East Asia, and Oceania, Northern Africa and Western Asia, and Sub-Saharan Africa take up the first 20 positions in this ratio ranking.

Among upper-middle-income economies, only China is in the top 10 in terms of efficiency; China also ranks in the top 15 in the Innovation Output Sub-Index, surmounting its relatively lower ranking in the Innovation Input Sub-Index. Within the upper-middle-income group, 47.1% of economies rank higher in outputs than they do in inputs.

Among lower-middle-income economies, only the Republic of Moldova is in the top 10 in terms of efficiency; the Republic of Moldova also ranks at the top of lower-middle-income economies in the Innovation Output Sub-Index (36th). Additionally, Viet Nam, Ukraine, Armenia, and Côte d'Ivoire rank in the group of the top 20 economies globally in terms of innovation efficiency. Within the lower-middle-income group, 75.9% of economies rank higher in outputs than they do in inputs. No low-income economies are in the top 10 this year in innovation efficiency rankings.

Clustering leaders, innovation achievers, and underperformers: The GII bubble chart

The GII helps also identify economies that over- or underperform on innovation relative to their level of development. Figure 4 on page 32 illustrates the findings by presenting the GII scores plotted against GDP per capita in PPP$ (in natural logs). The economies that appear close to the trend line show results that are in accordance with what is expected based on their level of development. The further up and above the trend line an economy appears, the better its innovation performance is when compared with that of its peers at the same stage of development. Light-coloured bubbles in the figure correspond to the efficient innovators (a majority of them are situated above the trend line), while the dark-coloured bubbles represent those countries in the lower half of the Innovation Efficiency Ratio.

Among the innovation leaders we find the top 25 countries that, with two exceptions—China is now in and the Czech Republic is out—are the same economies as in 2015. A majority of economies in this category are in the high-income group and located in Europe or South East Asia, East Asia, and Oceania. All of these economies also have a GII score above 50.[48] These all show solid innovation systems where investments in human capital prosper in stable innovation infrastructures to create the highest levels of innovation outputs globally.

Economies that perform at least 10 percent higher than their peers for their level of GDP are called 'innovation achievers'. These economies are shown in Table 5. Innovation achievers demonstrate better results in innovation because they continuously make improvements to their institutional framework, have a set of highly skilled workers who operate

Table 6: Heatmap for GII top 10 economies and regional and income group averages (1–100)

Country/Economy	GII	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Input	Knowledge and technology outputs	Creative outputs	Output	Efficiency
Switzerland	66.28	90.25	63.32	60.97	69.76	57.57	68.38	66.99	61.38	64.19	0.94
Sweden	63.57	88.32	64.82	66.33	66.17	56.78	68.48	63.92	53.40	58.66	0.86
United Kingdom	61.93	87.65	62.61	66.39	71.63	49.24	67.50	50.17	62.53	56.35	0.83
United States of America	61.40	85.74	57.03	61.73	86.63	52.45	68.71	56.54	51.62	54.08	0.79
Finland	59.90	94.31	68.11	59.99	62.72	57.34	68.49	52.07	50.56	51.32	0.75
Singapore	59.16	94.85	67.08	69.11	71.52	62.14	72.94	49.63	41.14	45.38	0.62
Ireland	59.03	88.15	54.00	59.39	56.94	53.76	62.44	57.89	53.36	55.63	0.89
Denmark	58.45	91.56	65.77	58.77	71.33	47.86	67.06	46.36	53.33	49.84	0.74
Netherlands	58.29	90.98	55.30	62.07	58.05	53.75	64.03	44.08	61.01	52.54	0.82
Germany	57.94	84.11	58.93	58.51	59.70	48.29	61.91	51.64	56.29	53.97	0.87
Average	**36.73**	63.10	**33.91**	**43.36**	**45.37**	**33.58**	**43.86**	**27.58**	**31.62**	**29.60**	**0.66**
Region											
Northern America	58.05	88.70	54.99	62.04	80.12	49.47	67.06	48.73	49.36	49.04	0.73
Europe	46.85	76.00	46.73	52.61	49.81	40.39	53.11	37.57	43.61	40.59	0.75
South East Asia, East Asia, and Oceania	44.59	69.70	42.99	50.88	56.93	41.50	52.40	36.06	37.48	36.77	0.71
Northern Africa and Western Asia	33.83	60.45	32.02	44.40	42.12	26.91	41.18	24.22	28.72	26.47	0.63
Latin America and the Caribbean	30.29	52.93	26.29	40.14	42.30	30.77	38.49	18.09	26.09	22.09	0.57
Central and Southern Asia	27.73	49.47	24.83	35.02	40.63	25.78	35.15	19.92	20.71	20.32	0.59
Sub-Saharan Africa	25.56	52.42	17.98	28.21	35.92	27.56	32.42	18.41	19.00	18.70	0.58
Income level											
High income	48.33	77.74	48.84	56.26	53.59	42.07	55.70	37.85	44.09	40.97	0.73
Upper-middle income	33.50	60.67	30.99	41.80	43.68	29.61	41.35	23.03	28.26	25.65	0.62
Lower-middle income	27.87	48.52	21.75	33.12	40.13	25.88	33.88	21.01	22.71	21.86	0.64
Low income	24.15	49.86	16.40	25.74	33.34	29.95	31.06	17.74	16.73	17.23	0.56

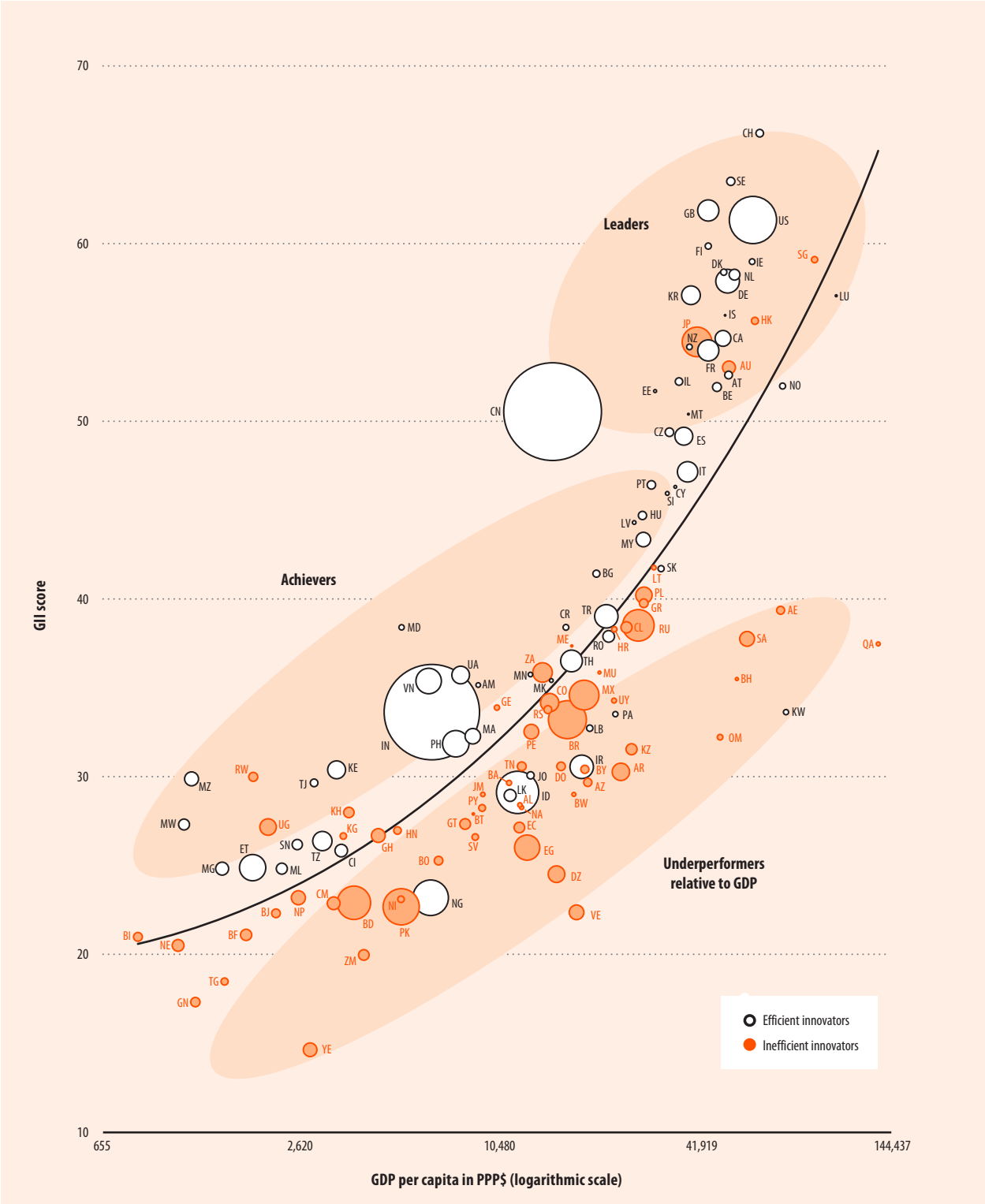
Worst — Average — Best

Note: Darker shadings indicate better performances. Countries/economies are classified according to the World Bank Income Group and the United Nations Regional Classifications (July 2015 and October 2013, respectively).

in more stable innovation systems, show a better integration with international markets, and display more solid channels of knowledge absorption. These traits result in higher economic growth rates per worker and in more sophisticated local business communities that are attractive for foreign investment. Yet progress on these dimensions is still not uniform across their economies.[49] The number of innovation achiever countries—a total of 15—is smaller this year than it was in previous editions. This is the result of having fewer countries covered by the GII this year, resulting from stricter minimum data requirement.[50] If the less strict data coverage rule from last year were applied this year, the total number of innovation achievers would increase to 24 and include the following economies (listed in order of distance to the trend): Mongolia, Georgia, Bulgaria, the Philippines, the United Republic of Tanzania, Latvia, Hungary, Morocco, Cambodia, and Malaysia.

In either case, the majority of countries in this category would still

Figure 4: GII scores and GDP per capita in PPP$ (bubbles sized by population)



Note: 'Efficient innovators' are countries/economies with Innovation Efficiency ratios ≥ 0.66; 'Inefficient innovators' have ratios < 0.66; the trend line is a polynomial of degree three with intercept ($R^2 = 0.661$).

Figure 4: GII scores and GDP per capita in PPP$ (bubbles sized by population): ISO-2 Country Codes

Code	Country
AL	Albania
DZ	Algeria
AR	Argentina
AM	Armenia
AU	Australia
AT	Austria
AZ	Azerbaijan
BH	Bahrain
BD	Bangladesh
BY	Belarus
BE	Belgium
BJ	Benin
BT	Bhutan
BO	Bolivia, Plurinational St.
BA	Bosnia and Herzegovina
BW	Botswana
BR	Brazil
BG	Bulgaria
BF	Burkina Faso
BI	Burundi
KH	Cambodia
CM	Cameroon
CA	Canada
CL	Chile
CN	China
CO	Colombia
CR	Costa Rica
CI	Côte d'Ivoire
HR	Croatia
CY	Cyprus
CZ	Czech Republic
DK	Denmark
DO	Dominican Republic
EC	Ecuador
EG	Egypt
SV	El Salvador
EE	Estonia
ET	Ethiopia
FI	Finland
FR	France
GE	Georgia
DE	Germany
GH	Ghana

Code	Country
GR	Greece
GT	Guatemala
GN	Guinea
HN	Honduras
HK	Hong Kong (China)
HU	Hungary
IS	Iceland
IN	India
ID	Indonesia
IR	Iran, Islamic Rep.
IE	Ireland
IL	Israel
IT	Italy
JM	Jamaica
JP	Japan
JO	Jordan
KZ	Kazakhstan
KE	Kenya
KR	Korea, Rep.
KW	Kuwait
KG	Kyrgyzstan
LV	Latvia
LB	Lebanon
LT	Lithuania
LU	Luxembourg
MG	Madagascar
MW	Malawi
MY	Malaysia
ML	Mali
MT	Malta
MU	Mauritius
MX	Mexico
MD	Moldova, Rep.
MN	Mongolia
ME	Montenegro
MA	Morocco
MZ	Mozambique
NA	Namibia
NP	Nepal
NL	Netherlands
NZ	New Zealand
NI	Nicaragua
NE	Niger

Code	Country
NG	Nigeria
NO	Norway
OM	Oman
PK	Pakistan
PA	Panama
PY	Paraguay
PE	Peru
PH	Philippines
PL	Poland
PT	Portugal
QA	Qatar
RO	Romania
RU	Russian Federation
RW	Rwanda
SA	Saudi Arabia
SN	Senegal
RS	Serbia
SG	Singapore
SK	Slovakia
SI	Slovenia
ZA	South Africa
ES	Spain
LK	Sri Lanka
SE	Sweden
CH	Switzerland
TJ	Tajikistan
TZ	Tanzania, United Rep.
TH	Thailand
MK	TFYR of Macedonia
TG	Togo
TN	Tunisia
TR	Turkey
UG	Uganda
UA	Ukraine
AE	United Arab Emirates
GB	United Kingdom
US	United States of America
UY	Uruguay
VE	Venezuela, Bolivarian Rep.
VN	Viet Nam
YE	Yemen
ZM	Zambia

consist of middle- and low-income economies and would still mostly be situated in Sub-Saharan Africa and the eastern region of Europe.

There is also a group of economies that perform at least 10 percent below their peers for their level of GDP. This cluster includes 36 countries from different regions and income groups. Nine of these are from the high-income group (7 high-income economies are from the Middle East), 13 are from the upper-middle income group, 12 are lower-middle economies, and 2 are low-income economies.

Regional rankings

This section discusses regional and sub-regional trends, with snapshots for some of the economies leading in the rankings. This year various notable changes occur in these regional GII rankings, in part as a result of changed performance or methodological considerations (see Annex 2).

Table 6 on page 31 presents a heatmap with the scores for the top 10, along with average scores by income and regional group. To put the discussion of rankings further into perspective, Figure 5 on page 35 presents, for each region, bars representing the median pillar scores (second quartile) as well as the range of scores determined by the first and third quartile; regions are presented in decreasing order of their average GII rankings (except for the EU, which is placed at the end).

Northern America (2 economies)

Northern America, the UN-defined region that includes both the USA and Canada, holds two of the top 15 rankings in this year's GII. Both the USA and Canada are high-income economies and rank in the top 10 economies in terms of GDP. The USA ranks 4th overall this year, up one position from 2015, and is in the top 10 economies in both the Innovation Input Sub-Index (3rd) and the Innovation Output Sub-Index (7th). Canada is 15th overall, having also moved up one spot from 2015, and is in the top 25 economies in the Innovation Input Sub-Index (10th) and the Innovation Output Sub-Index (23rd).

For more details on the innovation environment of the USA and Canada, see Box 5 on page 36.

Sub-Saharan Africa: Preserving the innovation momentum in one of the most promising regions (25 economies)

For several editions, the GII has noted that the Sub-Saharan Africa region performs well on the innovation front. Since 2012, Sub-Saharan Africa has had more countries among the group of innovation achievers than any other region. As economic slowdown occurs, it will be important for Africa to preserve its current innovation momentum (see Box 6 on page 38).

Similar to 2015, there are nine economies that rank in this year's top 100 economies in the GII: Mauritius takes the top spot among all economies in the region (53rd), followed by South Africa (54th), Kenya (80th), Rwanda (83rd), Mozambique (84th), Botswana (90th), Namibia (93rd), Malawi (98th), and Uganda (99th). All of these economies remained either at stable or improved GII rankings in relation to their 2015 rankings, with the exception of Mauritius, which drops four spots this year.

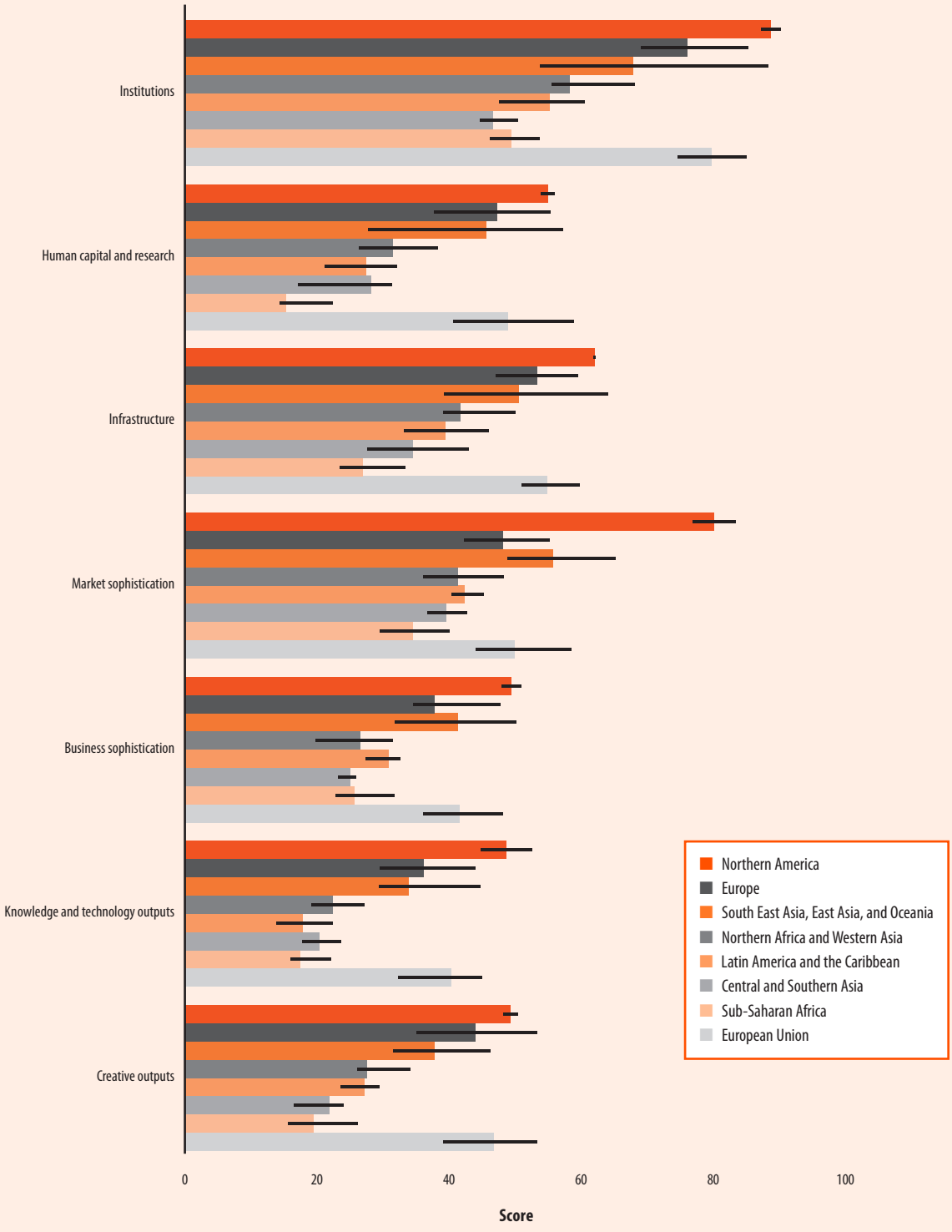
The remaining 16 economies in this region can be found at the bottom of the rankings (100 or lower). Eleven of them have improved since 2015: Ghana (102nd), the United Republic of Tanzania (105th), Côte d'Ivoire (108th), Ethiopia (110th), Madagascar (111th), Nigeria (114th), Benin (unranked in 2015, this year 121st), Burundi (123rd), Niger (124th), Togo (126th), and Guinea (127th). See Box 6 on page 38 for more details.

Latin America and the Caribbean: A region with untapped innovation potential but important risks in the near-term (19 economies)

In the last few GII editions, Latin America was labelled as a region with important untapped innovation potential. Although significant potential exists, the GII rankings of local countries, relative to other regions, have not steadily improved. Furthermore, none of the economies in the region has recently been an innovation achiever, with performance higher than expected by its GDP. Still, a few economies—such as Chile, Colombia, and Mexico—stood out among their peers; the important role of Brazil and the emergent role of Peru and Uruguay were noted in past GII editions. And, this year, Chile, Colombia, Costa Rica, Mexico, and Uruguay achieve the best regional GII ranks.

Clearly, most if not all countries in Latin America and the Caribbean, particularly their local governments, firms, and other actors, continue to have the innovation agenda firmly on their radar. This is unlikely to come to a sudden halt anytime soon. Yet, as Latin America and the Caribbean, especially Brazil, has entered into a zone of considerable economic turbulence, it will be important to overcome short-term political and economic constraints and to cling to longer-term innovation commitments and results. Greater regional R&D and innovation cooperation in Latin America and the Caribbean might indeed help in this process, as underlined in this year's GII theme.

Figure 5: Median scores by regional group and by pillar



Note: The bars show median scores (second quartiles); the lines show the range of scores between the first and third quartiles.

Box 5: Northern America: The USA and Canada on different innovation pathways?

Northern America is home to two large high-income economies, the United States of America (USA) and Canada. Although both economies have achieved top scores this year, these two countries have been experiencing different innovation dynamics over recent years.

Ranked 4th in the GII overall rankings and number 2 on innovation quality,[1] the USA continues to be one of the leading innovation nations. It has prominent positions among the top 25 countries in all GII pillars and 17 of the 21 sub-pillars. It comes in 1st on the Credit, Investment, and Trade, competition, and market scale sub-pillars and scores among the top 10 on six of the other sub-pillars.[2] The USA also continues to be the highest performer of R&D worldwide, accounting for close to 27% of the world total in 2014 according to our estimates.[3] US total R&D spending is projected to increase by 4.2 percent in 2017.[4] Although US businesses are responsible for 70% of R&D spending, its government continues to play a substantial role in performing and financing R&D, driving one of the highest levels of basic R&D globally.[5] The quality of its innovation system is frequently demonstrated by its top scores in the quality of its universities and the quality of its scientific publications (see Box 4). It also boasts a high degree of market sophistication and its innovation clusters, in particular those on the East and West Coasts of the country, continue to be a magnet for top talent and a critical source of technological and non-technological innovation.

Still, the USA's lead in innovation is narrowing in terms of the absolute levels of key innovation input and output metrics alone. With fast growth in its R&D expenditure, China accounted for about 21% of global R&D spending in 2014, second only to the USA. Studies note that China is also catching up rapidly in the number of researchers and the absolute number of scientific publications.[6] The same is true for output indicators such as patents by origin, where the USA's lead is tightening.

Of course absolute spending or absolute figures on publications do not guarantee a successful innovation system, which remains unparalleled in the USA, thanks to its thriving market sophistication and business sector and its solid ties between research and firms. Other countries will continue to benchmark their innovation systems against the USA's system, with its success stories, for years to come.

Nonetheless, the USA also exhibits some structural weaknesses; education (it ranks 39th, far below its overall rank of 4th on the GII) and tertiary education (ranks 50th) continue to be relatively weaker spots. On tertiary education, the number of graduates in science and engineering, (ranked 85th) is low; this has been a source of concern for some time. The USA's performance on the PISA assessment (ranked 25th) is less alarming but also lower than the average of top 10 innovating economies (see Figure 5.1). More broadly, the USA faces a productivity and investment weakness, reflected in its low score in gross fixed capital formation and labor productivity (see Figure 5.1).

Canada also continues to be among the top 25 innovation leaders. Now standing at rank 15 with top 25 scores in all leading pillars and 13 of the 21 sub-pillars, it has a clear lead in having one of the most conducive business and investment climates worldwide and ranks in the top 10 in seven sub-pillars.[7] It ranks favourably in terms of innovation quality, boasting a world-class university network and top-quality scientific publications.

On average, however, Canada's GII rankings have declined in recent years. Partly as a result of methodological changes to the GII model and partly because of its relatively weak performance, Canada dropped out of the top 10 in 2011; the country also shows weaknesses in its education indicators. Looking at human capital and research, Canadian R&D expenditures have been on a different trajectory than those of the USA. Specifically, the growth of its R&D expenditures has been on a downward trend since 2001.[8] Where business R&D in the USA is increasing at a much faster pace than government R&D, dynamics in Canada are the reverse (see Figure 5.2). So far, earlier government attempts to revive R&D by providing tax support have not translated into more business R&D.[9] In terms of the government's education expenditure per pupil, Canada ranks 64th; the average rank of top 10 innovating economies (excluding the USA) is 33 in this indicator. Other weaknesses include new businesses creation, ICT services imports, and gross capital formation.

Figure 5.1 compares the 2016 GII scores of the USA, Canada, and the average scores of top 10 GII innovating economies (without the USA) on key innovation input and output indicators. Although the USA and Canada each lead in some areas, in several variables they perform worse than the top 10 average. Some of these variables are government expenditure/pupil, secondary; knowledge-intensive employment; and high-tech and medium-high tech output.

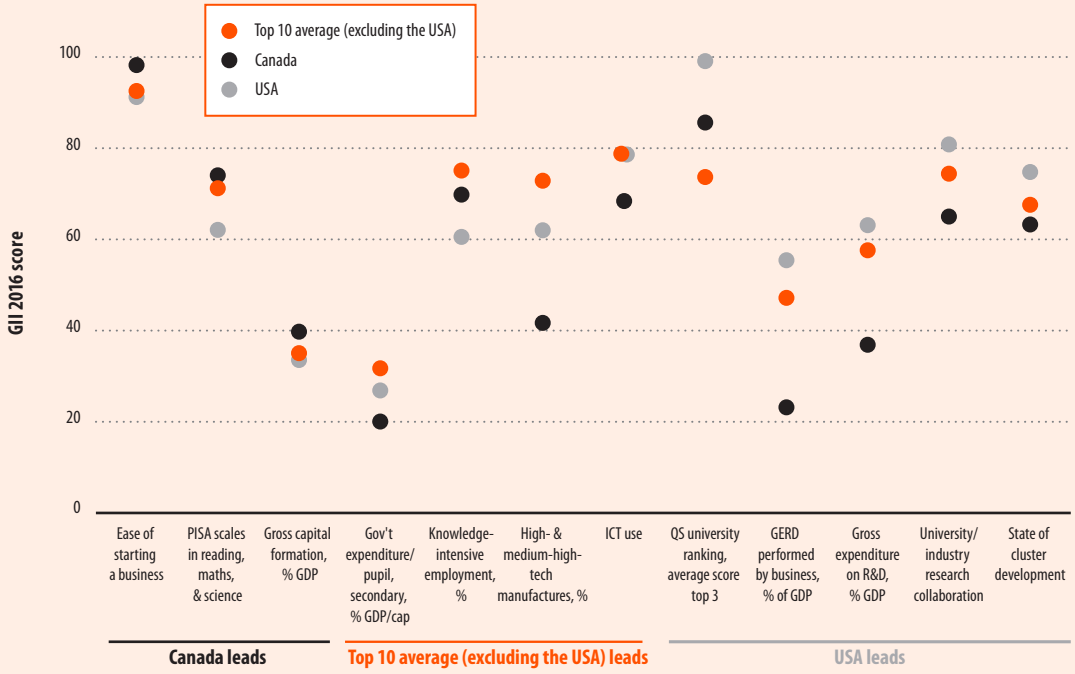
For both the USA and Canada to grow as innovation leaders they need not only to overcome their weaknesses but also to reinforce their education and research base. Canada, for instance, plans to counteract its relative decline and increase its investments in infrastructure, extend its research capacity, provide a stimulating environment for creative and entrepreneurial firms, and invest in its universities and research hospitals. It proposes, over next four years, to provide support for innovation clusters and networks across the country.[10] As global innovation leaders, the direction of innovation policies that governments adopt will determine the synergies that these two economies can harness to maintain Northern America as a key global innovation hub.

Notes

Notes for this box appear at the end of the chapter.

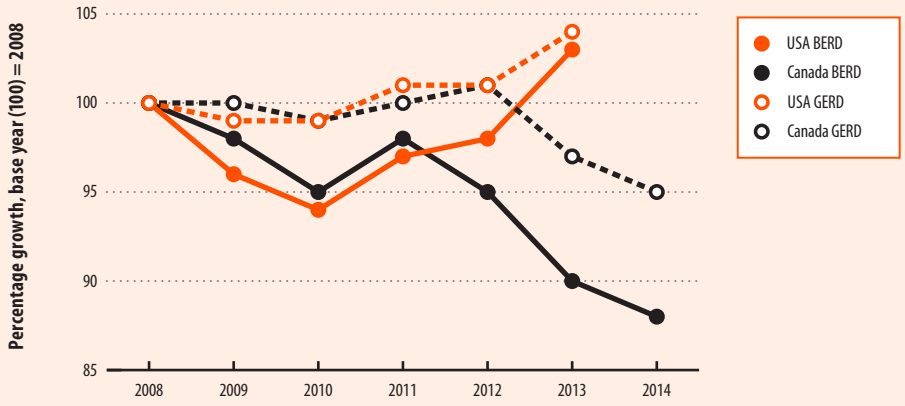
Box 5: Northern America: The USA and Canada on different innovation pathways? *(continued)*

Figure 5.1: The United States of America, Canada, and top 10 average (excluding the USA) scores



Source: GII 2016 data.

Figure 5.2: The United States of America and Canada: Public and private R&D spending, 2008–14



Source: GII based on UIS data.
Note: BERD = Business enterprise expenditure on R&D; GERD = Gross domestic expenditures on R&D.

Box 6: Sub-Saharan Africa: Preserving the innovation momentum in one of the most promising regions

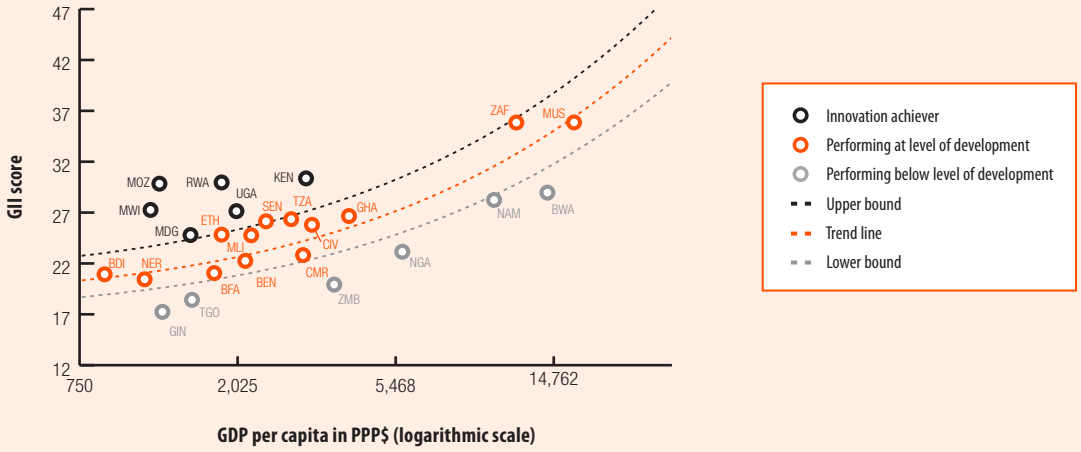
For several editions, the GII has noted that the Sub-Saharan Africa region performs well on the innovation front. Since 2012, Sub-Saharan Africa has had more countries among the group of innovation achievers than any other region.[1] Noted improvements in the Institutions, Business sophistication, and Knowledge and technology output pillars have allowed the region as a whole to catch up to Central and Southern Asia in these factors, and even to overtake Northern Africa and Western Asia in Business sophistication. The drivers of growth that have been at play in the region have come mostly from an improved institutions, a better business environment, and explicit efforts on the part of science and innovation policy.

Assisted by economies such as Mauritius, South Africa, Rwanda, and Botswana, Sub-Saharan Africa this year has its highest scores in the Institutions and Market sophistication pillars. These countries perform on par or above their peers in South East Asia, East Asia, and Oceania and Europe in some of these pillars. In addition to developments in Business sophistication, efforts to improve infrastructure have translated into a higher regional score in this pillar. Larger economies, such as Botswana and Namibia, are helping promote this expansion through stronger performances in general infrastructure and ecological sustainability. These, among other positive efforts, can be highlighted as factors that are helping to keep the region's overall innovation momentum alive, albeit with economic and GDP growth slowing in the region over the last year.

This box benchmarks the regional innovation performance of Sub-Saharan Africa countries by taking into account both the overall GII scores and those of the seven individual GII pillars. Countries are termed 'innovation achievers' and said to outperform their peers if their GII scores are higher than expected based on their level of economic development (as measured by GDP per capita).[2] Countries also have the opportunity to be 'pillar outperformers' if they outperform their peers on four or more of the seven GII pillars. Countries that meet both of these benchmarks are referred to as 'innovation outperformers'.

Although the number of countries considered in the GII decreased in 2016, affecting the total of those identified as innovation achievers, the Sub-Saharan Africa region continues to lead in this metric. Figure 6.1 shows the performance of all 25 economies in the Sub-Saharan Africa region included in the GII 2016. This year, a total of six economies from this region—Mozambique, Rwanda, Malawi, Kenya, Uganda, and Madagascar, representing 40% of all innovation achievers—perform better than their level of development would predict (see Figure 6.1 for details). The innovation achiever economies, shown in black, are located above the upper bound and farthest from the trend line. A total of 13 economies are identified as performing at their level of development, while the last 6 are performing below development.[3]

Figure 6.1: Innovation achievers in Sub-Saharan Africa



Note: BDI = Burundi; BEN = Benin; BFA = Burkina Faso; BWA = Botswana; CIV = Côte d'Ivoire; CMR = Cameroon; ETH = Ethiopia; GHA = Ghana; GIN = Guinea; KEN = Kenya; MDG = Madagascar; MLI = Mali; MOZ = Mozambique; MUS = Mauritius; MWI = Malawi; NAM = Namibia; NER = Niger; NGA = Nigeria; RWA = Rwanda; SEN = Senegal; TGO = Togo; TZA = Tanzania, United Republic of; UGA = Uganda; ZAF = South Africa; ZMB = Zambia.

Box 6: Sub-Saharan Africa: Preserving the innovation momentum in one of the most promising regions *(continued)*

Importantly, Kenya, Mozambique, Malawi, Rwanda, and Uganda stand out for being innovation achievers at least four times in the past five years. Kenya, the chief innovation achiever in the region, has been credited as such every year since 2011, including in 2016. Likewise, these five economies, along with South Africa, Niger, and Mauritius, outperform their peers in more than half of the seven GII pillars in 2016. Most of these economies are more likely to outperform in Business sophistication and less likely to do so in either Human capital and research or Infrastructure. Uganda outperforms in all seven pillars, followed by Rwanda and Mozambique, which do so in six. South Africa and Kenya outperform in five, while Mauritius, Malawi, and Niger outperform in only four.

This year the five innovation achievers mentioned above, plus Burkina Faso, are labeled as innovation outperformers within the Sub-Saharan Africa region. Table 6.1 shows the full list of achievers and outperformers in this region.

Yet the relatively strong performance in innovation in the region is neither uniform across all economies nor is future success guaranteed. Economic forecasts, such as that of the International Monetary Fund, suggest that, after a prolonged period of strong economic growth, Sub-Saharan Africa will face an economic slowdown, partly as a result of a sharp decline in commodity prices.[4] It is notable that in some oil-importing African nations—particularly some in East Africa, such as Kenya and Rwanda—stand out as innovation achievers. As these and other innovation achievers noted above get caught up in a greater economic slowdown, it will be important for them to preserve their current innovation momentum.

Other countries in Sub-Saharan Africa have to redouble their innovation efforts in order to grow and move away from relying on oil and commodity revenues alone.

Notes

1 In 2011, most innovation achievers were located in the South East Asia, East Asia, and Oceania region. In 2012 and 2013, Europe and Sub-Saharan Africa shared the same number of innovation achievers, six and four, respectively.

2 For a country to be labeled an 'innovation outperformer' it has to be identified as an 'innovation achiever' and it must also score above its income group average in four or more GII pillars for two or more years, including the two most recent—2014 and 2015. In 2016, 15 economies were identified as innovation outperformers. See Chapter 2 in GII 2015 on the theme 'Effective Innovation Policies for Development' for more details.

3 The general trend line is defined by the scores and economic development level of all countries considered in the GII. The threshold bounds are defined as 10% above and 10% below the scores defined by trend line (see Box 2 in Chapter 2 of the GII 2015 for more details).

4 IMF, 2016c.

Source

IMF, 2016c.

Table 6.1: Sub-Saharan Africa: Innovation achievers, pillar outperformers, and innovation outperformers, 2011–16

Economy	Income group	Years as an innovation achiever	Years as a pillar outperformer	Innovation outperformer
Kenya	Lower-middle income	2016, 2015, 2014, 2013, 2012, 2011 (6)	2016, 2015, 2014, 2013, 2012, 2011 (6)	Yes
Rwanda	Low income	2016, 2015, 2014, 2012 (4)	2016, 2015, 2014, 2012 (4)	Yes
Mozambique	Low income	2016, 2015, 2014, 2012 (4)	2016, 2015, 2014, 2012 (4)	Yes
Malawi	Low income	2016, 2015, 2014, 2012 (4)	2016, 2015, 2014, 2012 (4)	Yes
Uganda	Low income	2016, 2015, 2014, 2013 (4)	2016, 2015, 2014, 2013 (4)	Yes
Madagascar	Low income	2016 (1)	—	No
Senegal	Lower-middle income	2015, 2014, 2013, 2012 (4)	2015 (1)	No
Mali	Low income	2015, 2013 (2)	2013 (1)	No
Burkina Faso	Low income	2015, 2014 (2)	2015, 2014 (1)	Yes
Gambia	Low income	2014 (1)	2014 (1)	No
Zimbabwe	Low income	2012 (1)	2012 (1)	No
Ghana	Lower-middle income	2011 (1)	2011 (1)	No

Note: The table includes GII 2016. Economies identified as innovation achievers and pillar outperformers for two or more consecutive years, including 2014 and 2015, are also identified as innovation outperformers.

Latin America and the Caribbean includes only upper- and lower-middle-income economies, with four exceptions: Chile, Uruguay, Argentina, and the Bolivarian Republic of Venezuela, which are all high-income economies. Ranking 1st in the region this year is Chile (44th overall), followed closely by Costa Rica (45th), which gains six spots in the rankings from 2015.

As previously mentioned, the minimum data coverage threshold rule was adjusted this year to retain only those economies with sufficient data coverage in the GII. As a result, Barbados and Guyana drop from the GII this year (see Annex 2). Trinidad and Tobago, the other country from that region that drops, although having sufficient coverage in both the Input and Output Sub-Indices, it is not considered in the GII this year because it does not have scores for at least two sub-pillars in pillar 2: Human capital and research.

Following Chile and Costa Rica within the region, and ranking in the top half of the GII this year, are Mexico (61st), Uruguay (62nd), and Colombia (63rd). The top 100 economies overall include Panama (68th), Brazil (69th), Peru (71st), Dominican Republic (76th), Argentina (81st), Jamaica (89th), Paraguay (94th), and Guatemala (97th). The remaining economies in the region rank at 100 or below in the GII this year: Ecuador (100th), Honduras (101st), El Salvador (104th), the Plurinational State of Bolivia (109th), Nicaragua (116th), and the Bolivarian Republic of Venezuela (120th).

Although important regional potential exists, the GII rankings of local countries relative to other regions have not steadily improved. In recent years and in 2016, no economies from this region are identified as innovation achievers. Only Brazil, Costa Rica, El Salvador, Mexico, and Panama are identified as pillar outperformers.

Chile is ranked 44th in the GII this year, at the top spot in the region. It is ranked 40th and 53rd in the Innovation Input Sub-Index and Innovation Output Sub-Index, respectively, with a place in the top 50 economies across four pillars: Institutions (36th), Infrastructure (38th), Market sophistication (47th), and Business sophistication (41st). Its improvements in 2016 are mainly in Market sophistication and Business sophistication, with better rankings in ease of protecting investors and applied tariff rate. The largest loss of momentum comes from Creative outputs, where Chile ranks 93rd in the new indicator industrial designs, a relative overall weakness for the economy. Chile also shows areas of weakness in pillar 2, Human capital and research (62nd), in a total of five indicators including government expenditure in education (84th), PISA scales in reading, maths, and science (45th), pupil-teacher ratio (86th), tertiary inbound mobility (95th), and the newly introduced indicator measuring average expenditure of the top 3 global companies by R&D (45th).

Mexico is ranked 61st in 2016, down from 57th in 2015, coming in at 60th and 62nd overall in the Innovation Input Sub-Index and Innovation Output Sub-Index, respectively. The country ranks the highest among pillars in Market sophistication (51st), where it ranks among the top 25 economies in Trade, competition, and market scale (24th). Mexico also sees improvements in 7 of the 10 indicators within this pillar, including a strong improvement in microfinance gross loan portfolios (45th). Conversely, Mexico's ranking on the output side falls to 62nd. This is the result of lower rankings for intellectual property receipts (77th) and FDI net outflows (64th). For Mexico, Business sophistication (pillar 5 at 77th) still harbours most of the country's weaknesses: females employed with advanced degrees (69th), GERD financed by abroad (94th), and the number of joint venture–strategic alliance deals (60th). Venture capital deals (69th), computer software spending (67th), cultural and creative services exports (66th), and printing and publishing manufactures (85th) are also areas of potential improvement for Mexico.

Brazil is ranked 69th this year in the GII, gaining one position since 2015. Brazil's strongest pillar ranking is in Business sophistication (39th), where it sees one of its highest rankings in IP payments (8th). Brazil's improvement on the input side, up seven spots from 2015 to 58th, is caused by specific gains across several other indicators, including political stability and safety (68th), ease of paying taxes (121st), ICT use (46th), gross capital formation (98th), environmental performance (45th), microfinance gross loans (59th), and intensity of local competition (40th). Brazil also benefits from high rankings in two new indicators: domestic market scale (7th) and average expenditure of the top 3 global companies by R&D (17th). Brazil sees its largest drop in Creative outputs (90th), where one of its relative weaknesses is printing and publishing output manufactures (74th). While for Brazil the General infrastructure (91st) sub-pillar is no longer identified as a weakness, both Business environment (123rd) and Tertiary education (111th) still have room for improvement. Brazil has made gains in areas such as joint venture and strategic alliance deals (66th) and printing and publishing manufactures (74th), yet in these

areas further improvements can be made.

Central and Southern Asia (10 economies)

Economies of the Central and Southern Asia region have seen an improvement in ranking since 2015: after only three of these economies ranked in the top 100 overall in the GII last year, six of the 10 economies in the region rank in the top 100 in 2016.

India maintains its top place in the region, moving up 15 spots from 81st last year to 66th overall; Kazakhstan also maintains its position as second in the region, moving up seven spots, from 82nd to 75th overall. The remaining economies rank in order within the region as follows: the Islamic Republic of Iran shows an improvement in its ranking (at 78th) this year; this is followed by Tajikistan (86th), Sri Lanka (91st), Bhutan (96th), Kyrgyzstan (103rd), Nepal (115th), Bangladesh (117th), and Pakistan (119th). There has also been an improvement in data coverage for economies in Central and Southern Asia. In 2016, economies in the region averaged 83.4% coverage of data in the GII, up from 80.3% in 2015. Only three economies in the region are highlighted as missing 20 or more values (see Annex 2).

India ranks 1st in the region, as it did in 2015, and improves its ranking among lower-middle-income economies to 6th (up two places from 8th in 2015). Ranking 66th overall this year, India advances 15 spots overall to reach the same position it had in the GII 2013. India ranks among the top 50 economies overall in two pillars: Market sophistication (33rd) and Knowledge and technology outputs (43rd). The country maintains stable or improved rankings across all pillars, with the most significant improvements in Human capital and research (up 40 spots) and Business

Box 7: China's Belt and Road Initiative: Towards More Regional Cooperation

China's Belt and Road Initiative (BRI) initiative (the Initiative on Building Silk Road Economic Belt and 21st-Century Maritime Silk Road), also referred to as 'One Belt One Road', was first introduced in 2013 by President Xi Jinping and more formally announced in 2015. It aims to promote economic integration among Asian, European, and African economies that lie on the path of the ancient Silk Road.[1] From around 200 BC into approximately the 15th century, the ancient Silk Road connected the East to the West, linking China to Europe through Central Asia.[2] Historians consider the road an important factor in the growth of civilizations of China, India, parts of Persia, Europe, and Arabia.[3] The road was a central transport hub, used primarily for shipping silk, gold, spices, glass, textiles, and livestock.

The idea of the BRI initiative is to revive the Silk Road spirit to help regional integration and economic development. Although the exact list of countries that will be part of the BRI is still open, the current list comprises over 60 countries, mostly middle-income economies but also select high- and low-income economies.[4] The current plan has two dimensions: (1) a series of highways, economic corridors, and rail networks between countries on the former land route of the Silk Road; and (2) a network of sea routes between the costal ports of the economies in question, hence a maritime Silk Road.[5]

The initiative aims to not only support infrastructure and trade, but also to bring about greater cooperation in promoting education, for example via the New Silk Road University Association; and in boosting research cooperation and innovation. With respect to economic conditions and innovation, the countries in question vary significantly in their level of economic development and the sophistication of their national innovation systems.

The GII rankings of countries along the principal original land route between China and Greece, and largely crossing Central Asia, vary from China (ranked 25th) and Turkey (42nd) at the top to Armenia (60th), Georgia (64th), and Kazakhstan (75th) in the middle and to Tajikistan (86th) and Kyrgyzstan (103rd). These countries are equally diverse in their performance on the various GII innovation input and output pillars. In the area of Human capital and research, GII ranks range from China (29th) to Armenia (104th); in the area of Infrastructure, ranks range from China (36th place) to Tajikistan (123rd); and in Knowledge and technology outputs, from China (6th) to Kyrgyzstan (96th). This diversity continues when comparing these countries based on critical innovation inputs such as Gross expenditure on R&D as a share of GDP, which ranges from 2.1% of GDP in China (with $313 billion in 2014) to 0.1% of GDP in Tajikistan ($21 million).[6] This diversity holds also for innovation output factors such as patents filed by origin—where China comes in at 1st place and Tajikistan at 112th—as well as many other variables, such as High-tech production and exports.

This diversity across the BRI countries, though challenging, is also a source of the appeal of this initiative: if the comparative advantages of diverse countries can be leveraged, the potential for robust progress is high. Deeper economic integration, better infrastructure, and cooperation in fields such as education, research, and innovation have the potential to lead to convergence at higher levels and increased economic development.

Notes

1 The State Council, People's Republic of China, 2015.

2 Elisseeff, 2000; Hansen, 2012; Xinru, 2011.

3 Bentley, 1993.

4 The State Council, People's Republic of China, 2015.

5 The State Council, People's Republic of China, 2015.

6 UNESCO-UIS Science & Technology Data Center, update from April 2016. Data used: GERD, performed by Business enterprise (in '000 PPP$, constant prices, 2005). Data for Kyrgyzstan corresponds to 2013. For the others it corresponds to 2014.

sophistication (up 59 spots). Within Human capital and research, India data coverage increased, specifically in graduates in sciences and engineering (ranked 8th overall in 2016, while this was a missing value in 2015), affecting the jump in its ranking. India's ranking in the Business sophistication pillar is affected most by a substantial improvement in Knowledge workers (up 46 spots) and Knowledge absorption (up 33 spots); India improves in the ranking of firms offering formal training by 56 spots to reach 42nd place. Furthermore, India improves across all indicators within the Knowledge absorption sub-pillar, and it turns in a solid performance in the GII model's newly incorporated research talent in business enterprise, where it ranks 31st. Conversely, India shows weakness in two sub-pillars: Business environment (117th) and Education (118th). In the former pillar, ease of starting a business (114th), and in the latter, the pupil-teacher ratio (103rd) and tertiary inbound mobility (99th) are three areas where India can seek improvement. Progress is also needed in environmental performance (110th) on the input side; on the output side, indicators measuring new businesses (101st), global entertainment and media market (59th), and printing and publishing manufactures (84th) all show room for improvement.

Sri Lanka ranks 91st overall in the GII this year, and, along with India and the Islamic Republic of Iran, the country ranks among the top 100 economies in all three main indices as well as in the Innovation Efficiency Ratio. Sri Lanka sees the greatest improvement in pillars in Institutions (up twelve spots) and Creative outputs (up eight spots). Sri Lanka exhibits relative strengths in Infrastructure in particular, ranking 58th overall and ranking in the top 40 economies for four of its 10 indicators. The country ranks 78th overall in the Innovation Output Sub-Index (up one spot from 2015), where it exhibits the greatest improvements in rankings in scientific and technical publications (110th, up six spots), FDI net outflows (81st, up ten spots), ICTs and business model creations (52nd, up nine spots), generic top-level domains (TLDs) (100th, up six spots), and country-code TLDs (102nd, up eight spots). Weaknesses for Sri Lanka are, at the pillar level, in Institutions (116th); the country also exhibits weaknesses in Regulatory environment (125th), Education (111th), and Credit (110th) sub-pillars. At the indicator level, most of Sri Lanka's weaknesses are located in the Education sub-pillar, where expenditure on education (117th), government expenditure per pupil (105th), tertiary inbound mobility (94th), and gross expenditure on R&D (102nd), among others, are all areas where its performance could see improvement.

Box 7 on page 41 elaborates on the significant heterogeneity of innovation rankings in parts of this region, and describes efforts for increased international cooperation along the ancient Silk Road.

Northern Africa and Western Asia (19 economies)

Israel (21st) and Cyprus (31st) achieve the top two spots in the region for the fourth consecutive year, improving by one and three positions, respectively. Also among the top 5 in the region are two of the six economies in the Gulf Cooperation Council (GCC): the United Arab Emirates (41st) and Saudi Arabia (49th).

Despite these top ranks, and compared to their level of development, resource-rich countries in the region could rank higher (see Figure 4 on page 32). These countries exhibit relative shortcomings in important areas, such as Institutions, Market sophistication, and Business sophistication. This phenomenon—reminiscent of what has been called the 'resource curse' or the 'paradox of plenty'—has been discussed in the GII before (see the GII 2013, 2014, and 2015 reports). These GCC countries, however, are uniquely positioned to do better in the years to come. Many of them have been diversifying towards innovation-rich sectors already; such diversification offers the GCC countries the potential to do better in the years to come.

Sixteen of the 19 economies in the Northern Africa and Western Asia region are in the top 100, including Qatar (50th), Bahrain (57th), Armenia (60th), Georgia (64th), Kuwait (67th), Lebanon (70th), Morocco (72nd), Oman (73rd), Tunisia (77th), Jordan (82nd), and Azerbaijan (85th). Of all the economies in the region, Turkey (42nd), Kuwait, and Algeria (113th) see the most improvement in their GII ranking, having moved up 16 spots, 10 spots, and 13 spots, respectively.

Israel moves up one place, from 22nd to 21st, in 2016, while remaining number 1 in the Northern Africa and Western Asia region. Israel is ranked in the top 25 economies for five of the seven pillars and is the only economy in the region to rank in the top 10 for any pillar (6th, Business sophistication). The country ranks 21st and 16th in the Innovation Input Sub-Index and Innovation Output Sub-Index, respectively, seeing the most gains in Education (45th, up 6 spots), Trade, competition, and market scale (49th, up 26 spots), Knowledge absorption (16th, up 40 spots), and Intangible assets (34th, up 52 spots). Israel's biggest drop at the pillar level is Knowledge and technology outputs, where it moves down three spots; this has affected

its lower ranking in innovation efficiency 23rd (down three spots from 20th last year). At the indicator level, Israel ranks in the top 3 economies in six different areas: researchers (1st), gross expenditure on R&D (2nd), venture capital deals (1st), GERD performed by business (1st), females employed with advanced degrees (3rd), and research talent in business enterprise (1st)—the last a newly introduced indictor to reflect the linkages in the innovation ecosystem. Weaknesses for Israel are found in the input side of the GII and are more prominent in political stability and safety (114th), the cost of redundancy dismissal (110th), and the intensity of local competition (109th). On the output side, two areas show possibilities for improvement: the growth rate of GDP per worker (93rd) and trademarks by origin (90th).

Turkey ranks 4th in the region in 2016, improving across all three main indices and the Innovation Efficiency Ratio and ranking 42nd overall (up from 58th in 2015). Its ranking in the Innovation Efficiency Ratio (13th) is 1st in the Northern Africa and Western Asia region, with improvements in the Output Innovation Sub-Index of 15 places in Knowledge and technology outputs and 6 in Creative outputs. Turkey ranks in the top 50 economies in five different sub-pillars: Tertiary education (49th), Research and development (38th), Trade, competition, and market scale (12th), Knowledge creation (35th), and Intangible assets (5th). On the other hand, weaknesses in areas closely associated with R&D—such as expenditure on education (103rd), females employed with advanced degrees (72nd), and GERD financed by abroad (87th)—are identified for Turkey. Other areas where improvement can be achieved by Turkey are ICT services imports (118th) and exports (116th), and cultural and creative services exports (72nd).

South East Asia, East Asia, and Oceania (14 economies)

Unlike 2015, this year all economies within the South East Asia, East Asia, and Oceania region are ranked within the top 100 in the GII. All economies in the region also rank within the top 100 in the Innovation Input Sub-Index, the Innovation Output Sub-Index, and the Innovation Efficiency Ratio.

The top five economies in the region rank in the top 25 overall for the GII, the Innovation Input Sub-Index, and the Innovation Output Sub-Index: Singapore (6th), Korea (11th), Hong Kong (China) (14th), Japan (16th), and New Zealand (17th). Australia ranks next (19th), coming in 11th on the input side; China follows (at 25th), ranking 7th in efficiency. Among upper-middle-income economies, three economies (China, Thailand, and Mongolia) improved from 2015; Malaysia moved down three spots to 35th overall. Malaysia's move is affected by its drop of five spots on the output side, though it shows improvement in rankings across the Human capital and research, Infrastructure, and Market sophistication pillars.

Viet Nam (59th) maintains its top place among lower-middle-income economies; following Viet Nam, in the same order as in 2015, are the Philippines (74th, up nine spots) and Indonesia (88th, up nine spots). Low-income economy Cambodia maintains its ranking in the top 100 economies overall (95th).

The Republic of Korea (Korea) is the only economy in the region to rank among the top 25 economies across all main indices as well as the Innovation Efficiency Ratio. Korea ranks 11th overall, up three spots from last year, and ranks 13th and 11th in the Innovation Input Sub-Index and Innovation Output Sub-Index, respectively. Korea is among the top 10 economies in three pillars: Human capital and research (3rd), Infrastructure (9th), and Knowledge and technology outputs (5th). It improves in all other pillars, particularly in Business sophistication (13th, up 17 spots) and Creative outputs (21st, up 7 spots). In addition to ranking 1st overall in four existing indicators (gross expenditure on R&D, E-participation, patents by origin, and PCT patent applications), Korea also ranks 1st in one of this year's three new indicators: industrial designs by origin. The Institutions pillar, where Korea ranks 31st, provides the economy's greatest opportunities for improvement. Within this pillar, the cost of redundancy dismissal rank (107th) is Korea's lowest ranked indicator and weakness.

Japan has risen in the GII rankings each year for the last four years, moving up to 16th in 2016. Japan ranks 9th overall in the Innovation Input Sub-Index, led by top 10 rankings among all economies in Infrastructure (7th), Market sophistication (8th), and Business sophistication (10th); the country also ranks 24th overall in the Innovation Output Sub-Index. Japan ranks in the top 5 economies for three sub-pillars, all on the input side: Research and development (2nd), Information and communication technologies (4th), and Trade, competition, and market scale (2nd). The only pillar in which Japan saw downward movement in was Infrastructure (down two spots to 7th place this year), despite the lack of any relative indicator weaknesses. Outside of this pillar, however, Japan shows the highest number of relative weaknesses in Knowledge and technology outputs, ranking 97th

or lower in growth rate of GDP per worker, new businesses, and ICT services exports.

Europe (39 economies)

In this year's edition of the GII, 15 of the top 25 economies come from Europe. This region is home to the top 3 economies of the GII 2016: Switzerland (1st), Sweden (2nd), and the United Kingdom (3rd). Following these regional leaders among this group of top 25 are Finland (5th), Ireland (7th), Denmark (8th), the Netherlands (9th), Germany (10th), Luxembourg (12th), Iceland (13th), France (18th), Austria (20th), Norway (22nd), Belgium (23rd), and Estonia (24th). It should be noted that most of the economies in this region have the fewest missing values, leading them to display the most accurate GII rankings (see Annex 2). This includes the following economies with 100% data coverage in the Innovation Input Sub-Index, the Innovation Output Sub-Index, or both: Finland, Denmark, Germany, France, Austria, the Czech Republic, Italy, Portugal, Hungary, Poland, and the Russian Federation.

Seventeen economies follow among the top 50 and maintain relatively stable rankings since 2014: Malta (26th), the Czech Republic (27th), Spain (28th), Italy (29th), Portugal (30th), Slovenia (32nd), Hungary (33rd), Latvia (34th), Lithuania (36th), Slovakia (37th), Bulgaria (38th), Poland (the largest mover in this group, improving by seven spots to 39th), Greece (40th), the Russian Federation (43rd), the Republic of Moldova (46th), Croatia (47th), and Romania (48th).

The remaining European economies remain among the top 100 economies overall. Ukraine is the only economy in the group to improve since 2015, up eight spots. The region's rankings continue as follows: Montenegro (51st), Ukraine (56th), the Former Yugoslav Republic of Macedonia (58th), Serbia (65th), Belarus (79th), Bosnia and Herzegovina (87th), and Albania (92nd).

France moves up three spots in 2016 from 21st to 18th overall. France ranks 15th in the Innovation Input Sub-Index and 19th in the Innovation Output Sub-Index, improvements of two spots and four spots, respectively. It ranks in the top 25 economies and improves in all pillars with one exception (Institutions, where it moves down five spots to 26th). France's two most improved pillars on the input side, Infrastructure (8th) and Market sophistication (15th), gained four spots and ten spots, respectively, as the economy has earned top 5 overall rankings in three areas: government's online service (1st), E-participation (4th), and venture capital deals (1st). France also sees a drop in Political environment (29th) and Regulatory environment (21st). France's greatest relative weaknesses outside of the top 100 overall rankings are FDI net inflows (118th) and growth rate of GDP per worker (90th).

Ukraine moves up from 64th to 56th in 2016. This is the highest ranking of the GII the Ukraine has attained, led by an improvement of eight places in the Innovation Input Sub-Index (76th) and an improvement of seven places in the Innovation Output Sub-Index (40th). Ukraine's ranking in the Innovation Efficiency Ratio also improves by three spots to 12th overall (and 10th in the region), one of the economy's relative strengths in 2016. Ukraine ranks among the top 100 economies for all pillars with one exception (Institutions, 101st); it also improved in rankings across all pillars with two exceptions (Institutions and Human capital and research). Ukraine's higher overall ranking is in part the result of improvements of 10 or more spots across seven sub-pillars: Business environment (79th), General infrastructure (110th), Ecological sustainability (100th), Investment (113th), Trade, competition, and market scale (46th), Innovation linkages (88th), and Intangible assets (42nd). The only pillar where Ukraine ranks below the top 100 economies is Institutions (101st), where it also has the highest number of weaknesses: political stability and safety (125th), ease of resolving insolvency (113th), and, at the sub-pillar level, Political environment (123rd).

Conclusions

The theme for this year's GII is 'Winning with Global Innovation'. This chapter has provided a current assessment of worldwide innovation expenditures, making calls for a renewed and sustained innovation effort. Following this year's theme, it has analysed the opportunities and challenges of designing innovation policies for a new global innovation context that aims for a global win-win proposition. The chapter has also presented the main GII 2016 results, distilling main messages and noting some important evolutions that have taken place since last year. The remaining chapters provide more details on this year's theme from academic, business, and particular country perspectives from leading experts and decision makers.

There is no automatism or mechanical recipe for creating sound innovation systems. Absolute spending on R&D or absolute figures on the number of domestic researchers, on the number of science and engineering graduates, or on scientific publications do not guarantee

a successful innovation system. In fact, all too often a higher share of science and engineering graduates, for example, is pursued as a panacea for creating sound innovation systems. Clearly policy makers have to start somewhere, and this factor is easily measurable. Yet the creation of sound innovation systems—with solid innovation inputs, sophisticated markets, a thriving business sector, and sturdy linkages among innovation actors—and assessing their performance is more complex than aiming at increasing one innovation input variable, as evidenced in the GII model.

One approach to overcoming a purely quantitative approach is to look at the quality of innovation, as the GII does, assessing the worth of universities, scientific output, and patents. Good quality remains a distinct characteristic of leaders such as Germany, Japan, the UK, and the USA. China is the only middle-income country showing a comparable innovation quality. India comes in second among middle-income economies.

Yet there is more to the story. High-quality innovation inputs and outputs are often the reflection of other factors that make an innovation ecosystem healthy, vibrant, and productive. Ideally, these systems become self-perpetuating, bottom-up, and without a recurrent need for policy or government to drive innovation. How best to create such an organic innovation system poses an interesting dilemma for governments and their role in future innovation policy models. On the one hand, it is now accepted that governments continue to play an important role in generating innovation. The boundaries between industrial and innovation policy are slim or non-existent; both play an important role. In particular, in the last few decades, Asian economies have benefited from a strong and strategic coordination role of governments in innovation. The role of governments in spurring innovation in high-income countries in Northern America and Europe has also been strong throughout history.

It can be argued that the role of governments, and also of public and coordinated private investments, might be even more significant today than it has been in the past. Driving future innovation in the fields such as travel, health, and communications is becoming more complex and costly.

On the other hand, if governments overreach, if they select technologies, they might quickly end up diluting the possibility of self-sustaining organic innovation ecosystems. Providing enough space for entrepreneurship and innovation; the right incentives and encouragement to bottom-up forces such as individuals, students, small firms, and others; and a certain 'freedom to operate' that often challenges the status quo is part of the equation. Surely developing countries are well-advised to avoid over relying on government forces as the sole driver to orchestrating a sound innovation system.

For governments, finding the right balance between intervention and laissez-faire has never been as challenging.

Over the last years, the GII has established itself as a leading reference on innovation. The GII is meant to be a 'tool for action' for decision makers with the goal of improving countries' innovation performances. Upon the release of the GII, numerous workshops in different countries bring innovation actors together around the GII results with the aim of improving data availability, boosting a region's or a country's innovation performance, and designing policies for effective impact. These exchanges on the ground also generate feedback that, in turn, improves the GII and assists the journey towards improved innovation measurement and policy. This valuable feedback will continue to be integrated into future iterations of the GII in the years to come.

Notes for Box 1

1 These estimates are based on preliminary calculations using GERD and BERD figures at constant $PPP-2005 prices from the UNESCO-UIS Science & Technology Data Center, updated February 2015, with imputed value for the USA in 2014. Economies included: Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Côte d'Ivoire, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong (China), Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macao (China), Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Nepal, the Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, the Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Taiwan (China), Tajikistan, Thailand, the Former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, the United Arab Emirates, the United Kingdom, the United Republic of Tanzania, the United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, and Zimbabwe.

2 Data are based on the OECD Main Science and Technology Indicators (MSTI), updated January 2016.

3 OECD data on government appropriations to R&D (GBAORD) (accessed 2 May 2016) via OECD MSTI.

Notes for Box 5

1 Innovation quality is measured as an average of three GII variables: QS university ranking average score of top 3 universities, patent families filed in at least two offices, and the citable documents H index.

2 These six sub-pillars are Research and development (R&D), Information and communication technologies (ICTs), Knowledge workers, Knowledge creation, Knowledge impact, and Creative goods and services.

3 NSF, 2016. The estimates are based on preliminary calculations using GERD and BERD figures at constant $PPP 2005 prices from the UNESCO-UIS database with imputed value for the USA in 2014.

4 Government of the United States of America, 2016. Available at https://www.whitehouse.gov/administration/eop/ostp/rdbudgets.

5 OECD MSTI, updated 9 February 2016. Data used: Gross domestic expenditure on R&D (GERD) at constant 2010 PPP$; UNESCO-UIS Science & Technology Data Center; and OECD Main Science and Technology Indicators (MSTI), update from April 2016. Data used: GERD, performed by Business enterprise (in '000 PPP$, constant prices, 2005).

6 NSF, 2016.

7 These seven sub-pillars are Political environment; Business environment; General infrastructure; Credit; Investment; Trade, competition & market scale; and Online creativity.

8 See Box 1 on R&D expenditures; OECD, 2015a; OECD, 2013.

9 OECD, 2015b; OECD, 2013.

10 Government of Canada, 2016. Available at http://www.budget.gc.ca/2016/docs/plan/ch2-en.html.

Notes for Chapter 1

1 Conference Board, 2016; IMF, 2016a; IMF, 2016b; OECD, 2016; World Bank, 2016.

2 IMF, 2016a; IMF, 2016b; OECD, 2016; World Bank, 2016.

3 Conference Board, 2015.

4 IMF, 2015; IMF, 2016b; OECD, 2016; WIPO, 2015b.

5 OECD, 2009; WIPO, 2010; Dutta et al., 2013.

6 Dutta et al., 2014, and Dutta et al., 2015, based on UNESCO Institute for Statistics R&D data and OECD Main Science and Technology Indicators. See also Soete et al., 2015. Largely as a result of slower GDP growth, global R&D intensity—computed as global R&D expenditures over global GDP—remained relatively stable at about 1.7% in 2014, compared with about 1.6% in 2008, with the Republic of Korea overtaking Israel in 2013 to become the most R&D-intensive country.

7 These estimates are based on preliminary calculations using GERD and BERD figures at constant $PPP- 2005 prices from UNESCO-UIS database with imputed value for the USA in 2014.

8 WIPO, 2015b. At the same time patent applications under WIPO's Patent Cooperation Treaty (PCT) saw a 1.7% increase in 2015; a significant fall in growth compared with previous years (WIPO, 2016).

9 WIPO, 2015b.

10 UIS, 2015; Soete et al., 2015.

11 WIPO, 2015b.

12 Wagner et al., 2015.

13 Cincera and Pottelsberghe, 2001; Griliches, 1992.

14 Coe and Helpman, 1995; Coe et al., 2009; Griliches, 1992.

15 See also Soete et al., 2015; WIPO, 2015b.

16 Avenyo et al., 2015; WIPO, 2015b.

17 Dutta et al., 2015.

18 Ezell et al., 2013; Ezell et al., 2015.

19 Examples are efforts of the New Partnership for Africa's Development (NEPAD), OECD, UNESCO, and WIPO.

20 See indicators on high-tech goods and services trade in the GII.

21 See FDI flow data in the GII. Sources are the UNCTAD FDI Statistics Database at http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics.aspx and OECD FDI statistics database at http://www.oecd.org/daf/inv/OECD-BMD4-FDI-statistics-database-predefined-queries.pdf.

22 See the IP payment data in the GII. For background see IMF, 2009; UN et al., 2011. For shortcomings see Box 1.11 in Chapter 1 in WIPO, 2013.

23 See Box 1.11 in WIPO, 2013.

24 Alkemade et al., 2015; Dunning and Lundan, 2009.

25 Fink and Miguelez, forthcoming; ; INSEAD, 2015; Miguelez and Fink, 2013; OECD, 2015b; Scellato et al., 2014.

26 Keller, 2004.

27 Cincera and Van Pottelsberghe, 2001.

28 Keller, 2004.

29 See Box 1.3 in WIPO, 2011; Bergek and Bruzelius, 2010.

30 For a notable exception see OECD, 2014, on the economic value of The European Organization for Nuclear Research (CERN).

31 See also the WHO Global Observatory on Health R&D and the development of R&D blueprints that help prioritize and direct R&D on infectious diseases, available at http://apps.who.int/gb/ebwha/pdf_files/WHA69/A69_29-en.pdf.

32 WIPO, 2011.

33 NSF, 2016; UNESCO, 2015.

34 OECD, 2015c; WIPO, 2015a; World Bank, 2008; World Bank, 2016.

35 Wagner et al., 2015.

36 Brunner, 2016.

37 Wagner et al., 2015.

38 The 'forced cooperation rules' of EUREKA are an example in this regard, at http://www.eurekanetwork.org/.

39 See http://www.naturalsciences.ch/organisations/kfpe.

40 OECD, 2011.

41 U.S.-India Commercial, Trade, and Economic Cooperation, Washington, DC, September 22, 2015; http://www.state.gov/r/pa/prs/ps/2015/09/247174.htm.

42 See Soete et al., 2015, on this point.

43 See the 'Daejeon Ministerial Declaration on Science, Technology, and Innovation Policies for the Global and Digital', available at http://www.oecd.org/sti/daejeon-declaration-2015.htm, which also suggests the need to update the 'Recommendation of the Council Concerning a General Framework of Principles for International Co-operation in Science and Technology,' C(88)60/FINAL, which dates from 1988.

44 For related efforts, see BMBF, 2015.

45 Hungary (33rd), another middle-income economy identified as being on the heels of the high-income top performers in the GII 2015, changes its income group from upper-middle to high income this year.

46 Economies are grouped according to the World Bank classification (July 2015) gross national income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: low income, US$1,045 or less; lower-middle income, US$1,046 to US$4,125; upper-middle income, US$4,126 to US$12,735; and high income, US$12,736 or more.

47 Since 2012, the regional groups have been based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; and SSF = Sub-Saharan Africa.

48 Although Malta (GII rank 26) has a score above 50, it is not considered among the leaders because its ranking is below the top 25.

49 Innovation achievers share the most strengths in the Innovation Efficiency Ratio, Knowledge absorption (5.3), government expenditure on education per pupil, secondary (2.1.2), growth rate of GDP per person engaged (6.2.1), microfinance institutions' gross loan portfolio (4.1.3), GERD financed by abroad (5.2.3), foreign direct investment net inflows (5.3.4), ICT services exports (6.3.3), and trademark application class count by origin (7.1.1). They also share the most weaknesses in tertiary enrolment (2.2.1), global R&D companies, average expenditure top 3 (2.3.3), QS university ranking average score top 3 universities (2.3.4), ICT access (3.1.1), GDP per unit of energy use (3.3.1), ISO 14001 environmental certificates (3.3.3), total value of stocks traded (4.2.3), and employment in knowledge-intensive services (5.1.1).

50 This year the rule to determine what countries become part of the GII rankings shifts from one that requires a minimum overall data coverage of 60% of all indicators to one where this same percentage is applied individually to each input and output side of the index (see Annex 2 for further details).

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The Global Innovation Index (GII) Conceptual Framework

The rationale for the Global Innovation Index

The Global Innovation Index (GII) project was launched by Professor Dutta at INSEAD in 2007 with the simple goal of determining how to find metrics and approaches that better capture the richness of innovation in society and go beyond such traditional measures of innovation as the number of research articles and the level of research and development (R&D) expenditures.[1]

There were several motivations for setting this goal. First, innovation is important for driving economic progress and competitiveness—both for developed and developing economies. Many governments are putting innovation at the centre of their growth strategies. Second, the definition of innovation has broadened—it is no longer restricted to R&D laboratories and to published scientific papers. Innovation could be and is more general and horizontal in nature, and includes social innovations and business model innovations as well as technical ones. Last but not least, recognizing and celebrating innovation in emerging markets is seen as critical for inspiring people—especially the next generation of entrepreneurs and innovators.

The GII helps to create an environment in which innovation factors are under continual evaluation, and it provides a key tool and a rich database of detailed metrics for refining innovation policies.

The GII is not meant to be the ultimate and definitive ranking of economies with respect to innovation. Measuring innovation outputs and impacts remains difficult, hence great emphasis is placed on measuring the climate and infrastructure for innovation and on assessing related outcomes.

Although the end results take the shape of several rankings, the GII is more concerned with improving the 'journey' to better measure and understand innovation and with identifying targeted policies, good practices, and other levers that foster innovation. The rich metrics can be used—on the level of the index, the sub-indices, or the actual raw data of individual indicators—to monitor performance over time and to benchmark developments against countries in the same region or of the same income category.

Drawing on the expertise of the GII's Knowledge Partners and its prominent Advisory Board, the GII model is continually updated to reflect the improved availability of statistics and our understanding of innovation. This year, the model continues to evolve, although its mature state now requires only minor updates (refer to Annex 2).

An inclusive perspective on innovation

The GII adopts a broad notion of innovation, originally elaborated in the *Oslo Manual* developed by the European Communities and the Organisation for Economic Co-operation and Development (OECD):[2]

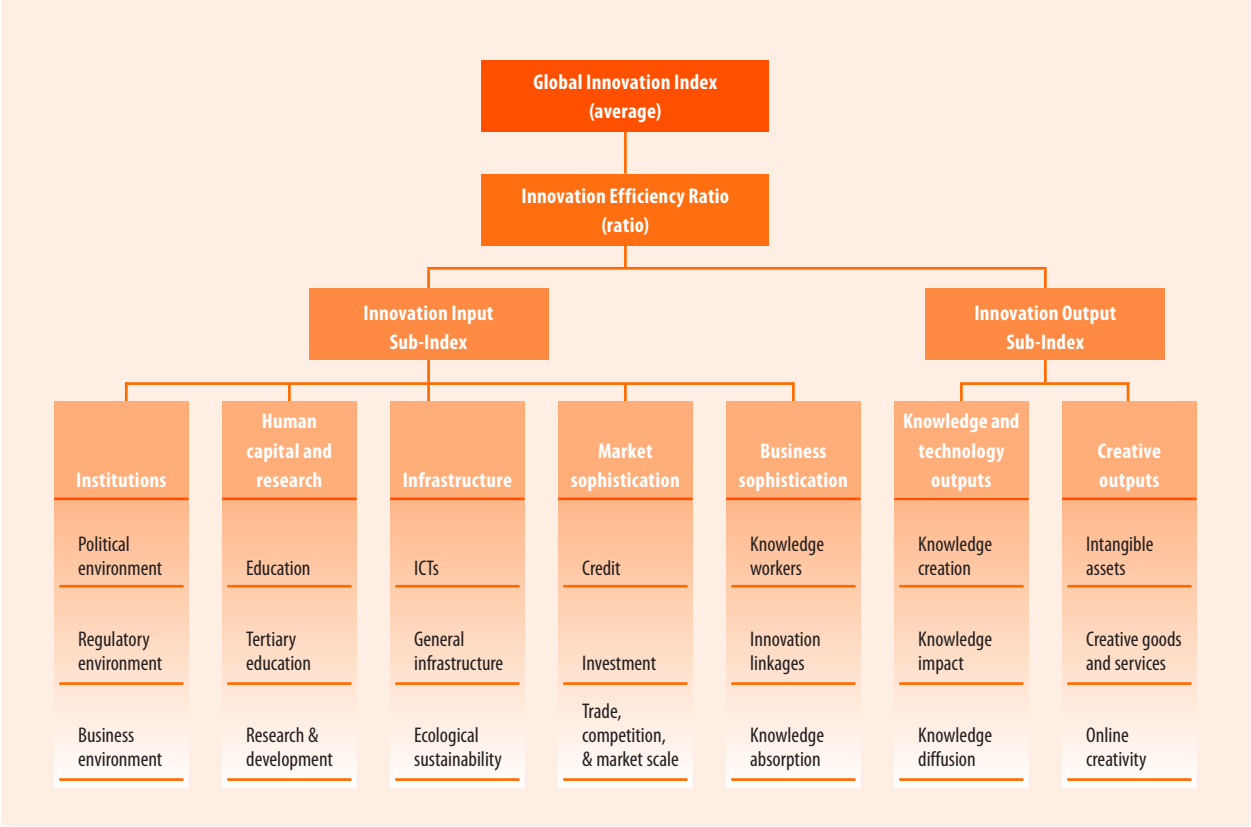
> An innovation is the implementation of a new or significantly improved product (good or service), a new process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations.

This definition reflects the evolution of the way innovation has been perceived and understood over the last two decades.[3]

Previously economists and policy makers focused on R&D-based technological product innovation, largely produced in-house and mostly in manufacturing industries. This type of innovation was performed by a highly educated labour force in R&D-intensive companies. The process leading to such innovation was conceptualized as closed, internal, and localized. Technological breakthroughs were necessarily 'radical' and took place at the 'global knowledge frontier'. This characterization implied the existence of leading and lagging countries, with low- or middle-income economies only catching up.

Today innovation capability is seen more as the ability to exploit new technological combinations; it embraces the notion of incremental innovation and 'innovation without research'. Non-R&D innovative expenditure is an important

Figure 1: Framework of the Global Innovation Index 2016



component of reaping the rewards of technological innovation. Interest in understanding how innovation takes place in low- and middle-income countries is increasing, along with an awareness that incremental forms of innovation can impact development. Furthermore, the process of innovation itself has changed significantly. Investment in innovation-related activity has consistently intensified at the firm, country, and global levels, adding both new innovation actors from outside high-income economies and nonprofit actors. The structure of knowledge production activity is more complex and geographically dispersed than ever.

A key challenge is to find metrics that capture innovation as it actually happens in the world today.[4] Direct official measures that quantify innovation outputs remain extremely scarce.[5] For example, there are no official statistics on the amount of innovative activity—defined as the number of new products, processes, or other innovations—for any given innovation actor, let alone for any given country (see Box 1, Annex 1 of Chapter 1 in the GII 2013). Most measures also struggle to appropriately capture the innovation outputs of a wider spectrum of innovation actors, such as the services sector or public entities.

The GII aims to move beyond the mere measurement of such simple innovation metrics. To do so will require the integration of new variables, with a trade-off between the quality of the variable on the one hand and achieving good country coverage on the other hand.

The timeliest possible indicators are used for the GII: 31.9% of data obtained are from 2015, 42.5% are from 2014, 13.0% are from 2013, 6.3% from 2012, and the small remainder (6.3%) from earlier years.[6]

The GII conceptual framework

The GII is an evolving project that builds on its previous editions while incorporating newly available data and that is inspired by the latest research on the measurement of innovation. This year the GII model includes 128 countries/economies, which represent 92.8% of the world's population and 97.9% of the world's GDP (in current US dollars). The GII relies on two sub-indices—the Innovation Input Sub-Index and the Innovation Output Sub-Index—each built around pillars. Four measures are calculated (see Figure 1):

1. **Innovation Input Sub-Index:** Five input pillars capture elements of the national economy that enable innovative activities.
2. **Innovation Output Sub-Index:** Innovation outputs are the results of innovative activities within the economy. Although the Output Sub-Index includes only two pillars, it has the same weight in calculating the overall GII scores as the Input Sub-Index.
3. **The overall GII score** is the simple average of the Input and Output Sub-Indices.
4. **The Innovation Efficiency Ratio** is the ratio of the Output Sub-Index to the Input Sub-Index. It shows how much innovation output a given country is getting for its inputs.

Each pillar is divided into three sub-pillars, each of which is composed of individual indicators, for a total of 82 indicators this year. The GII pays special attention to presenting a scoreboard for each economy that includes strengths and weaknesses (Appendix I Country/Economy Profiles), making accessible the data series (Appendix II Data Tables), and providing data sources and definitions (Appendix III) and detailed technical notes (Appendix IV). Adjustments to the GII framework, including a detailed analysis of the factors influencing year-on-year changes, are detailed in Annex 2. In addition, since 2011 the GII has been submitted to an independent statistical audit performed by the Joint Research Centre of the European Union (results are detailed in Annex 3).

A table is included here for each pillar. That table provides a list of the pillar's indicators, specifying their type (composite indicators are identified with an asterisk '*', survey questions with a dagger '†', and the remaining indicators are hard data); their weight in the index (indicators with half weight are identified with the letter 'a'); and the direction of their effect (indicators for which higher values imply worse outcomes are identified with the letter 'b'). The table then provides each indicator's average values (in their respective units) per income group (World Bank classification) and for the whole sample of 128 economies retained in the final computation (Tables 1a through 1g).

Table 1a: Institutions pillar

		Average value by income group				
	Indicator	High income	Upper-middle income	Lower-middle income	Low income	Mean
1	**Institutions**					
1.1	*Political environment*					
1.1.1	Political stability and safety*	0.67	−0.15	−0.69	−0.63	−0.02
1.1.2	Government effectiveness*	1.13	0.01	−0.44	−0.76	0.24
1.2	*Regulatory environment*					
1.2.1	Regulatory quality*[a]	1.07	0.04	−0.39	−0.58	0.26
1.2.2	Rule of law*[a]	1.13	−0.19	−0.51	−0.64	0.18
1.2.3	Cost of redundancy dismissal, salary weeks[b]	16.13	17.25	26.63	15.90	18.78
1.3	*Business environment*					
1.3.1	Ease of starting a business*	88.73	85.18	82.76	76.85	84.95
1.3.2	Ease of resolving insolvency*	67.08	51.74	36.56	38.98	52.58
1.3.3	Ease of paying taxes*	81.69	72.79	59.58	62.56	71.93

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes.

The Innovation Input Sub-Index

The first sub-index of the GII, the Innovation Input Sub-Index, has five enabler pillars: Institutions, Human capital and research, Infrastructure, Market sophistication, and Business sophistication. Enabler pillars define aspects of the environment conducive to innovation within an economy.

Pillar 1: Institutions

Nurturing an institutional framework that attracts business and fosters growth by providing good governance and the correct levels of protection and incentives is essential to innovation. The Institutions pillar captures the institutional framework of a country (Table 1a).

The Political environment sub-pillar includes two indices: one that reflects perceptions of the likelihood that a government might be destabilized; and one that reflects the quality of public and civil services, policy formulation, and implementation.

The Regulatory environment sub-pillar draws on two indices aimed at capturing perceptions on the ability of the government to formulate and implement cohesive policies that promote the development of the private sector and at evaluating the extent to which the rule of law prevails (in aspects such as contract enforcement, property rights, the police, and the courts). The third indicator evaluates the cost of redundancy dismissal as the sum, in salary weeks, of the cost of advance notice requirements added to severance payments due when terminating a redundant worker.

The Business environment sub-pillar expands on three aspects that directly affect private entrepreneurial endeavours by using the World Bank indices on the ease of starting a business; the ease of resolving insolvency (based on the recovery rate recorded as the cents on the

Table 1b: Human capital & research pillar

	Indicator	Average value by income group: High income	Upper-middle income	Lower-middle income	Low income	Mean
2	**Human capital and research**					
2.1	*Education*					
2.1.1	Expenditure on education, % GDP	5.44	4.59	4.32	4.53	4.85
2.1.2	Gov't expend. on edu./pupil, secondary[1]	24.41	17.49	19.82	26.64	22.12
2.1.3	School life expectancy, years	16.50	14.03	11.71	9.69	13.89
2.1.4	PISA scales in reading, maths & science[a]	491.87	427.08	360.19	n/a	469.85
2.1.5	Pupil-teacher ratio, secondary[a,b]	11.06	15.44	20.50	29.33	16.90
2.2	*Tertiary education*					
2.2.1	Tertiary enrolment, % gross[a]	66.10	45.19	26.06	7.43	44.21
2.2.2	Graduates in science & engineering, %	22.43	21.96	21.31	12.75	21.13
2.2.3	Tertiary inbound mobility, %[a]	9.22	2.84	1.64	2.51	5.26
2.3	*Research and development (R&D)*					
2.3.1	Researchers, FTE/mn pop	3,568.87	678.68	328.77	36.47	1,921.76
2.3.2	Gross expenditure on R&D, % GDP	1.64	0.51	0.32	0.37	0.95
2.3.3	Global R&D firms, avg. exp. top 3, mn $US	997.76	84.74	14.96	0.00	407.85
2.3.4	QS university ranking, average score top 3*	44.53	16.92	7.45	0.16	23.25

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes. FTE = full-time equivalence.
[1] Scaled by percent of GDP per capita.

Table 1c: Infrastructure pillar

	Indicator	Average value by income group: High income	Upper-middle income	Lower-middle income	Low income	Mean
3	**Infrastructure**					
3.1	*Information and communication technologies (ICTs)*					
3.1.1	ICT access*	7.99	5.67	4.26	2.62	5.96
3.1.2	ICT use*	6.66	3.63	1.99	0.56	4.15
3.1.3	Government's online service*	0.72	0.46	0.37	0.20	0.50
3.1.4	E-participation*	0.68	0.47	0.41	0.22	0.51
3.2	*General infrastructure*					
3.2.1	Electricity output, kWh/cap[a]	9,111.92	3,109.95	1,082.22	136.12	4,904.32
3.2.2	Logistics performance*[a]	3.51	2.87	2.69	2.52	3.04
3.2.3	Gross capital formation, % GDP	21.13	25.51	23.33	26.32	23.43
3.3	*Ecological sustainability*					
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.71	8.72	7.90	4.03	8.21
3.3.2	Environmental performance*	82.50	73.74	65.49	47.08	71.91
3.3.3	ISO 14001 environ. certificates/bn PPP$ GDP[a]	4.37	2.77	0.52	0.16	2.56

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes. KwH = kilowatt hours.

dollar recouped by creditors through reorganization, liquidation, or debt enforcement/foreclosure proceedings); and the ease of paying taxes.

Pillar 2: Human capital and research

The level and standard of education and research activity in a country are prime determinants of the innovation capacity of a nation. This pillar tries to gauge the human capital of countries (Table 1b).

The first sub-pillar includes a mix of indicators aimed at capturing achievements at the elementary and secondary education levels. Education expenditure and school life expectancy are good proxies for coverage. Government expenditure per pupil, secondary gives a sense of the level of priority given to secondary education by the state. The quality of education is measured through the results to the OECD Programme for International Student Assessment (PISA), which examines 15-year-old students' performances in reading, mathematics, and science, as well as the pupil-teacher ratio.

Higher education is crucial for economies to move up the value chain beyond simple production processes and products. The sub-pillar on tertiary education aims at capturing coverage (tertiary enrolment); priority is given to the sectors traditionally associated with innovation (with a series on the percentage of tertiary graduates in science and engineering, manufacturing, and construction); and the inbound and mobility of tertiary students, which plays a crucial role in the exchange of ideas and skills necessary for innovation.

The last sub-pillar, on R&D, measures the level and quality of R&D activities, with indicators on researchers (full-time equivalence), gross expenditure, the R&D expenditures of top global R&D spenders, and the quality of scientific and research institutions as measured by the average score of the top three universities in the QS World University Ranking of 2015. The average R&D expenditures of the top three firms in a given country looks at the average expenditure of these three firms that are part of the top 2,500 R&D spenders worldwide. The QS university rankings indicator gives the average scores of the country's top three universities that belong to the top 700 universities worldwide. These indicators are not aimed at assessing the average level of all institutions within a particular economy.

Pillar 3: Infrastructure

The third pillar includes three sub-pillars: Information and communication technologies (ICTs), General infrastructure, and Ecological sustainability (Table 1c).

Good and ecologically friendly communication, transport, and energy infrastructures facilitate the production and exchange of ideas,

services, and goods and feed into the innovation system through increased productivity and efficiency, lower transaction costs, better access to markets, and sustainable growth.

The ICTs sub-pillar includes four indices developed by international organizations on ICT access, ICT use, online service by governments, and online participation of citizens.

The sub-pillar on general infrastructure includes the average of electricity output in kWh per capita; a composite indicator on logistics performance; and gross capital formation, which consists of outlays on additions to the fixed assets and net inventories of the economy, including land improvements (fences, ditches, drains); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.

The sub-pillar on ecological sustainability includes three indicators: GDP per unit of energy use (a measure of efficiency in the use of energy), the Environmental Performance Index of Yale and Columbia Universities, and the number of certificates of conformity with standard ISO 14001 on environmental management systems issued.

Table 1d: Market sophistication pillar

		Average value by income group				
	Indicator	High income	Upper-middle income	Lower-middle income	Low income	Mean
4	**Market sophistication**					
4.1	*Credit*					
4.1.1	Ease of getting credit*	58.57	57.94	54.14	35.31	54.49
4.1.2	Domestic credit to private sector, % GDP	95.39	61.42	37.19	24.79	64.69
4.1.3	Microfinance gross loans, % GDP	0.14	1.58	2.02	2.97	1.86
4.2	*Investment*					
4.2.1	Ease of protecting minority investors*	61.76	57.79	51.44	44.48	56.21
4.2.2	Market capitalization, % GDP[a]	84.90	45.49	32.97	23.74	60.74
4.2.3	Total value of stocks traded, % GDP[a]	44.32	19.40	5.99	0.19	28.55
4.2.4	Venture capital deals/bn PPP$ GDP[a]	0.13	0.03	0.02	0.03	0.08
4.3	*Trade, competition, and market scale*					
4.3.1	Applied tariff rate, weighted mean, %[a,b]	1.91	4.42	5.60	8.94	4.29
4.3.2	Intensity of local competition†[a]	5.37	4.97	4.89	4.65	5.07
4.3.3	Domestic market scale, bn PPP$	1,131.15	968.62	571.97	43.62	825.35

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes.

Pillar 4: Market sophistication

The availability of credit and an environment that supports investment, access to the international market, competition, and market scale are all critical for businesses to prosper and for innovation to occur. The Market sophistication pillar has three sub-pillars structured around market conditions and the total level of transactions (Table 1d).

The Credit sub-pillar includes a measure on the ease of getting credit aimed at measuring the degree to which collateral and bankruptcy laws facilitate lending by protecting the rights of borrowers and lenders, as well as the rules and practices affecting the coverage, scope, and accessibility of credit information. Transactions are given by the total value of domestic credit and, in an attempt to make the model more applicable to emerging markets, by the gross loan portfolio of microfinance institutions.

The Investment sub-pillar includes the ease of protecting minority investors index as well as three indicators on the level of transactions. To show whether market size is matched by market dynamism, stock market capitalization is complemented by the total value of shares traded. The last metric is a hard data metric on venture capital deals, taking into account a total of 13,703 deals in 95 countries in 2015.

The last sub-pillar tackles trade, competition, and market scale. The market conditions for trade are given in the first indicator measuring the average tariff rate weighted by import shares. The second indicator is a survey question that reflects on the intensity of competition in local markets. Efforts made at finding hard data on competition so far remain unsuccessful. Domestic market scale, as measured by an economy's GDP, has been incorporated so the last sub-pillar takes into consideration the impact that the size of an economy has on its capacity to introduce and test innovations in the market place.

Pillar 5: Business sophistication

The last enabler pillar tries to capture the level of business sophistication to assess how conducive firms are to innovation activity (Table 1e). The Human capital and research pillar (pillar 2) made the case that the accumulation of human capital through education, particularly higher education and the prioritization of R&D activities, is an indispensable condition for innovation to take place. That logic is taken one step further here with the assertion that businesses foster their productivity, competitiveness, and innovation potential with the employment of highly qualified professionals and technicians.

The first sub-pillar includes four quantitative indicators on knowledge workers: employment in knowledge-intensive services; the availability of formal training at

Table 1e: Business sophistication pillar

	Indicator	Average value by income group: High income	Upper-middle income	Lower-middle income	Low income	Mean
5	**Business sophistication**					
5.1	*Knowledge workers*					
5.1.1	Knowledge-intensive employment, %	38.79	22.41	17.82	3.36	27.21
5.1.2	Firms offering formal training, % firms	43.93	41.37	30.74	32.40	37.00
5.1.3	GERD performed by business, % GDP[a]	1.07	0.24	0.08	0.06	0.63
5.1.4	GERD financed by business, %[a]	43.84	25.47	13.74	7.31	31.69
5.1.5	Females emp. w/adv. degrees, % tot. emp.[a]	18.71	12.27	9.78	2.45	14.46
5.2	*Innovation linkages*					
5.2.1	University/industry research collaboration†[a]	4.48	3.55	3.31	3.08	3.82
5.2.2	State of cluster development†	4.30	3.62	3.54	3.35	3.84
5.2.3	GERD financed by abroad, %	12.83	8.66	12.80	34.51	13.74
5.2.4	JV-strategic alliance deals/bn PPP$ GDP[a]	0.02	0.01	0.01	0.01	0.02
5.2.5	Patent families filed in 2+ offices/bn PPP$ GDP[a]	2.40	0.13	0.07	0.06	1.09
5.3	*Knowledge absorption*					
5.3.1	Intellectual property payments, % total trade[a]	1.82	0.53	0.39	0.13	0.91
5.3.2	High-tech imports less re-imports, % tot. trade	9.50	9.59	7.30	7.18	8.74
5.3.3	ICT services imports, % total trade	1.53	0.79	0.97	1.59	1.21
5.3.4	FDI net inflows, % GDP	4.35	3.62	2.91	6.82	4.14
5.3.5	Research talent, % in business enterprise	42.31	23.63	17.96	25.46	33.19

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes. GERD = gross domestic expenditure on R&D.

the firm level; R&D performed by business enterprise (GERD) as a percentage of GDP (i.e., GERD over GDP); and the percentage of total gross expenditure of R&D that is financed by business enterprise. In addition, the sub-pillar includes an indicator related to the percentage of females employed with advanced degrees. This indicator, in addition to providing a glimpse into the gender labour distributions of nations, offers more information about the degree of sophistication of the local human capital currently employed.

Innovation linkages and public/private/academic partnerships are essential to innovation. In emerging markets, pockets of wealth have developed around industrial or technological clusters and networks, in sharp contrast to the poverty that may prevail in the rest of the territory. The Innovation linkages sub-pillar draws on both qualitative and quantitative data regarding business/university collaboration on R&D, the prevalence of well-developed and deep clusters, the level of gross R&D expenditure financed by abroad, and the number of deals on joint ventures and strategic alliances. The latter covers a total of 1,512 deals announced in 2015, with firms headquartered in 92 participating economies.[7] In addition, the total number of Patent Cooperation Treaty (PCT) and national office published patent family applications filed by residents in at least two offices proxies for international linkages.

In broad terms, pillar 4 on market sophistication makes the case that well-functioning markets contribute to the innovation environment through competitive pressure, efficiency gains, and economies of transaction and by allowing supply to meet demand. Markets that are open to foreign trade and investment have the additional effect of exposing domestic firms to best practices around the globe, which is critical to innovation through knowledge absorption and diffusion, which are considered in pillars 5 and 6. The rationale behind sub-pillars 5.3 on knowledge absorption (an enabler) and 6.3 on knowledge diffusion (a result)—two sub-pillars designed to be mirror images of each other—is precisely that together they will reveal how good economies are at absorbing and diffusing knowledge.

Sub-pillar 5.3 includes five metrics that are linked to sectors with high-tech content or are key to innovation: royalty and license fees payments as a percentage of total trade; high-tech imports (net of re-imports) as a percentage of total imports; imports of communication, computer, and information services as a percentage of total trade; and net inflows of foreign direct investment (FDI) as a percentage of GDP. To strengthen the sub-pillar, the percentage of research talent in business was added this year to provide a measurement of professionals engaged in the conception or creation of new knowledge, products, processes, methods, and systems, including business management.

The Innovation Output Sub-Index

Innovation outputs are the results of innovative activities within the economy. Although the Output Sub-Index includes only two pillars, it has the same weight in calculating the overall GII scores as the Input Sub-Index. There are two output pillars: Knowledge and technology outputs and Creative outputs.

Pillar 6: Knowledge and technology outputs

This pillar covers all those variables that are traditionally thought to be the fruits of inventions and/or innovations (Table 1f). The first sub-pillar refers to the creation of knowledge. It includes five indicators that are the result of inventive and innovative activities: patent applications filed by residents both at the national patent office and at

the international level through the PCT; utility model applications filed by residents at the national office; scientific and technical published articles in peer-reviewed journals; and an economy's number of articles (H) that have received at least H citations.

The second sub-pillar, on knowledge impact, includes statistics representing the impact of innovation activities at the micro- and macroeconomic level or related proxies: increases in labour productivity, the entry density of new firms, spending on computer software, the number of certificates of conformity with standard ISO 9001 on quality management systems issued, and the measure of high- and medium-high-tech industrial output over total manufactures output.

The third sub-pillar, on knowledge diffusion, is the mirror image of the knowledge absorption sub-pillar of pillar 5, with the exception of indicator 5.3.5. It includes four statistics all linked to sectors with high-tech content or that are key to innovation: royalty and license fees receipts as a percentage of total trade; high-tech exports (net of re-exports) as a percentage of total exports (net of re-exports); exports of ICT services as a percentage of total trade; and net outflows of FDI as a percentage of GDP.

Table 1f: Knowledge & technology outputs pillar

		Average value by income group				
	Indicator	High income	Upper-middle income	Lower-middle income	Low income	Mean
6	**Knowledge and technology outputs**					
6.1	*Knowledge creation*					
6.1.1	Patents by origin/bn PPP$ GDP[a]	7.96	2.88	1.37	0.23	4.38
6.1.2	PCT patent applications/bn PPP$ GDP[a]	2.65	0.20	0.12	0.05	1.27
6.1.3	Utility models by origin/bn PPP$ GDP	1.42	3.08	2.93	0.10	2.31
6.1.4	Scientific & technical articles/bn PPP$ GDP[a]	29.22	10.57	6.56	8.43	16.43
6.1.5	Citable documents H index*[a]	393.65	137.53	105.93	69.63	219.93
6.2	*Knowledge impact*					
6.2.1	Growth rate of PPP$ GDP/worker, %	0.47	1.41	2.92	3.14	1.49
6.2.2	New businesses/th pop. 15–64[a]	5.94	3.31	0.90	0.45	3.58
6.2.3	Computer software spending, % GDP[a]	0.46	0.31	0.26	n/a	0.38
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP[a]	14.93	9.96	2.50	0.95	9.05
6.2.5	High- & medium-high-tech manufactures, %[a]	34.65	22.50	16.55	6.75	25.84
6.3	*Knowledge diffusion*					
6.3.1	Intellectual property receipts, % total trade[a]	1.03	0.06	0.11	0.20	0.47
6.3.2	High-tech exports less re-exports, % total trade[a]	6.48	4.92	1.71	0.43	4.26
6.3.3	ICT services exports, % total trade[a]	2.55	1.44	2.46	2.11	2.17
6.3.4	FDI net outflows, % GDP	5.46	6.63	0.12	1.37	4.14

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes.

Table 1g: Creative outputs pillar

		Average value by income group				
	Indicator	High income	Upper-middle income	Lower-middle income	Low income	Mean
7	**Creative outputs**					
7.1	*Intangible assets*					
7.1.1	Trademarks by origin/bn PPP$ GDP	59.01	57.49	36.47	17.78	49.08
7.1.2	Industrial designs by origin/bn PPP$ GDP[a]	5.87	3.69	2.59	1.34	4.06
7.1.3	ICTs & business model creation†	5.06	4.40	4.22	3.82	4.56
7.1.4	ICTs & organizational model creation†	4.81	4.01	3.93	3.43	4.25
7.2	*Creative goods and services*					
7.2.1	Cultural & creative services exp., % total trade[a]	0.75	0.46	0.10	0.09	0.46
7.2.2	National feature films/mn pop. 15–69[a]	7.74	2.44	4.41	0.82	5.15
7.2.3	Global ent. & media market/th pop. 15–69[a]	1.34	0.20	0.05	n/a	0.90
7.2.4	Printing & publishing manufactures, %	2.31	1.56	1.23	1.77	1.85
7.2.5	Creative goods exports, % total trade	1.85	1.82	0.65	0.08	1.36
7.3	*Online creativity*					
7.3.1	Generic TLDs/th pop. 15–69	34.55	6.22	1.51	0.32	15.26
7.3.2	Country-code TLDs/th pop. 15–69	34.96	6.57	0.96	0.97	15.47
7.3.3	Wikipedia monthly edits/mn pop. 15–69	5,295.46	1,644.95	593.80	43.72	2,604.11
7.3.4	Video uploads on YouTube/pop. 15–69	51.13	18.80	7.75	0.19	35.54

Note: (*) index, (†) survey question, (a) half weight, (b) higher values indicate worse outcomes. Scores rather than values are presented for indicators 7.3.1, 7.3.2, and 7.3.4. TLDs = top-level domains.

Pillar 7: Creative outputs

The role of creativity for innovation is still largely underappreciated in innovation measurement and policy debates. Since its inception, the GII has always emphasized measuring creativity as part of its Innovation Output Sub-Index. The last pillar, on creative outputs, has three sub-pillars (Table 1g).

The first sub-pillar on intangible assets includes statistics on trademark applications by residents at the national office; industrial designs included in applications at a regional or national office, and two survey questions regarding the use of ICTs in business and organizational models, new areas that are increasingly linked to process innovations in the literature.

The second sub-pillar on creative goods and services includes proxies to get at creativity and the creative outputs of an economy. In 2014, in an attempt to include broader sectoral coverage, a global entertainment and media output composite was added. In addition, the indicator on audio-visual and related services exports was renamed 'Cultural and creative services exports' and expanded to include information

services, advertising, market research and public opinion polling, and other personal, cultural, and recreational services (as a percentage of total trade). These two indicators complement the remainder of the sub-pillar, which measures national feature films produced in a given country (per capita count); printing and publishing output (as a percentage of total manufactures output); and creative goods exports (as a percentage of total trade), all which are aimed at providing an overall sense of the international reach of creative activities in the country.

The third sub-pillar on online creativity includes four indicators, all scaled by population aged 15 through 69 years old: generic (biz, info, org, net, and com) and country-code top level domains, average monthly edits to Wikipedia; and video uploads on YouTube. Attempts made to strengthen this sub-pillar with indicators in areas such as Internet and machine learning, blog posting, online gaming, and the development of applications have so far proved unsuccessful.

Notes

1 For a fuller introduction to the Global Innovation Index, see the GII 2011.

2 Eurostat and OECD, 2005.

3 OECD, 2010; INSEAD, 2011; and WIPO, 2011.

4 INSEAD, 2011; OECD Scoreboard, 2013; WIPO, 2011.

5 INSEAD, 2011; OECD, 2011; WIPO, 2011.

6 For completeness, 2.1% of data points are from 2011, 1.9% from 2010, 1.0% from 2009, 0.7% from 2008, 0.4% from 2007, and 0.2% from 2006. In addition, the GII is calculated on the basis of 9,148 data points (compared to 10,496 with complete series), implying that 12.8% of data points are missing. Data Tables (Appendix II) include the reference year for each data point and mark missing data as not available (n/a).

7 These data were determined from a query on joint ventures/strategic alliances deals announced in 2015 from Thomson Reuters SDC Platinum database. A count variable was created: each participating nation of each company in a deal (*n* countries per deal) gets, per deal, a score equivalent to 1/*n* so that all country scores add up to the total number of deals.

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Adjustments to the Global Innovation Index Framework and Year-on-Year Comparability of Results

The Global Innovation Index (GII) is a cross-country performance assessment, compiled on an annual basis, which continuously seeks to update and improve the way innovation is measured. The GII report pays special attention to making accessible the statistics used in the Country/Economy Profiles and Data Tables, providing data sources and definitions, and detailing the computation methodology (Appendices I, II, III, and IV, respectively). This annex summarizes the changes made this year and provides an assessment of the impact of these changes on the comparability of rankings.

Adjustments to the Global Innovation Index framework

The GII model is revised every year in a transparent exercise. This year, no change was made at the pillar level. At the sub-pillar level, the name of sub-pillar 4.3 was changed from 'Trade and competition' to 'Trade, competition, and market scale' following the addition of one new indicator (see Table 1).

Beyond the use of World Intellectual Property Organization (WIPO) data, we collaborate with both public international bodies such as the International Energy Agency; the United Nations Educational, Scientific and Cultural Organization (UNESCO); the United Nations Industrial Development Organization (UNIDO); the International Telecommunication Union (ITU); and the Joint Research Centre of the European Commission (JRC) as well as with private organizations such as the International Organization for Standardization (ISO); IHS Global Insight; QS Quacquarelli Symonds Ltd; Bureau van Dijk (BvD); ZookNIC Inc; and Google to obtain the best available data on innovation measurement globally.

Although the rationale for the adjustments made to the GII framework is explained in detail in Annex 1, Table 1 provides a summary of these changes for quick reference.

Table 1: Changes to the Global Innovation Index framework

GII 2015		Adjustment	GII 2016	
2.3.3	QS university ranking average score top 3 universities	Number changed	2.3.4	QS university ranking average score top 3 universities
		New indicator	2.3.3	Global R&D companies, average top 3 spenders
4.2.1	Ease of protecting investors	Name change	4.2.1	Ease of protecting minority investors
4.3	**Trade & competition**	**Sub-pillar name change**	**4.3**	**Trade, competition, and market scale**
		New indicator	4.3.3	Domestic market scale
5.2.5	Patent families filed in at least three offices	Methodology changed	5.2.5	Patent families filed in at least two offices
5.3.1	Royalties and license fees payments	Name and methodology change	5.3.1	Intellectual property payments
5.3.3	Communications, computer and information services imports	Name and methodology change	5.3.3	ICT services imports
		New indicator	5.3.5	Research talent in business enterprise
6.1.1	National office patent applications	Name change	6.1.1	Patent applications by origin
6.1.3	National office resident utility model applications	Name change	6.1.3	Utility model applications by origin
6.3.1	Royalties and license fees receipts	Name and methodology change	6.3.1	Intellectual property receipts
6.3.3	Communications, computer and information services exports	Name and methodology change	6.3.3	ICT services exports
7.1.1	National office resident trademark applications	Name change	7.1.1	Trademark application class count by origin
7.1.2	Madrid System trademark applications by country of origin	Replaced	7.1.2	Industrial designs by origin

Note: Orange text refers to name change at the sub-pillar level. Refer to Annex 1 and Appendix III for detailed explanation of terminologies and acronyms. Indicators whose name did not change but methodology at the source did are not part of this list. Refer to Appendix III for detailed explanation on methodological changes at the source.

A total of one sub-pillar and fourteen indicators were modified this year: sub-pillar 4.3 as well as four indicators underwent name changes, eight indicators underwent methodological changes (new computation methodology at the source), three indicators were added, one indicator was replaced, and one indicator changed its number as a result of the framework adjustments. Indicators that retained the same name as last year but are derived from a source that changed its methodology are not identified in Table 1.

The statistical audit performed by the JRC (see Annex 3) provides a confidence interval for each ranking following a robustness and uncertainty analysis of the modelling assumptions.

Sources of changes in the rankings

The GII compares the performance of national innovation systems across economies, and it also presents changes in economy rankings over time.

Importantly, scores and rankings from one year to the next are not directly comparable (see Annex 2 of the GII 2013 for a full explanation). Making inferences about absolute or relative performance on the basis of year-on-year differences in rankings can be misleading. Each ranking reflects the relative positioning of that particular country/economy on the basis of the conceptual framework, the data coverage, and the sample of economies—elements that change from one year to another.

A few particular factors influence the year-on-year ranking of a country/economy:

- the actual performance of the economy in question;
- adjustments made to the GII framework;
- data updates, the treatment of outliers, and missing values; and
- the inclusion or exclusion of countries/economies in the sample.

Additionally, the following characteristics complicate the time-series analysis based on simple GII scores or rankings:

- **Missing values.** The GII produces relative index scores, which means that a missing value for one economy affects the index score of other economies. Because the number of missing values decreases every year, this problem is reduced over time.
- **Reference year.** The data underlying the GII do not refer to a single year but to several years, depending on the latest available year for any given variable. In addition, the reference years for different variables are not the same for each economy. The motivation for this approach is that it widens the set of data points for cross-economy comparability.
- **Normalization factor.** Most GII variables are normalized using either GDP or population. This approach is also intended to enable cross-economy comparability. Yet, again, year-on-year changes in individual variables may be driven either by the variable's numerator or by its denominator.
- **Consistent data collection.** Finally, measuring year-on-year performance changes relies on the consistent collection of data over time. Changes in the definition of variables or in the data collection process could create movements in the rankings that are unrelated to true performance.

A detailed economy study based on the GII database and the country/economy profile over time, coupled with analytical work on grounds that include innovation actors and decision makers, yields the best results in terms of grasping an economy's innovation performance over time as well as possible avenues for improvement.

Methodology and data

The revision of the computation methodology for certain individual indicators has caused significant shifts in the results for several countries. The methodologies underpinning indicators 5.2.5 (computed by World Intellectual Property Organization) and 5.3.1, 5.3.3, 6.3.1, 6.3.3, and 7.2.1 (computed by World Trade Organization) have been revised. In addition, indicators 4.2.2 and 4.3.3 (computed by the World Bank) changed methodology because of the need for a different source of data.[1]

Missing values

Since its inception, the GII has had a positive influence on data availability, increasing awareness of the importance of submitting timely data. The number of data points submitted by economies to international data agencies has substantially increased in recent years.

When it comes to country coverage, the objective is to include as many economies as possible. However, it is also important to maintain a good level of data coverage within each

of these economies. Because the GII results are linked to data availability (see the JRC Statistical Audit presented in Annex 3 for more details), which affects the overall GII ranks, this year the minimum data coverage threshold rule was adjusted—on the recommendation of the JRC—to maintain the significance of both the GII results and the country sample. This year, to be included in the GII, an economy must have a minimum symmetric data coverage of 33 indicators in the Innovation Input Sub-Index (60%) and 16 indicators in the Innovation Output Sub-Index (60%), and it must have scores for at least two sub-pillars per pillar. Missing values are indicated with 'n/a' and are not considered in the sub-pillar score.

This adjustment derives from a sensitivity that is the result of the data availability, which is less satisfactory in the case of the Output Sub-Index: 13 countries that were part of the GII 2015 have data coverage below the 60% threshold in the 27 variables in the Output Sub-Index. In contrast, data coverage is satisfactory in all of these cases in the Input Sub-Index (all of these economies have indicator coverage of more than 60% over the 55 input variables). As a result, the following countries included in the GII 2015 dropped out this year: Angola, Barbados, Cabo Verde, Fiji, Gambia, Guyana, Lesotho, Myanmar, Seychelles, Sudan, Swaziland, Uzbekistan, and Zimbabwe.[2]

Despite this rule change, for several economies the number of missing data points remains very high. Table 2 lists the countries that have the highest number of missing data points (20 or more), ranking them according to how many data points are missing.

Conversely, Table 3 lists those economies with the best data coverage, ranking them according to the least number of missed data points. These economies are missing at most only five data points; some are missing none at all.

Table 2: GII economies with the most missing values

Economy	Number of missing values
Yemen	29
Nicaragua	27
Burundi	27
Niger	27
Bhutan	26
Togo	26
Benin	24
Guinea	24
Malawi	23
Côte d'Ivoire	23
Burkina Faso	23
Rwanda	22
Tajikistan	22
Jamaica	22
Honduras	21
Nepal	21
Mozambique	20
Cambodia	20

Table 3: GII economies with the fewest missing values

Economy	Number of missing values
Hungary	0
Mexico	0
Colombia	0
Malaysia	1
Poland	1
Russian Federation	1
Japan	2
France	2
Austria	2
Czech Republic	2
Italy	2
Portugal	2
Turkey	2
Thailand	2
South Africa	2
Ukraine	2
Germany	3
Korea, Rep.	3
Australia	3
Belgium	3
Slovakia	3
Bulgaria	3
Chile	3
Romania	3
Indonesia	3
Switzerland	4
Sweden	4
United Kingdom	4
Finland	4
New Zealand	4
Israel	4
Norway	4
Estonia	4
Slovenia	4
Lithuania	4
Brazil	4
Philippines	4
Kazakhstan	4
Argentina	4
United States of America	5
Ireland	5
Denmark	5
Latvia	5
Greece	5
India	5
Egypt	5

Notes

1 The update by the World Intellectual Property Organization for patent families filed in two instead of three offices is meant to capture a wider range of patent families. The update for indicators derived from the World Trade Organization data is twofold: it reflects changes to the codes and also a different classification methodology for the variables used to calculate these indicators, which now follows the *Balance of Payments Manual 6*. The changes in the World Bank indicators are based on the fact that Standard & Poor's discontinued its *Global Stock Markets Factbook,* which was the main source of data for these indicators. The current source of the data used is the World Federation of Exchanges (WFE), which uses a different methodology. The WFE provides data according to its membership list. See Appendix III for further details.

2 Although Trinidad and Tobago has sufficient coverage in both the Input and Output Sub-Indices, it also drops out of the GII this year because it does not have scores for at least two sub-pillars in pillar 2: Human capital and research. Conversely, Benin—which was not included in the GII 2015—enters the GII this year with the required coverage in both sub-indices and sufficient data availability per pillar.

Joint Research Centre Statistical Audit of the 2016 Global Innovation Index

Michaela Saisana, Marcos Domínguez-Torreiro, and Daniel Vertesy, European Commission, Joint Research Centre (JRC), Ispra, Italy

Conceptual and practical challenges are inevitable when trying to understand and model the fundamentals of innovation at the national level worldwide. In its ninth edition, the 2016 Global Innovation Index (GII) considers these conceptual challenges in Chapter 1 and deals with practical challenges—related to data quality and methodological choices—by grouping country-level data across 82 indicators into 21 sub-pillars, 7 pillars, 2 sub-indices, and, finally, an overall index. The object of this annex is to offer a detailed insight into the practical issues related to the construction of the index, analysing in-depth the statistical soundness of the calculations and assumptions made to arrive at the final index rankings. Notwithstanding, statistical soundness should be regarded as a necessary but not a sufficient condition for a sound GII, since the correlations underpinning the majority of the statistical analyses carried out herein 'need not necessarily represent the real influence of the individual indicators on the phenomenon being measured'.[1] Consequently, the development of the GII must be nurtured by a dynamic iterative dialogue between the principles of statistical and conceptual soundness or, to put it another way, between the theoretical understanding of innovation and the empirical observations of the data underlying the variables.

The European Commission's Competence Centre on Composite Indicators and Scoreboards at the Joint Research Centre (JRC) in Ispra has been invited for the sixth consecutive year to audit the GII. As in previous editions, the present JRC audit will focus on the statistical soundness of the multi-level structure of the index as well as on the impact of key modelling assumptions on the results.[2] The independent statistical assessment of the GII provided by the JRC guarantees the transparency and reliability of the index for both policy makers and other stakeholders, thus facilitating more accurate priority setting and policy formulation in this particular field.

As in past GII reports, the JRC analysis complements the country rankings with confidence intervals for the GII, the Innovation Input Sub-Index, and the Innovation Output Sub-Index, in order to better appreciate the robustness of these ranks to the computation methodology. In addition, the JRC analysis includes an assessment of the added value of the GII and a measure of distance to the efficient frontier of innovation by using data envelopment analysis.

Conceptual and statistical coherence in the GII framework

An earlier version of the GII model was assessed by the JRC in April–May 2016. Fine-tuning suggestions were taken into account in the final computation of the rankings in an iterative process with the JRC aimed at setting the foundation for a balanced index. The entire process followed four steps (see Figure 1).

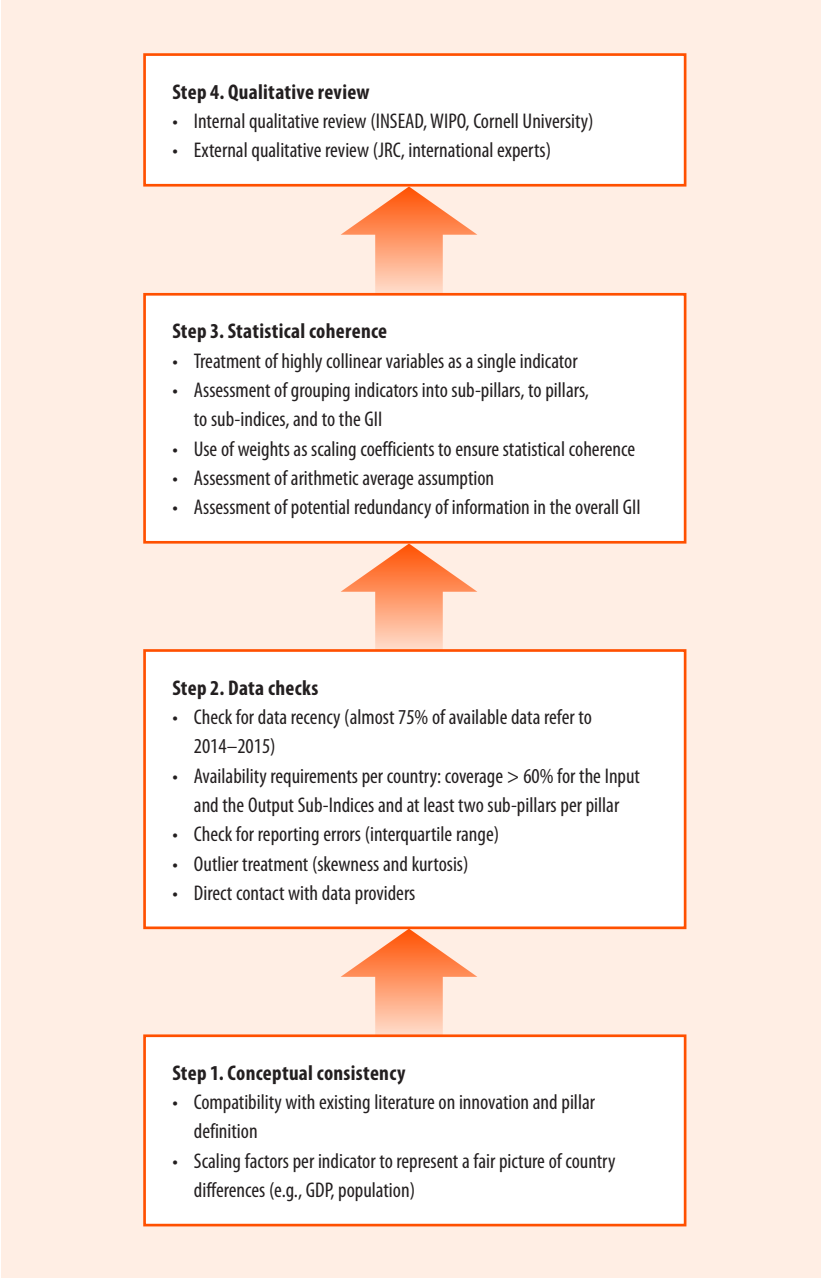
Step 1: Conceptual consistency

Eighty-two indicators were selected for their relevance to a specific innovation pillar on the basis of the literature review, expert opinion, country coverage, and timeliness. To represent a fair picture of country differences, indicators were scaled either at the source or by the GII team as appropriate and where needed.

Step 2: Data checks

The most recently released data within the period 2006–15 were used for each economy. Almost 75% of the available data refer to 2014 or more recent years. In past editions, countries were included if data availability was at least 60% across all variables in the GII framework. A more stringent criterion was adopted this year, following the JRC recommendation of past GII audits. This year countries were included if data availability was at least 60% within each of the two sub-indices (i.e., 33 out of 55 variables within the Input Sub-Index and 16 out of the 27 variables in the Output Sub-Index) and at least two of the three sub-pillars in each pillar could be computed. This more stringent criterion for a country's inclusion in the GII is introduced this year to ensure

Figure 1: Conceptual and statistical coherence in the GII 2016 framework



Source: Saisana, Domínquez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

that country scores for the GII and for the two Input and Output Sub-Indices are not particularly sensitive to the missing values (as was the case for the Output Sub-Index scores of several countries in past editions). Potentially problematic indicators that could bias the overall results were identified as those having absolute skewness greater than 2 and kurtosis greater than 3.5;[3] these were treated either by winsorization or by taking the natural logarithm (in case of more than five outliers). These criteria were decided jointly with the JRC back in 2011 (see Appendix IV Technical Notes in this report for details).

Step 3: Statistical Coherence

Weights as scaling coefficients

Weights of 0.5 or 1.0 were jointly decided between the JRC and the GII team in 2012 to be scaling coefficients and not importance coefficients, with the aim of arriving at sub-pillar and pillar scores that were balanced in their underlying components (i.e., that indicators and sub-pillars can explain a similar amount of variance in their respective sub-pillars/pillars). Paruolo et al. (2013) and Becker et al. (2016) show that, in weighted arithmetic averages, the ratio of two nominal weights gives the rate of substitutability between the two indicators and hence can be used to reveal the relative importance of individual indicators. This importance can then be compared with ex-post measures of variables' importance, such as the non-linear Pearson correlation ratio. As a result of this analysis, 36 out of 82 indicators and two sub-pillars—7.2 Creative goods and services and 7.3 Creation of online content—were assigned half weight while all other indicators and sub-pillars were assigned a weight of 1.0. Nevertheless, for seven indicators with Pearson correlation coefficients less than 0.3 with the respective sub-pillars, some further reflection is needed because they seem to behave as 'noise' at all aggregation levels in the GII framework despite the fact that their inclusion was based on conceptual grounds or practical experience. This applies to 2.2.2 Graduates in science and engineering; 3.2.3 Gross capital formation; 3.3.1 GDP per unit of energy use; 4.1.3 Microfinance institutions' gross loan portfolio; 5.2.3 GERD financed by abroad; 5.3.4 Foreign

Table 1: Statistical coherence in the GII: Correlations between sub-pillars and pillars

	Sub-pillar	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
INPUT	Political environment	0.94	0.77	0.84	0.70	0.74	0.69	0.80
	Regulatory environment	0.92	0.63	0.67	0.58	0.65	0.60	0.67
	Business environment	0.90	0.71	0.75	0.68	0.62	0.68	0.71
	Education	0.52	0.75	0.54	0.40	0.48	0.51	0.52
	Tertiary education	0.65	0.79	0.75	0.57	0.46	0.52	0.57
	Research and development (R&D)	0.69	0.89	0.77	0.78	0.81	0.84	0.74
	Information and communication technologies (ICTs)	0.77	0.83	0.94	0.70	0.64	0.69	0.76
	General infrastructure	0.62	0.62	0.74	0.55	0.58	0.56	0.54
	Ecological sustainability	0.62	0.60	0.74	0.52	0.51	0.52	0.63
	Credit	0.65	0.60	0.58	0.85	0.59	0.52	0.57
	Investment	0.48	0.50	0.42	0.76	0.52	0.49	0.40
	Trade, competition, & market scale	0.51	0.66	0.71	0.71	0.50	0.64	0.60
	Knowledge workers	0.63	0.80	0.68	0.67	0.85	0.73	0.67
	Innovation linkages	0.53	0.40	0.42	0.43	0.72	0.49	0.49
	Knowledge absorption	0.60	0.56	0.56	0.54	0.82	0.71	0.59
OUTPUT	Knowledge creation	0.63	0.79	0.63	0.66	0.75	0.88	0.77
	Knowledge impact	0.51	0.51	0.56	0.44	0.50	0.73	0.59
	Knowledge diffusion	0.52	0.54	0.51	0.52	0.64	0.73	0.50
	Intangible assets	0.62	0.61	0.67	0.54	0.56	0.65	0.89
	Creative goods and services	0.67	0.63	0.64	0.54	0.61	0.69	0.84
	Online creativity	0.81	0.78	0.77	0.67	0.76	0.77	0.88

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

direct investment net inflows; and 6.2.1 Growth rate of GDP per person engaged.

Principal components analysis and reliability item analysis

Principal component analysis (PCA) was used to assess to what extent the conceptual framework is confirmed by statistical approaches. PCA results confirm the presence of a single latent dimension in each of the seven pillars (one component with an eigenvalue greater than 1.0) that captures between 60% (pillar 4: Market sophistication) up to 84% (pillar 1: Institutions) of the total variance in the three underlying sub-pillars. These results reveal that the adjustments made to the 2016 GII framework have left unaffected the already good statistical coherence properties of the previous version. Furthermore, results confirm the expectation that the sub-pillars are more correlated to their own pillar than to any other pillar and that all coefficients are greater than 0.70 (see Table 1).

The five input pillars share a single statistical dimension that summarizes 76% of the total variance, and the five loadings (correlation coefficients) of these pillars are very similar to each other. This similarity suggests that the five pillars make roughly equal contributions to the variation of the Innovation Input Sub-Index scores, as envisaged by the developing team. The reliability of the Input Sub-Index, measured by the Cronbach alpha value, is very high at 0.95—well above the 0.70 threshold for a reliable aggregate.[4]

The two output pillars—Knowledge and technology outputs and Creative outputs—are strongly correlated to each other (0.80); they are also both strongly correlated with the Innovation Output Sub-index (0.95). This result suggests that the Output Sub-index is also well balanced in its two pillars.

Finally, building the GII as the simple average of the Input Sub-Index and Output Sub-Index is also statistically justifiable because the Pearson correlation coefficient of either sub-index with the overall GII is 0.97; the two sub-indices have a correlation of 0.88. Thus far, results show that the grouping of sub-pillars into pillars, sub-indices, and the GII 2016 is statistically coherent, and that the GII has a balanced structure at each aggregation level. The only recommendation for next year relates to a careful evaluation of the seven indicators discussed above—2.2.2 Graduates in science and engineering; 3.2.3 Gross capital formation; 3.3.1 GDP per unit

Table 2: Distribution of differences between pillar and GII rankings

	Innovation Input Sub-Index					Innovation Output Sub-Index	
Rank differences (positions)	Institutions (%)	Human capital and research (%)	Infrastructure (%)	Market sophistication (%)	Business sophistication (%)	Knowledge and technology outputs (%)	Creative outputs (%)
More than 30	12.5	10.2	7.8	21.1	21.9	10.9	4.7
20–29	16.4	14.8	12.5	16.4	10.2	10.2	11.7
10–19	21.9	23.4	35.9	25.0	21.9	30.5	15.6
10 or more*	**50.8**	**48.4**	**56.3**	**62.5**	**53.9**	**51.6**	**32.0**
5–9	28.1	22.7	16.4	16.4	23.4	19.5	32.0
Less than 5	18.0	25.8	24.2	20.3	20.3	21.9	32.8
Same rank	3.1	3.1	3.1	0.8	2.3	7.0	3.1
Total†	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Pearson correlation coefficient with the GII	0.88	0.90	0.89	0.81	0.86	0.92	0.93

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.
* This column is the sum of the prior three rows.
† This column is the sum of all white rows.

of energy use; 4.1.3 Microfinance institutions' gross loan portfolio; 5.2.3 GERD financed by abroad; 5.3.4 Foreign direct investment net inflows; and 6.2.1 Growth rate of GDP per person engaged. Because their information content is lost in the aggregation at the pillar level or higher (sub-index and overall GII), the recommendation is either to increase the weight attached to these indicators so that their information is not lost in the aggregation or to replace them with some more suitable indicators that are better proxies of the conditions they are intended to capture.

Added value of the GII

As already discussed, the Input and Output Sub-Indices correlate strongly with each other and with the overall GII. Furthermore, the five pillars in the Input Sub-Index have a very high statistical reliability. These results—the strong correlation between Input and Output Sub-Indices and the high statistical reliability of the five input pillars—may be interpreted by some as a sign of redundancy of information in the GII. The tests conducted by the JRC indicate that this is not the case. In fact, for more than 32% (up to 62.5%) of the 128 economies included in the GII 2016, the GII ranking and any of the seven pillar rankings differ by 10 positions or more (see Table 2). This is a desired outcome because it demonstrates the added value of the GII ranking, which helps to highlight other aspects of innovation that do not emerge directly by looking into the seven pillars separately. At the same time, this result points to the value of duly taking into account the GII pillars, sub-pillars, and individual indicators on their own merit. By doing so, country-specific strengths and bottlenecks on innovation can be identified and serve as an input for evidence-based policymaking.

Step 4: Qualitative Review

Finally, the GII results—including overall country classifications and relative performances in terms of the Innovation Input or Output Sub-Indices—were evaluated to verify that the overall results are, to a great extent, consistent with current evidence, existing research, and prevailing theory. Notwithstanding these statistical tests and the positive outcomes on the statistical coherence of the GII structure, the GII model is and has to remain open for future improvements as better data, more comprehensive surveys and assessments, and new relevant research studies become available.

The impact of modelling assumptions on the GII results

Setting up an underlying structure for the index based on a battery of pillars; choosing the individual variables to be used as indicators; deciding whether or not to impute missing data; selecting the normalization approach to be applied, the weights to be assigned, the rule of aggregation to be implemented, and other elements of the index are all modelling assumptions with a direct impact on the GII scores and rankings. The rationale for these choices is manifold. For instance, expert opinion is behind the selection of the individual indicators, common practice suggests the use of a min-max normalization approach in the [0–100] range, the treatment of outliers is driven by statistical analysis, and simplicity and parsimony criteria seem to advocate for not imputing missing data. The unavoidable uncertainty stemming

Table 3: Uncertainty parameters: Missing values, aggregation, and weights

		Reference	Alternative
I.	**Uncertainty in the treatment of missing values**	**No estimation of missing data**	**Expectation Maximization (EM)**
II.	**Uncertainty in the aggregation formula at pillar level**	**Arithmetic average**	**Geometric average**
III.	**Uncertainty intervals for the GII pillar weights**		
GII Sub-Index	Pillar	Reference value for the weight	Distribution assigned for robustness analysis
Innovation Input	Institutions	0.2	U[0.1, 0.3]
	Human capital and research	0.2	U[0.1, 0.3]
	Infrastructure	0.2	U[0.1, 0.3]
	Market sophistication	0.2	U[0.1, 0.3]
	Business sophistication	0.2	U[0.1, 0.3]
Innovation Output	Knowledge and technology outputs	0.5	U[0.4, 0.6]
	Creative outputs	0.5	U[0.4, 0.6]

Source: Saisana, Dominguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

from the above-mentioned modelling choices is accounted for in the robustness assessment carried out by the JRC. More precisely, the methodology applied herein allows for the joint and simultaneous analysis of the impact of such choices on the national scores, resulting in error estimates and confidence intervals calculated for the GII 2016 individual country rankings.

As suggested in the relevant literature on composite indicators,[5] the robustness assessment was based on Monte Carlo simulation and multi-modelling approaches, applied to 'error-free' data where potential outliers and eventual errors and typos have already been corrected in a preliminary stage. In particular, the three key modelling issues considered in the assessment of the GII were the pillar weights, the treatment of missing data, and the aggregation formula used.

Monte Carlo simulation comprised 1,000 runs of different sets of weights for the seven pillars in the GII. The weights were assigned to the pillars based on uniform continuous distributions centred in the reference values. The ranges of simulated weights were defined by taking into account both the need for a wide enough interval to allow for meaningful robustness checks and the need to respect the underlying principle of the GII that the Input and the Output Sub-Indices should be placed on equal footings. As a result of these considerations, the limit values of uncertainty for the five input pillars are 10%–30%; the limit values for the two output pillars are 40%–60% (see Table 3).

The GII developing team, for transparency and replicability, has always opted not to estimate missing data. The 'no imputation' choice, which is common in similar contexts, might encourage economies not to report low data values. In fact, with arithmetic average, the 'no imputation' choice is equivalent to replacing an indicator's missing value for a given country with the respective sub-pillar score. To overcome this limitation, the JRC estimated missing data using the Expectation Maximization (EM) algorithm.[6]

Regarding the aggregation formula, decision-theory practitioners have challenged the use of simple arithmetic averages because of their fully compensatory nature, in which a comparative high advantage on a few indicators can compensate for a comparative disadvantage on many indicators.[7] For example, one may argue that Ireland and Iceland, despite their similar performance at the Innovation Output Sub-Index—both close to 55.5 points (rank 5th and 6th, respectively) are very different if one considers how these countries perform within the sub-index. Ireland ranks 3rd in Knowledge and technology outputs and 10th in Creative outputs, while Iceland is much more diverse: the country ranks 22nd in Knowledge and technology outputs, but it notably improves its overall position in the Output Sub-Index thanks to its 1st place position in Creative outputs. To assess the impact of this compensability issue, the JRC relaxed the strong perfect substitutability assumption inherent in the arithmetic average and considered instead the geometric average, which is a partially compensatory approach that rewards economies with balanced profiles and motivates economies to improve in the GII pillars in which they perform poorly, and not just in *any* GII pillar. [8]

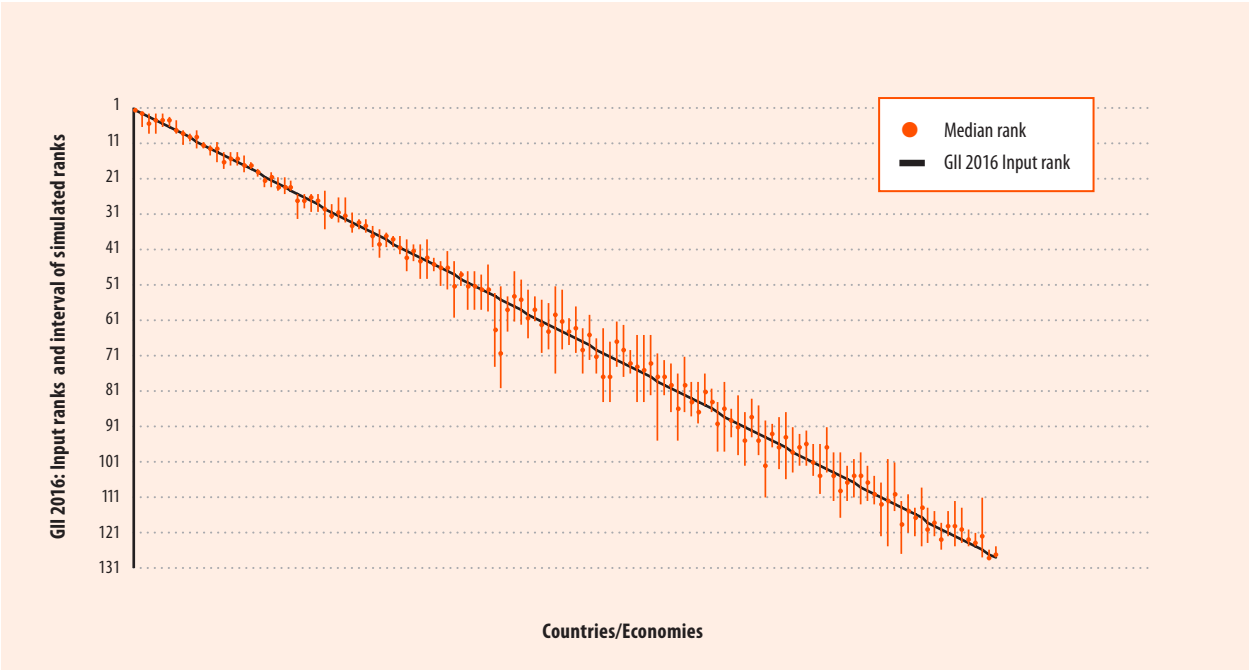
Four models were tested based on the combination of no imputation

Figure 2a: Robustness analysis (GII rank vs. median rank, 90% confidence intervals)

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

Notes: Median ranks and intervals are calculated over 4,000 simulated scenarios combining random weights, imputed versus missing values, and geometric versus arithmetic average at the pillar level. The Spearman rank correlation between the median rank and the GII 2016 rank is 0.997.

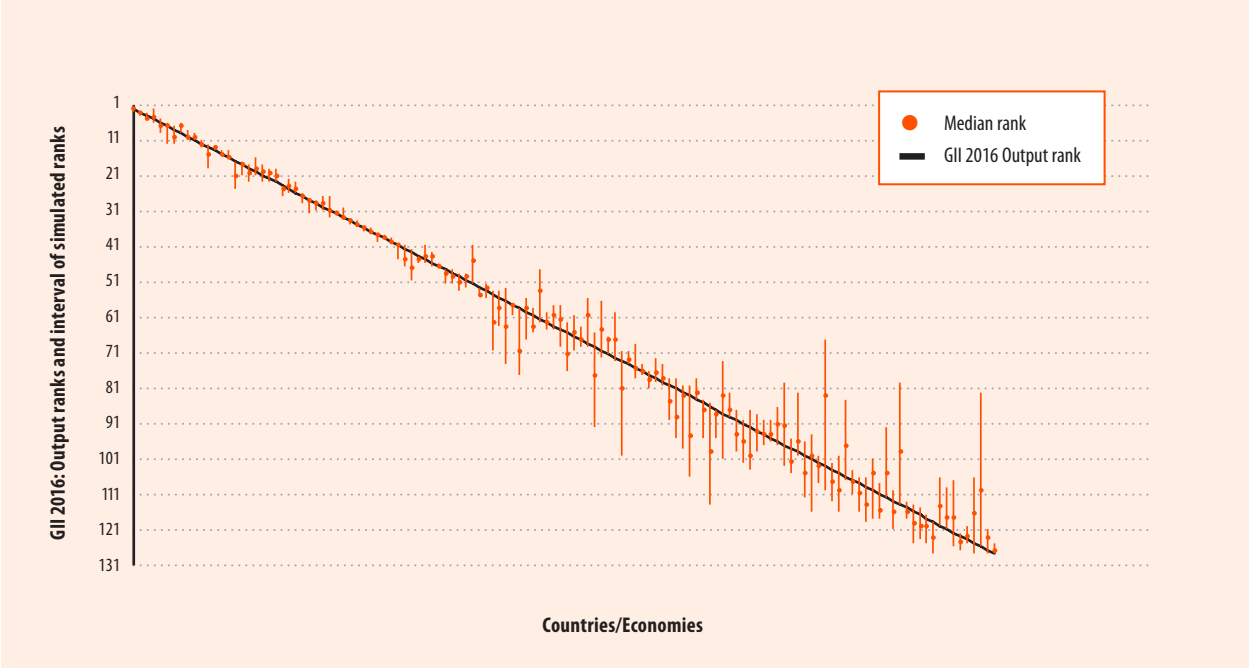
Figure 2b: Robustness analysis (Input rank vs. median rank, 90% confidence intervals)



Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

Notes: Median ranks and intervals are calculated over 4,000 simulated scenarios combining random weights, imputed versus missing values, and geometric versus arithmetic average at the pillar level. The Spearman rank correlation between the median rank and the Innovation Input 2016 rank is 0.997.

Figure 2c: Robustness analysis (Output rank vs. median rank, 90% confidence intervals)



Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

Notes: Median ranks and intervals are calculated over 4,000 simulated scenarios combining random weights, imputation versus no imputation of missing values, and geometric versus arithmetic average at the pillar level. The Spearman rank correlation between the median rank and the Innovation Output 2016 rank is 0.992.

versus EM imputation, and arithmetic versus geometric average, combined with 1,000 simulations per model (random weights versus fixed weights), for a total of 4,000 simulations for the GII and each of the two sub-indices (see Table 3 for a summary of the uncertainties considered).

Uncertainty analysis results

The main results of the robustness analysis are shown in Figure 2 with median ranks and 90% confidence intervals computed across the 4,000 Monte Carlo simulations for the GII and the two sub-indices. The figure orders economies from best to worst according to their reference rank (black line), the dot being the median rank over the simulations.

All published GII 2016 ranks lay within the simulated 90% confidence intervals, and for most economies these intervals are narrow enough for meaningful inferences to be drawn: there is a shift of fewer than 10 positions (roughly plus or minus 5 positions) for 93 of the 128 economies. However, it is also true that six economy ranks vary significantly with changes in weights and aggregation formula and, where applicable, they also vary because of the estimation of missing data. These six economies—Belarus, Mozambique, Tajikistan, Bhutan, Malawi, and Niger, in rank order—have 90% confidence interval widths between 20 and 29, hence their GII ranks should be interpreted cautiously and certainly not taken at face value. This is a remarkable improvement compared to last year's GII, where confidence interval widths for 32 economies lay between 20 and 29, for another 7 economies between 30 and 39, and for 2 countries the widths were 40 or greater. This improvement in the confidence one can attach to the GII 2016 ranks is the direct result of the developers' choice to adopt a more stringent criterion for a country's inclusion, which requires at least 60% data availability within each of the two sub-indices. Some caution is also warranted in the Input Sub-Index for 8 economies—Kuwait, Oman, Jordan, Rwanda, Bosnia and Herzegovina, Cambodia, Bhutan, and Venezuela—that have 90% confidence interval widths over 20 (up to 29 for Rwanda). The Output Sub-Index is slightly more sensitive to the methodological choices: 14 countries—Kuwait, Oman, Belarus, Rwanda, Mozambique, Tajikistan, Namibia, Paraguay, Malawi, Ecuador, Honduras, Nepal, Niger, and Togo—have 90% confidence interval widths over 20 (up to 44

Table 4: GII 2016 and Input/Output Sub-Indices: Ranks and 90% confidence intervals

	GII 2016		Input Sub-Index		Output Sub-Index	
Country/Economy	Rank	Interval	Rank	Interval	Rank	Interval
Switzerland	1	[1, 2]	6	[3, 6]	1	[1, 2]
Sweden	2	[2, 3]	5	[2, 6]	2	[2, 3]
United Kingdom	3	[1, 3]	7	[4, 8]	4	[1, 5]
United States of America	4	[4, 5]	3	[2, 8]	7	[6, 11]
Finland	5	[4, 5]	4	[2, 8]	10	[8, 10]
Singapore	6	[6, 11]	1	[1, 1]	20	[17, 22]
Ireland	7	[6, 11]	16	[13, 17]	5	[4, 8]
Denmark	8	[7, 11]	8	[7, 11]	13	[12, 13]
Netherlands	9	[6, 10]	12	[11, 14]	9	[7, 10]
Germany	10	[6, 11]	18	[16, 18]	8	[5, 8]
Korea, Republic of	11	[9, 13]	13	[10, 16]	11	[10, 12]
Luxembourg	12	[8, 13]	23	[20, 25]	3	[2, 4]
Iceland	13	[13, 15]	24	[21, 24]	6	[5, 11]
Hong Kong (China)	14	[11, 15]	2	[2, 6]	25	[22, 25]
Canada	15	[15, 18]	10	[7, 12]	23	[23, 26]
Japan	16	[14, 17]	9	[8, 10]	24	[21, 25]
New Zealand	17	[15, 19]	14	[13, 18]	17	[16, 20]
France	18	[15, 18]	15	[13, 17]	19	[15, 20]
Australia	19	[19, 23]	11	[10, 12]	27	[27, 31]
Austria	20	[19, 21]	19	[18, 20]	22	[18, 22]
Israel	21	[18, 25]	21	[19, 23]	16	[16, 24]
Norway	22	[21, 25]	17	[14, 19]	26	[25, 28]
Belgium	23	[21, 24]	20	[20, 23]	18	[17, 22]
Estonia	24	[21, 24]	27	[25, 30]	14	[13, 14]
China	25	[22, 27]	29	[24, 35]	15	[13, 15]
Malta	26	[25, 28]	35	[32, 36]	12	[11, 18]
Czech Republic	27	[26, 28]	26	[25, 29]	21	[18, 22]
Spain	28	[26, 28]	22	[20, 24]	28	[27, 30]
Italy	29	[29, 29]	28	[25, 30]	31	[30, 31]
Portugal	30	[30, 32]	30	[28, 32]	32	[29, 32]
Cyprus	31	[30, 32]	33	[30, 36]	29	[26, 30]
Slovenia	32	[31, 33]	31	[26, 33]	33	[33, 34]
Hungary	33	[32, 34]	38	[36, 40]	30	[26, 32]
Latvia	34	[33, 35]	36	[34, 40]	34	[33, 34]
Malaysia	35	[34, 35]	32	[26, 33]	39	[38, 39]
Lithuania	36	[36, 38]	34	[32, 35]	41	[40, 46]
Slovakia	37	[36, 37]	42	[39, 44]	38	[37, 38]
Bulgaria	38	[36, 38]	49	[47, 51]	35	[35, 36]
Poland	39	[39, 40]	39	[37, 40]	46	[45, 46]
Greece	40	[40, 46]	37	[35, 43]	49	[48, 53]
United Arab Emirates	41	[40, 52]	25	[25, 32]	75	[68, 78]
Turkey	42	[40, 45]	59	[52, 66]	37	[37, 39]
Russian Federation	43	[40, 47]	44	[38, 49]	47	[47, 51]
Chile	44	[40, 47]	40	[37, 42]	53	[51, 55]
Costa Rica	45	[42, 47]	50	[47, 58]	44	[40, 45]
Moldova, Republic of	46	[41, 49]	74	[69, 76]	36	[35, 36]
Croatia	47	[44, 48]	45	[43, 47]	48	[47, 51]
Romania	48	[42, 49]	52	[48, 58]	45	[42, 46]
Saudi Arabia	49	[47, 59]	43	[39, 49]	54	[53, 70]
Qatar	50	[49, 62]	41	[38, 47]	58	[58, 77]
Montenegro	51	[49, 52]	46	[44, 51]	52	[52, 54]
Thailand	52	[49, 53]	57	[47, 61]	50	[48, 52]
Mauritius	53	[50, 61]	48	[44, 60]	68	[55, 69]
South Africa	54	[53, 59]	47	[41, 52]	71	[66, 71]
Mongolia	55	[48, 57]	66	[57, 70]	51	[40, 51]
Ukraine	56	[50, 60]	76	[65, 84]	40	[40, 44]
Bahrain	57	[54, 66]	51	[47, 58]	67	[63, 69]
TFYR of Macedonia	58	[56, 69]	62	[56, 69]	55	[53, 63]
Viet Nam	59	[53, 68]	79	[72, 82]	42	[41, 50]
Armenia	60	[55, 61]	80	[73, 87]	43	[43, 45]
Mexico	61	[57, 62]	60	[54, 61]	62	[59, 64]
Uruguay	62	[59, 68]	61	[55, 70]	66	[60, 70]
Colombia	63	[59, 67]	53	[45, 58]	74	[70, 74]
Georgia	64	[64, 71]	67	[63, 76]	60	[58, 65]

Table 4: GII 2016 and Input/Output Sub-Indices: Ranks and 90% confidence intervals *(continued)*

	GII 2016		Input Sub-Index		Output Sub-Index	
Country/Economy	Rank	Interval	Rank	Interval	Rank	Interval
Serbia	65	[59, 67]	68	[59, 72]	63	[57, 64]
India	66	[59, 68]	72	[61, 74]	59	[55, 67]
Kuwait	67	[65, 74]	78	[70, 95]	56	[52, 74]
Panama	68	[52, 69]	73	[62, 77]	61	[47, 62]
Brazil	69	[65, 70]	58	[49, 62]	79	[74, 80]
Lebanon	70	[66, 73]	85	[76, 85]	57	[57, 60]
Peru	71	[70, 77]	56	[54, 64]	87	[87, 95]
Morocco	72	[63, 73]	75	[65, 84]	70	[56, 72]
Oman	73	[71, 85]	63	[51, 76]	86	[85, 114]
Philippines	74	[71, 75]	86	[80, 87]	64	[57, 69]
Kazakhstan	75	[74, 79]	65	[60, 68]	90	[87, 99]
Dominican Republic	76	[76, 90]	84	[78, 90]	82	[80, 98]
Tunisia	77	[75, 82]	82	[71, 87]	84	[78, 84]
Iran, Islamic Republic of	78	[73, 82]	90	[82, 99]	72	[59, 73]
Belarus	79	[65, 93]	64	[52, 69]	103	[67, 110]
Kenya	80	[76, 84]	97	[87, 106]	65	[62, 76]
Argentina	81	[75, 83]	77	[65, 82]	89	[82, 89]
Jordan	82	[79, 85]	88	[78, 98]	77	[76, 81]
Rwanda	83	[76, 91]	55	[51, 80]	114	[79, 114]
Mozambique	84	[75, 100]	96	[88, 103]	73	[70, 100]
Azerbaijan	85	[83, 91]	81	[76, 95]	94	[90, 97]
Tajikistan	86	[80, 102]	102	[96, 110]	69	[65, 92]
Bosnia and Herzegovina	87	[83, 96]	70	[63, 84]	104	[102, 113]
Indonesia	88	[82, 92]	99	[93, 102]	76	[74, 77]
Jamaica	89	[82, 91]	83	[78, 88]	99	[82, 100]
Botswana	90	[85, 97]	69	[66, 76]	111	[108, 118]
Sri Lanka	91	[82, 92]	98	[91, 104]	78	[72, 79]
Albania	92	[90, 103]	71	[67, 84]	115	[113, 118]
Namibia	93	[89, 109]	87	[84, 98]	101	[94, 116]
Paraguay	94	[83, 97]	95	[90, 97]	88	[73, 101]
Cambodia	95	[91, 104]	94	[89, 111]	95	[90, 96]
Bhutan	96	[84, 113]	54	[53, 74]	122	[107, 126]
Guatemala	97	[92, 100]	101	[96, 105]	93	[88, 99]
Malawi	98	[90, 111]	110	[105, 113]	83	[80, 106]
Uganda	99	[96, 108]	91	[87, 102]	105	[100, 116]
Ecuador	100	[87, 102]	100	[92, 102]	97	[79, 103]
Honduras	101	[89, 103]	93	[85, 99]	106	[84, 107]
Ghana	102	[93, 104]	103	[91, 104]	100	[96, 112]
Kyrgyzstan	103	[98, 105]	92	[83, 94]	109	[106, 119]
El Salvador	104	[92, 110]	89	[86, 94]	110	[101, 118]
Tanzania, United Republic of	105	[102, 108]	117	[108, 125]	80	[78, 90]
Senegal	106	[97, 107]	109	[102, 112]	96	[86, 97]
Egypt	107	[98, 108]	107	[100, 111]	98	[95, 105]
Côte d'Ivoire	108	[101, 111]	121	[115, 122]	81	[78, 95]
Bolivia, Plurinational State of	109	[103, 112]	108	[98, 113]	102	[100, 108]
Ethiopia	110	[107, 115]	124	[120, 125]	85	[84, 95]
Madagascar	111	[109, 120]	120	[118, 126]	91	[90, 102]
Mali	112	[107, 118]	119	[115, 122]	92	[87, 104]
Algeria	113	[110, 121]	104	[98, 112]	116	[114, 125]
Nigeria	114	[113, 120]	122	[112, 125]	107	[104, 111]
Nepal	115	[113, 117]	116	[114, 122]	112	[92, 112]
Nicaragua	116	[107, 120]	106	[102, 112]	120	[106, 120]
Bangladesh	117	[116, 124]	115	[110, 121]	117	[115, 124]
Cameroon	118	[114, 125]	118	[114, 124]	113	[110, 121]
Pakistan	119	[115, 122]	123	[114, 124]	108	[106, 116]
Venezuela, Bolivarian Republic of	120	[116, 127]	112	[100, 125]	119	[119, 128]
Benin	121	[116, 121]	111	[107, 122]	121	[109, 121]
Burkina Faso	122	[116, 126]	105	[98, 117]	127	[121, 128]
Burundi	123	[121, 127]	114	[112, 127]	123	[122, 127]
Niger	124	[106, 128]	113	[101, 115]	125	[106, 128]
Zambia	125	[121, 125]	126	[111, 128]	118	[117, 125]
Togo	126	[111, 126]	125	[121, 125]	126	[82, 126]
Guinea	127	[123, 128]	127	[126, 128]	124	[120, 125]
Yemen	128	[126, 128]	128	[125, 128]	128	[125, 128]

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

Table 5: Sensitivity analysis: Impact of modelling choices on economies with most sensitive ranks

Index or Sub-Index	Uncertainty tested (pillar level only)	Number of economies that *improve* by 20 or more positions	Number of economies that *deteriorate* by 20 or more positions
GII	Geometric vs. arithmetic average	0	1
	EM imputation vs. no imputation of missing data	0	0
	Geometric average and EM imputation vs. arithmetic average and missing values	0	0
Input Sub-Index	Geometric vs. arithmetic average	0	0
	EM imputation vs. no imputation of missing data	19	16
	Geometric average and EM imputation vs. arithmetic average and missing values	0	1
Output Sub-Index	Geometric vs. arithmetic average	0	0
	EM imputation vs. no imputation of missing data	17	19
	Geometric average and EM imputation vs. arithmetic average and missing values	4	3

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.

for Togo). This sensitivity is mostly the consequence of the estimation of missing data and the fact that there are only two pillars: this means that changes to the imputation method, weights, or aggregation formula have a more notable impact on the country ranks in the Innovation Output Sub-Index.

Although a few economy ranks, in the GII 2016 overall or in the two sub-indices, appear to be sensitive to the methodological choices, the published rankings for the vast majority can be considered as representative of the plurality of scenarios simulated herein. Taking the median rank as the yardstick for an economy's expected rank in the realm of the GII's unavoidable methodological uncertainties, 75% of the economies are found to shift fewer than three positions with respect to the median rank in the GII (three and four positions in the Input and Output Sub-Index, respectively). Note that in the past GII 2015, 75% of the economies included were found to shift fewer than seven positions with respect to the median rank in the GII (seven and eleven positions in the Input and Output Sub-Indices, respectively). This result further confirms that the developers' choice to require higher data availability for a country's inclusion in this year's GII has led to more reliable country ranks for the GII and the two sub-indices.

For full transparency and information, Table 4 reports the GII 2016 Index and Input and Output Sub-Indices economy ranks together with the simulated 90% confidence intervals in order to better appreciate the robustness of the results to the choice of weights, of the aggregation formula and the impact of estimating missing data (where applicable).

Note: Median ranks and intervals are calculated over 4,000 simulated scenarios combining random weights, imputation versus no imputation of missing values, and geometric versus arithmetic average at the pillar level. The Spearman rank correlation between the median rank and the Innovation Output 2016 rank is 0.992.

Sensitivity analysis results

Complementary to the uncertainty analysis, sensitivity analysis has been used to identify which of the modelling assumptions have the highest impact on certain country ranks. Table 5 summarizes the impact of one-at-a-time changes of either the EM imputation method or the geometric aggregation formula, with random weights. As in past versions of the GII, the most influential assumption is the choice of no imputation versus EM imputation. Yet, unlike past editions, the decision as to whether to impute or not missing data has the same influence on both the Input and the Output Sub-Index (note that in past GII editions the Output Sub-Index was found to be much more sensitive to the estimation of missing data than the Input Sub-Index). The GII is found not to be heavily influenced by the imputation of missing data. The choice of the aggregation formula does not have a pronounced impact on the economies' ranks; if the geometric averaging across the pillars is used instead of an arithmetic averaging, then merely four countries—Belarus, Albania, Namibia, and Bhutan, in rank order—would decline by more than 10 positions (up to 26 for Bhutan), while no economy would improve by 10 positions or more.

All in all, the published GII 2016 ranks are reliable and for the vast majority of countries the simulated 90% confidence intervals are narrow

Table 6: Pie shares (absolute terms) and efficiency scores for the top 25 economies in the GII 2016

	Input pillars					Output pillars						
Country/Economy	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs	Efficient frontier rank (DEA)	GII rank	Difference	Efficiency ratio rank	Difference from GII rank
Switzerland	0.08	0.19	0.07	0.10	0.17	0.19	0.19	1	1	0	5	–4
Sweden	0.14	0.20	0.20	0.05	0.20	0.16	0.05	1	2	1	10	–8
Singapore	0.15	0.19	0.20	0.17	0.18	0.05	0.05	1	6	5	78	–72
United Kingdom	0.10	0.20	0.20	0.20	0.05	0.05	0.20	4	3	–1	14	–11
United States of America	0.20	0.05	0.20	0.20	0.18	0.05	0.12	5	4	–1	25	–21
Finland	0.20	0.20	0.18	0.05	0.20	0.05	0.12	6	5	–1	32	–27
Denmark	0.20	0.20	0.20	0.20	0.05	0.05	0.10	7	8	1	34	–26
Hong Kong (China)	0.20	0.20	0.20	0.20	0.07	0.05	0.08	8	14	6	83	–69
Netherlands	0.20	0.10	0.20	0.05	0.20	0.05	0.20	9	9	0	20	–11
Ireland	0.20	0.05	0.20	0.05	0.20	0.10	0.20	10	7	–3	8	–1
Korea, Rep.	0.05	0.20	0.20	0.20	0.17	0.13	0.05	10	11	1	24	–13
Germany	0.20	0.20	0.20	0.10	0.05	0.05	0.20	12	10	–2	9	1
Canada	0.20	0.20	0.20	0.20	0.06	0.05	0.09	12	15	3	57	–42
Japan	0.20	0.20	0.20	0.20	0.06	0.09	0.05	12	16	4	65	–49
Australia	0.20	0.20	0.20	0.20	0.05	0.05	0.10	12	19	7	73	–54
Luxembourg	0.20	0.05	0.20	0.05	0.20	0.10	0.20	16	12	–4	1	11
New Zealand	0.20	0.20	0.20	0.20	0.05	0.05	0.10	16	17	1	40	–23
France	0.20	0.20	0.20	0.20	0.05	0.05	0.10	18	18	0	44	–26
Iceland	0.20	0.10	0.20	0.05	0.20	0.05	0.20	19	13	–6	3	10
Austria	0.20	0.20	0.20	0.05	0.18	0.05	0.12	19	20	1	43	–23
Norway	0.20	0.20	0.20	0.05	0.19	0.05	0.11	21	22	1	55	–33
Israel	0.05	0.20	0.20	0.19	0.20	0.05	0.11	22	21	–1	23	–2
Belgium	0.20	0.20	0.20	0.05	0.18	0.05	0.12	22	23	1	27	–4
Estonia	0.20	0.05	0.20	0.10	0.20	0.05	0.20	25	24	–1	6	18
China	0.05	0.10	0.20	0.20	0.20	0.20	0.05	25	25	0	7	18

Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.
Notes: Pie shares are in absolute terms, bounded by 0.05 and 0.20. In the GII 2016, however, the five input pillars each have a fixed weight of 0.10; the two output pillars each have a fixed weight of 0.25.

enough for meaningful inferences to be drawn. Nevertheless, the readers of the GII 2016 report should consider country ranks in the GII 2016 and in the Input and Output Sub-Indexes not only at face value but also within the 90% confidence intervals in order to better appreciate the degree to which a country's rank depends on the modelling choices. This year, following the JRC recommendation from past GII audits, the developers' choice to apply the 60% indicator coverage threshold separately to the Input and the Output Sub-Indices has led to a net increase in the reliability of country ranks for the GII and the two sub-indices.

Distance to the efficiency frontier in the GII by data envelopment analysis

Several innovation-related policy issues at the national level entail an intricate balance between global priorities and country-specific strategies. Comparing the multi-dimensional performance on innovation by subjecting countries to a fixed and common set of weights may prevent acceptance of an innovation index on grounds that a given weighting scheme might not be fair to a particular country. An appealing feature of the more recent Data Envelopment Analysis (DEA) literature applied in real decision-making settings is to determine endogenous weights that maximize the overall score of each decision-making unit given a set of other observations.

In this section, the assumption of fixed pillar weights common to all countries is relaxed once more; this time country-specific weights that maximize a country's score are determined endogenously by DEA.[9] In theory, each country is free to decide on the relative contribution of each pillar to its score, so as to achieve the best possible score in a computation that reflects its innovation strategy. In practice, the DEA method assigns a higher (lower) contribution to those pillars in which a country is relatively strong (weak). Reasonable constraints on the weights are assumed to preclude the possibility of a country achieving a perfect score by assigning a zero weight to weak pillars: for each country, the share of each pillar score (i.e., the pillar score multiplied by the DEA weight over the total score) has upper and lower bounds of 5% and 20%, respectively. The DEA score is then measured as the weighted average of all seven pillar scores, where the weights are the country-specific DEA weights, compared to the best performance among all other countries with those same weights. The DEA score can be interpreted as a measure of the 'distance to the efficient frontier'.

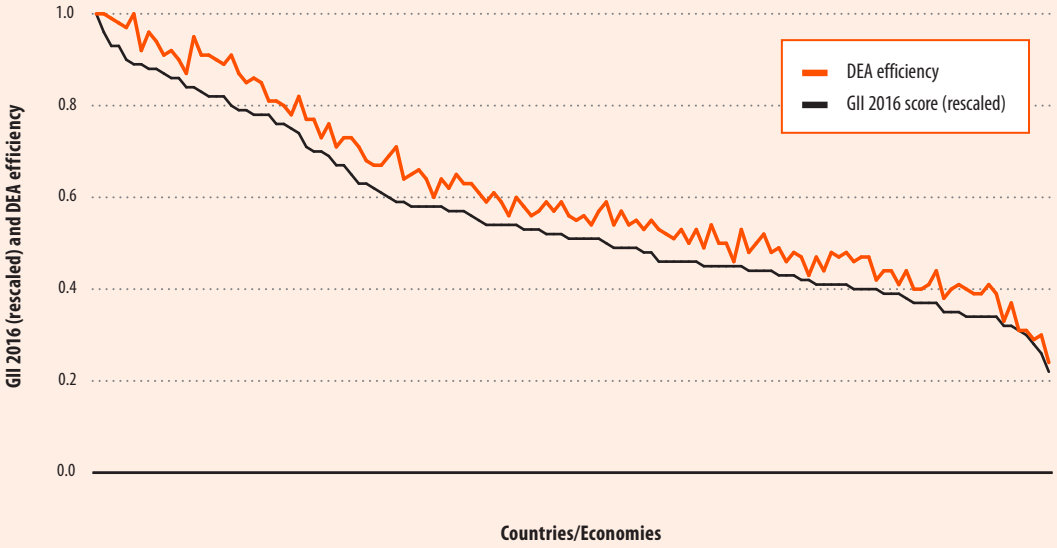
Table 6 presents the pie shares and DEA scores for the top 25 countries in the GII 2016, next to the GII 2016 ranks and efficiency ratio ranks. All pie shares are in accordance with the starting point of granting leeway to each country when assigning shares, while not violating the (relative) upper and lower bounds. The pie shares are quite diverse, reflecting the different national innovation strategies. These pie shares can also be seen to reflect countries comparative advantage in certain GII pillars vis-à-vis all other countries and all pillars. For example, Sweden obtains a perfect DEA score of 1 by assigning 20% of its DEA score to *Human capital and research, Infrastructure,* and *Business sophistication,* while merely 5% of its DEA score comes from *Market sophistication* and *Creative outputs.* Instead, countries including the United Kingdom (UK), the United States of America (USA), and Denmark would assign 20% of their DEA scores to Market sophistication. Three countries—Switzerland, Sweden, and Singapore—reach a perfect DEA score of 1. These countries are closely followed by the UK, the USA, Finland, Denmark, and Hong Kong (China), which score between 0.95 and 0.99 in terms of efficiency. Figure 3 shows how close the DEA scores and the GII 2016 scores are for all 128 economies (correlation of 0.98).[10] Note that, by construction, the version of the DEA used herein is closer to the GII than to the efficiency ratio calculated as the Output Sub-Index score divided by the Input Sub-Index score (which has a correlation of 0.59).

Conclusions

The JRC analysis suggests that the conceptualized multi-level structure of the GII 2016—with its 82 indicators, 21 sub-pillars, 7 pillars, 2 sub-indices, up to an overall index—is statistically sound and balanced: that is, each sub-pillar makes a similar contribution to the variation of its respective pillar. Nevertheless, a careful reflection by the GII team is needed for seven out of the 82 indicators because their capacity to distinguish countries' performance is lost in the aggregation at the pillar level or higher. Six indicators related to the inputs of innovation—2.2.2 Graduates in science and engineering; 3.2.3 Gross capital formation; 3.3.1 GDP per unit of energy use; 4.1.3 Microfinance institutions' gross loan portfolio; 5.2.3 GERD financed by abroad; 5.3.4 Foreign direct investment net inflows—and one indicator related to the outputs of innovation, 6.2.1 Growth rate of GDP per person engaged, need to be reviewed because their statistical relevance to the GII framework is very weak, unlike their strong conceptual relevance. The no-imputation choice for not treating missing values, common in relevant contexts and justified on grounds of transparency and replicability, can at times have an undesirable impact on some country scores, with the additional negative side-effect that it may encourage countries not to report low data values. This year's adoption by the GII team of a more stringent data coverage threshold (at least 60% for the input- and output-related indicators, separately) has notably improved the confidence in the country ranks for the GII and the two sub-indices. Additionally, the choice of the GII team, which has been followed since 2012, to use weights as scaling coefficients during the development of the index constitutes a significant departure from the traditional, yet erroneous, vision of weights as a reflection of indicators' importance in a weighted average. It is hoped that such a consideration will be made also by other developers of composite indicators to avoid situations where bias sneaks in when least expected.

The strong correlations between the GII components are proven not to be a sign of redundancy of information in the GII. For more than 32% (up to 62.5%) of the 128 economies included in the GII 2016, the GII ranking and the rankings of any of the seven pillars differ by 10 positions or more. This demonstrates the added value of the GII ranking, which helps to highlight other components of innovation that do not emerge directly by looking into the

Figure 3: GII 2016 scores and DEA 'distance to the efficient frontier' scores



Source: Saisana, Domínguez-Torreiro, and Vertesy, European Commission Joint Research Centre, 2016.
Note: For comparison purposes, we have rescaled the GII scores by dividing them with the best performer in the overall GII 2016.

seven pillars separately. At the same time, this finding points to the value of duly taking into account the GII pillars, sub-pillars, and individual indicators on their own merit. By doing so, country-specific strengths and bottlenecks in innovation can be identified and serve as an input for evidence-based policy making.

All published GII 2016 ranks lie within the simulated 90% confidence intervals that take into account the unavoidable uncertainties in the estimation of missing data, the weights (fixed vs. random), and the aggregation formula (arithmetic vs. geometric average) at the pillar level. For the vast majority of countries these intervals are narrow enough for meaningful inferences to be drawn: the intervals comprise fewer than 10 positions for 93 of the 128 economies. Some caution is needed merely for six countries with ranks that are highly sensitive to the methodological choices. The Input and Output Sub-Indices have the same modest degree of sensitivity to the methodological choices related to the imputation method, weights, or aggregation formula. Country ranks, either in the GII 2016 or in the two sub-indexes, can be considered representative of the many possible scenarios: 75% of the countries shift fewer than three positions with respect to the median rank in the GII (three and four positions, respectively, in the Input and Output Sub-Indices).

All things considered, the present JRC audit findings suggest that the GII 2016 meets international quality standards for statistical soundness, indicating that the GII index is a reliable benchmarking tool for innovation practices at the country level around the world.

That said, the GII should not be seen as the ultimate and definitive ranking of countries with respect to innovation. On the contrary, the GII best represents an ongoing attempt by Cornell University, the business school INSEAD, and the World Intellectual Property Organization to find metrics and approaches that better capture the richness of innovation, continuously adapting the GII framework to reflect the improved availability of statistics and the theoretical advances in the field. In any case, the GII should be regarded as a sound attempt to pave the way for better and more informed innovation policies worldwide.

Notes

1 OECD/EC JRC, 2008, p. 26.

2 The JRC analysis was based on the recommendations of the OECD/EC JRC (2008) *Handbook on Composite Indicators* and on more recent research from the JRC. The JRC audits on composite indicators are conducted upon request of the index developers and are available at https://ec.europa.eu/jrc/en/coin.

3 Groeneveld and Meeden (1984) set the criteria for absolute skewness above 1 and kurtosis above 3.5. The skewness criterion was relaxed to account for the small sample (141 economies).

4 Nunnally, 1978.

5 Saisana et al., 2005; Saisana et al., 2011.

6 The Expectation-Maximization (EM) algorithm (Little and Rubin, 2002; Schneider, 2001) is an iterative procedure that finds the maximum likelihood estimates of the parameter vector by repeating two steps: (1) The expectation E-step: Given a set of parameter estimates, such as a mean vector and covariance matrix for a multivariate normal distribution, the E-step calculates the conditional expectation of the complete-data log likelihood given the observed data and the parameter estimates. (2) The maximization M-step: Given a complete-data log likelihood, the M-step finds the parameter estimates to maximize the complete-data log likelihood from the E-step. The two steps are iterated until the iterations converge.

7 Munda, 2008.

8 In the geometric average, pillars are multiplied as opposed to summed in the arithmetic average. Pillar weights appear as exponents in the multiplication. All pillar scores were greater than zero, hence there was no reason to rescale them to avoid zero values that would have led to zero geometric averages.

9 A question that arises from the GII approach is whether there is a way to benchmark countries' multi-dimensional performance on innovation without imposing a fixed and common set of weights that may not be fair to a particular country. The original question in the DEA literature was how to measure each unit's relative efficiency in production compared to a sample of peers, given observations on input and output quantities and, often, no reliable information on prices (Charnes and Cooper, 1985). A notable difference between the original DEA question and the one applied here is that no differentiation between inputs and outputs is made (Cherchye et al., 2008; Melyn and Moesen, 1991). To estimate DEA-based distance to the efficient frontier scores, we consider the $m = 7$ pillars in the GII 2016 for $n = 128$ countries, with y_{ij} the value of pillar j in country i. The objective is to combine the pillar scores per country into a single number, calculated as the weighted average of the m pillars, where w_j represents the weight of the i-th pillar. In absence of reliable information about the true weights, the weights that maximize the DEA-based scores are endogenously determined. This gives the following linear programming problem for each country j:

$$Y_i = \max_{wij} \frac{\sum_{j=1}^{7} y_{ij} w_{ij}}{\max_{y_i \in \{dataset\}} \sum_{j=1}^{7} y_{ij} w_{ij}} \qquad \text{(bounding constraint)}$$

subject to

$$w_{ij} \geqq 0, \qquad \text{(non-negativity constraint)}$$

where

$j = 1, \ldots, 7,$
$i = 1, \ldots, 128$

In this basic programming problem, the weights are non-negative and a country's score is between 0 (worst) and 1 (best).

10 Of these, only Luxembourg achieved a 1.0 score in the Innovation Efficiency Ratio, calculated as the ratio of the Output Sub-Index over the Input Sub-Index. The Efficiency Ration and the DEA score embed very different concepts of efficiency leading to completely different results and insights. A high score in the Innovation Efficiency Ratio is obtained by scoring more on the Output Sub-Index than on the Input Sub-Index, irrespective of the actual scores in these two sub-indices. Instead, a high score in the DEA score can be obtained by having comparative advantages on several GII pillars (irrespective of these being input or output pillars). The DEA scores are therefore closer to the GII scores than to the Innovation Efficiency Ratio.

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A Bigger Bang for the Buck: Trends, Causes, and Implications of the Globalization of Science and Technology

Suma Athreye, Brunel University, United Kingdom

John Cantwell, Rutgers University, United States of America

The world has changed rapidly in many respects, but for scholars studying advances in science and technology (S&T) and its commercialization through innovation within firms, the rapid globalization of S&T since the 1990s has been both remarkable and also something of a puzzle in at least two respects.[1] First, the speed of the globalization of S&T in the private and public spheres is unprecedented. Second, the direction of globalization marks a distinct break from past trends because it has encompassed some fast-growing urban regions in countries (e.g., some regions in Ireland, India, and China) that, until very recently, have not engaged in activities near the scientific frontier that depend on a substantial scientific infrastructure.

Despite the increasingly global nature of S&T activity, most technological activity is still overwhelmingly concentrated in developed, high-income countries. Although some middle-income countries have gained, most low-income countries have remained outside the ambit of international technological activity. Many S&T indicators reveal the existence of this divide. Even middle-income countries still depend on technology transfers from developed economies for solutions to mainly domestic problems (e.g., combatting diseases such as malaria or securing cheaper energy sources—issues that concern primarily middle-income countries). Some lower-middle-income countries have been able to take advantage of greater openness in international trade and in the expansion of cross-border intellectual property markets to build basic technological capabilities as measured by licensing revenues, although generally they have not been able to acquire the more advanced capabilities associated with R&D and patents.[2]

These trends are not surprising: technological catch-up and technology diffusion are slow evolutionary processes. Nevertheless, the rapid internationalization of S&T in the 1990s is still remarkable and differs from earlier periods in its globalization. Studying the factors that influence this process and what they imply for policy is the focus of this chapter.

The internationalization of S&T

S&T activities are traditionally thought of as 'sticky' to the context of development and also as dependent on networks of scientists that are often bound to particular schools of thought. For quite a long period, such schools of thought were local or even regional; more recent times saw scientific communities competing in a race to discover particular solutions to common problems.[3] Firms, using technology as a competitive tool, also tended to keep much of their R&D effort in a single location quite close to their headquarters, leading some authors to contend that private R&D was a curious 'case of non-globalization'.[4]

A large number of S&T indicators confirm that this picture is changing and scientific endeavours are becoming increasingly global, although this globalization of S&T is limited to high-income and middle-income countries. One common indicator used to look at the internationalization of public science is the *international co-authorship of publications*. Based on data from Elsevier's Scopus database, the Royal Society (2011) estimates that over 35% of all scientific articles were internationally co-authored in 2011—up from 25% in 1996. Using a slightly different database of published work, the ISI Web of Science, Wagner and Leydesdorff (2005b) estimate that the share of international co-authored publications doubled between 1990 and 2000, rising from 8.7% to 15.6% of all published scientific papers.

Wagner and Leydesdorff (2005a) also show that the rise in international collaboration in public science is marked both by an increased participation of countries and by greater interaction by those participating countries. Thus the core of collaborating countries rose from 37 countries in 1990 to 54 in 2000. This growth is largely the result of the entry of Eastern European 'transition' economies and the Commonwealth of Independent States (CIS) economies, Latin American countries

such as Mexico and Chile, and East Asian economies such as Singapore, Taiwan (Province of China), and the Republic of Korea.[5] Even more interesting is the documentation of the rise in collaborative country pairs—the number of countries that collaborated with at least one other country rose from 103 in 1990 to 128 in 2000 (representing about 58% and 65%, respectively, of all countries producing published papers); while those collaborating with more than one country rose from 41 to 61 countries in the same period.[6]

These trends towards the internationalization of public science should not mask the fact that most publications still emerge largely from high- and middle-income countries. UNESCO shows that high-income countries still accounted for over 70% of all publications in 2014,[7] even though this share fell from 79% in 2008. During the same period, upper-middle-income countries saw a huge boost in share, climbing from just under 21% to over 32%. The growth registered by lower-middle-income countries was modest (1 percentage point, from 5.7% to 6.8%), and low-income countries saw hardly any change in shares (from 0.4% to 0.6%). China clearly dominates the result for upper-middle-income countries, with a doubling of its share of publications from 10% to 20% between 2008 and 2014.

Similarly, it has sometimes been argued that the strategic importance of R&D activities within firms to the competitiveness of those firms makes such activities notoriously 'non-global' and more likely to be local.[8] Yet the trends noted for the globalization of public science are mirrored in the growing *share of international R&D* by firms. Dunning and Lundan (2008) estimate that, in 1982, 30% of production and 12% of innovatory capacity of the world's largest companies were located overseas. By 2005, European firms were conducting over 40% of their R&D overseas. On average, smaller countries were more internationalized in their R&D activities than larger countries.[9] Thus, although US firms doubled their overseas R&D, their share rose from only 7% in 1982 to 15% in 2005.

Even more striking is the *dispersion of international R&D activity* across regions. Dunning and Lundan (2008) estimate that until 1994, more than two-thirds of overseas R&D by US firms was based in just six countries: Canada, France, Germany, Japan, Sweden, and the United Kingdom. Since 1994 this group has grown to include four new destinations: China, Israel, Ireland, and Singapore. Many of these are the same countries that are increasingly opening up for collaboration in public science, as noted by Wagner and Leydesdorff (2005a).

A third type of indicator frequently used to demonstrate the increasingly global nature of (private) inventive activity is the *incidence of co-invented patents*. Kerr and Kerr (2015) found, based on an exhaustive study of US patent documents, that global inventor teams have become surprisingly prominent and that, on average, 6% of the worldwide patents of US multinational corporations in 2004 are co-invented. They find that the ethnic composition of the United States of America (USA)-based firm's inventive workforce is an important factor in whether the firm engages in international collaboration.

Higher shares of collaborative patents are also observed when a US publicly held (private) company is entering into a new foreign region for innovative work; Branstetter et al. (2015) show this to be especially true of R&D work undertaken in India and China. In a large fraction of these cases, an inventor moving across borders within the firm is also evident, suggesting that the migration of scientists is part and parcel of the new internationalization of private R&D.

Long-term causes of the most recent globalization of S&T

These trends in the globalization of S&T in the 1990s (observed in a variety of different indicators, as noted above) reflect the influence of several long-term factors that have dramatically shifted innovation from a local phenomenon to an increasingly global and networked one.

The first of these factors is the opening up of the world economy, which took place for several reasons. The countries that had been part of Communist Europe desired institutional reform and greater integration into the global economy. Many developing countries were disenchanted with the import-substituting model of growth and development. Even large economies such as China, India, and Brazil, which had developed strong industrial bases for economic growth using the import substituting model, could no longer continue without opening up their economies to international trade and foreign investments. A key common factor across the large developing economies and former Eastern European countries was that they had access to new technologies and new knowledge networks that were more and more international in character. In other words, these countries—although technologically more capable—could no longer stand alone and depend on reverse engineering to meet their technological needs.

In the technological sphere, the development of a new techno-economic paradigm driven by advances in information and communication technologies (ICTs) was already transforming the industrial landscape; this proved to be the second important factor driving the tendency towards the internationalization of S&T. Advances such as powerful computers and new forms of technological convergence made technologies more complex than they had been in the past. The impact of ICTs is seen in several dimensions. First, products became multi-technology.[10] Cars were no longer exclusively about mechanical engineering but included sophisticated electronics that improved the travel experience with music and air-conditioning and many other features that we now take for granted. Another product that exemplifies the technological complexity caused by ICT convergence is the telephone. It was transformed from a receiver and sender of analogue radio waves to a mini, mobile office by the end of the 20th century.

The impact of the new techno-economic paradigm also extended to the costs of innovation. Powerful computers drove down these costs. Expensive trial-and-error processes and prototyping were replaced by simulation and computer-aided design (CAD) technologies.[11] The falling costs of communication and the dramatic connectivity allowed by Internet technologies have enabled specialization based on global markets. What began as a quest for efficiency in production soon snowballed into the fragmentation of production systems where value chains become more and more subdivided and specialized across different nations and geographies.

Third, ICT use in firms became progressively associated with the use of external knowledge and the development of global R&D teams rather than local R&D teams. This was inevitable because knowledge bases became more interlinked and interdependent. The best example of this growing openness in innovation is the pharmaceutical industry, long upheld as the canonical example of R&D-based closed innovation. Developments in biotechnology pointed to the existence of different pathways for achieving the same therapeutic effect. The impact of this on the pharmaceutical industry was to force the drug companies to be more open to other complementary knowledge bases. Patent data reveal this interdependence of knowledge bases most starkly. In the 1970s, backward citations to patents (which reflect the scientific and technological knowledge upon which the focal patent is building) most often came from the same technology field as the focal patent. Today two-thirds of the backward citations in a focal patent come from outside its own field.[12]

A fourth (more subtle) factor driving the internationalization of S&T is the growing demographic divide in the world economy, which increasingly has dictated where global R&D is located. Even as new technologies such as ICTs and advances in biotechnology raised the premium for scientific skills in the workforce, the populations of the advanced countries within which these technologies have developed are ageing. This demographic change makes the accumulation of such skills in large enough quantities to meet the skills needs of industries expensive unless the country resorts to globalization through the in-migration of scientific labour or the internationalization of R&D.

Demographers at the United Nations Population Division project that, over the next four decades, most of the large decreases in working-age populations will be concentrated in the economies in the Organisation for Economic Co-operation and Development (OECD). Of the advanced economies, Japan is projected to lose the most by this trend; the USA is projected to lose the least. Although the beginnings of this decline in fertility are different in different economies, evidence presented by Kent and Haub (2005) suggest that, for some EU countries (such as France and Italy) the process had already begun by the mid-1970s; in Japan, it gathered pace beginning in the mid-1980s. Kent and Haub estimate that, from 2005 to 2050, EU-27 countries will lose 19% of their working-age population (or 64 million workers), while Japan will lose twice as much. Only four EU countries—Ireland, Luxembourg, Sweden, and the United Kingdom (UK)—along with the USA are projected to see some growth in their working-age population. A large part of the ability to avert the crisis in these nations is attributed to a higher birth rate among migrant populations.

Although the impact of a greying population has been at the forefront of concerns about how best to limit welfare spending and address a pending pensions crisis, scholars have not linked these long-term demographic trends and the private and public responses in favour of increasing globalization of S&T. With a shrinking working-age population, many OECD countries would need a larger proportion of their population to study science and engineering to generate the existing stock levels of national science and engineering graduates. Yet many advanced countries currently face a vocational decline in science and engineering: in many countries, the

number of available places is often not matched by qualified applicants. Therefore other complementary, short-term measures have been put into place to raise the size and availability of a diverse scientific workforce. In Australia, Canada, the UK, and the USA, a selective migration policy encouraging the in-migration of scientific labour has been key to resolving skill shortages and maintaining the competitive edge of these nations. Arslan et al. (2014) estimate that, in 2010–11, the number of working-age migrants (15 years and older) was 106 million; this represents a 38% growth from 2000–01. Most were African and Asian migrants (about 50%), but in the OECD region, Mexican, Indian, Romanian, Chinese, and Polish migrants accounted for a quarter of all migration. Furthermore, about 35 million migrants in the OECD nations had a tertiary education, and a third of these came from Asia. This level of tertiary educated migrants represents an unprecedented increase of 70% from 2000 to 2010.

The migration of skilled labour to technology centres and the migration of capital investment to regions with large numbers of scientifically skilled workers have been almost as important as the growing international trade in goods.[13] With the large-scale movement of educated people and the fall in communication costs resulting from the growth of ICTs, the rapid internationalization of S&T is hardly a surprising result. Indeed, it has created a virtuous circle.

The internationalization of universities in OECD countries has, in turn, had a profound effect on public science. Sociologists now speak of communities of practice as generating social networks of scientists that are almost as important as local communities in their effect on innovation. Such communities share a passion or problem that they are prepared to address together, often using communication platforms such as fairs and conferences and, increasingly, Internet platforms.[14] Evidence of the effect of such communities is evident in many metrics, but a notable one is that the growth of citations to papers has been far greater than the growth in published papers. The Royal Society (2011) finds that the career paths of several Nobel Prize–winning scientists evidence the impact of global education and global collaboration in the advance of cutting-edge scientific work.

The private sector of many advanced countries reacted to the growing shortages in skilled labour differently than universities and public-sector labs: by moving capital to locations where scientific labour is abundantly available. The availability of scientific labour is seen as a key driver of R&D offshoring to emerging economies and countries in Asia. Not surprisingly, private firms responding to the cost and availability of scientific labour choose to locate their R&D where these constraints are most alleviated. The stickiness of technology and context is still a problem, but one that is increasingly being managed globally through inventors crossing borders and through knowledge management in global teams.

Implications for S&T policy

The globalization of S&T that began in the 1990s has been marked by a greater interconnectivity in economic activity between different regions—both because new ICTs enabled this connectivity and because economic circumstances surrounding many innovations required drawing on dispersed but specialized science capabilities. In the policy domain, these trends in the internationalization of S&T have stoked new anxieties. The emergence of new nations as contributors to public science and as destinations for international R&D has inevitably meant a loss of publication and patent shares by OECD countries in favour of the new S&T regions. Many developed economy governments now worry about the 'hollowing out' of innovative capability and loss of competitiveness to the emerging scientific nations, increasingly seen as contenders rather than collaborators.

This analysis of the causes of the internationalization of S&T suggests that the interdependence of knowledge (and therefore geographies) is its key driver. Existing data on collaborations, patents (both co-invention and citations), and alliances are all available at a national or technology-specific level of analysis. Geographical interdependence may not always be at national levels but instead may be seen at regional levels, as indicated by the literature on clusters that are centres of innovation (such as Silicon Valley in the USA; the Hsinchu Region in Taiwan, Province of China; and Bangalore in India). On the other hand, data for regions or cities do not always capture the international dimension of economic and social relationships, although such data are probably being collected by the administrators of major cities. To fully comprehend the extent and consequences of knowledge interdependence, better metrics drawn from disparate sources are needed.

A related point is that the frameworks of analysis have not kept pace with the reality of the unfolding phenomenon of connected innovation. Interconnectivity means that the rewards of activity in one

location positively influence actors in another location. This being the case, firms and nations can expect to reap the benefit of several sources of positive externalities—but certain old ways of thinking about innovation need to change. The conventional contemporary social science approach of attempting to isolate the determinants of some specified outcome variable while supposedly controlling for other influences on that received outcome needs to be replaced with evidence of the dispersion of innovation that is supported by a process-based analysis of change in an increasingly complex (interdependent) global system over time (with substantial endogenous feedback effects). For example, while discussing the globalization of R&D, 'location choice' models are often used. These models suggest that the gain of location A is at the expense of alternative location B (or vice versa).

Other examples may be seen in the R&D offshoring debate. Citibank developed a captive software subsidiary in India in order to computerize its global network. Within a decade of being set up, the subsidiary developed a financial product (I-flex) based on its experience of computerizing other developing-country operations; this became a successful product sold to other financial firms wanting to computerize their own operations in developing economies (such as in Africa) that had similar financial systems. It would be very difficult to attribute this development in R&D offshoring to India alone, but certainly that offshoring led to a chain of events that created a whole new product in the financial software space.

This example helps illustrate a more general point about knowledge interdependence and technological complexity. Knowledge generated in one part of the world in a given field can have rapid and unpredictable consequences or contagion effects for other industries and locations because of the fundamental interconnectivity of knowledge. It takes only an entrepreneurial spark anywhere in the chain to catalyse such a process.

Frameworks of analysis that do not recognize interdependencies give rise to the policy notion that national innovation is a zero sum game. This notion is built in to the logic of the argument and the way of thinking (it is not the underlying evidence that is necessarily the cause of the difficulty, but instead it is the overly simplistic analytical framework within which the evidence is examined). Using the earlier example of location choice theory, if location A is an alternative to location B, then location A can gain only at the expense of location B. If instead locations A and B are closely connected in a wider system, then they may well rise or fall together in what the Cambridge economists such as Nicholas Kaldor, John Eatwell, and Geoff Harcourt used to call a 'process of cumulative causation'. This is a positive sum game.[15]

The increasing relevance of global knowledge dispersion and connectivity has underlined the positive sum characteristics of innovation across countries, and, in turn, the positive sum characteristics carry vital implications for national science and technology policies. In the contemporary international economic environment in the information age, it is imperative that national governments move away from the closed national innovation system perspectives that characterize what have been called 'techno-nationalist policies',[16] and instead move towards policies that support the openness of local innovation systems. In a world in which cross-border knowledge connectivity is essential to innovative effort, actors must be willing to be knowledge providers if they also wish to enjoy the benefits of being knowledge recipients from the rest of the world.

In this interconnected world, the incentives to engage in international knowledge exchange are aligned in mature industrialized countries and emerging market countries despite their different levels of development and the differing degrees of sophistication of their stocks of scientific and technological knowledge. Each country has its own specific types of differentiated expertise and forms of knowledge. Many innovation opportunities now depend on moving new applications across both industries and markets, including between markets with different proportions of high-income and low-income consumers, and with different challenges for innovation.[17] Therefore the policy agenda must be to move away from the inward-looking approach of techno-nationalism towards a philosophy of mutual or shared interest in protecting and sustaining the entire international ecosystem of technological knowledge, which reaches well beyond any individual country or place.

The world looks less rosy for those developing countries that have not yet joined this club of participating nations in international S&T. The closing digital divide in ICTs, thought insurmountable in the 1980s, offers hope for the future. As Chapter 3 shows more conclusively, technology-driven foreign direct investment between Southern countries is in its infancy, but it has been led by investments in digital technology made by other developing countries. Could higher-middle-income countries such as China draw in poorer countries into their

own network of technology-driven foreign investments and thus extend the win-win paradigm? There is no crystal ball that will tell us, but the new policy thinking proposed here may turn that idea into reality.

Notes

1 There is a subtle difference between globalization and internationalization. In general, internationalization precedes and is a precondition for globalization. 'Internationalization' refers to international flows of people or resources or to the international spread or dispersal of activity, while 'globalization' refers to the international integration of activities, or international interdependence of actors or activities located in different places.

2 Athreye and Cantwell, 2007.

3 Examples in public science include the race to find a solution to the problem of establishing a longitude for sailors at sea for which prizes were offered in 1567 and 1598 in Spain and in 1717 in the UK, or more recently the race to find a solution (and protocol) to the problem of computer connectivity, which involved Computer Science departments in the UK and the USA.

4 See the title of Patel and Pavitt, 1991. Cantwell (1995) argued that this generalization applied more to large US, Japanese, German, and French firms than it did to the largest British, Swiss, Belgian, or Dutch firms.

5 Wagner and Leydesdorff, 2005a, Table 3.

6 Wagner and Leydesdorff, 2005a, Table 4.

7 UNESCO, 2015, Table 1.4.

8 Patel and Pavitt, 1991.

9 But see Cantwell and Kosmopoulou (2002) for some qualifications to this generalization.

10 Granstrand et al., 1997.

11 Arora and Gambardella (1994) called this the 'changing technology of technological change'.

12 Cantwell and Zhang (2011) provide evidence on cross-field versus within-field patent citations and knowledge complexity, using 56 technological fields.

13 Economic historians such as O'Rourke and Williamson (1999) emphasize the similarities between the globalization of the 1880s and the globalization of the l990s. Standage (1998) also shows how the increase in connectivity due to the telegraph was very similar to the increase in connectivity due to the growth of the Internet.

14 Lave and Wenger, 1991; Wagner, 2008; Wenger, 1998; Wenger et al., 2002.

15 See Kaldor, 1985. The use of the term 'cumulative causation' (what might now be referred to as 'positive and negative feedback effects in non-linear dynamics' or 'chaotic dynamics') is generally credited to Gunnar Myrdal (1957). Reference to cumulative causation in the context of FDI, the international location of technology development, patterns of industry growth, and decline in host locations can be found in Cantwell (1987).

16 Ostry and Nelson, 1995.

17 See, for example, Govindarajan and Ramamurti, 2011.

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Technology-Driven Foreign Direct Investment within the Global South

Cristina Chaminade, Lund University, Sweden

Lucía Gómez, Turku University, Finland

South–South technology investments can be important for the development of the Global South because they can have advantages over the (more conventional) North–South investments. As recently argued in academic literature, the technology distance between the countries in South–South investments is potentially lower, thus facilitating the assimilation of the technology by the host country and enabling higher degrees of novelty.[1] The last decade has seen a proliferation of anecdotal evidence indicating that a gradual change is taking place in the predominant paradigm of innovation: emerging economies are now playing a much more prominent role in the international flows of research and development (R&D).

However, knowledge about technology-related investments in the Global South has been very limited, partly because technology-driven foreign direct investment (TFDI) from the Global South is a relatively new phenomenon, partly because it is still a very marginal phenomenon, and partly because global data on technology-related investments were scarce. This chapter aims to move from anecdotal evidence to worldwide data to investigate the importance of international flows of R&D to, and particularly within, the Global South.[2]

Data on the number of foreign direct investments announced during the period 2003–14 as recorded in the fDi Markets database are used in this investigation. The fDi Markets is an online database maintained by the Financial Times; it collects information on all greenfield investment projects announced in publicly available information sources.[3] These data are the main data source for the United Nations Conference on Trade and Development (UNCTAD)'s *World Investment Report*.

The fDi Markets data trace the changes in cross-border greenfield investment projects by looking at the countries of origin and destination as well as the nature of the investment (manufacturing versus technology-driven investments).[4] This chapter follows Chaminade (2015) in defining 'technology-driven foreign direct investments (TFDI)' as including investments that are classified in fDi Markets as R&D; design, development, and testing (DDT); technology support centres; and information and communication technologies (ICTs) and infrastructure.

This chapter is structured as follows. First a condensed review of the literature on the effects of TFDI is provided to try to answer the question of why TFDI is important for development and why South–South TFDI would be particularly relevant for the growth and transformation of the Global South. Second, the chapter provides a summary of the general trends in TFDI worldwide, followed by a general overview of South–South TFDI. The data reveal that (1) TFDI South–South is a very marginal phenomenon; (2) it is clearly dominated by investments in ICTs; (3) it generally follows the same patterns as global TFDI; (4) important regional differences exist in the nature and geographical scope of the investments; and (5) it is driven by a handful of players who are active in many regions of the Global South. Finally, the chapter discusses the implications of some of the findings, particularly related to the critical role that multinationals from the Global South or emerging market multinationals (EMNEs) can play in bridging the technological gap between North and South.

The importance of South–South TFDI for development

The impact of foreign direct investment (FDI) on firms and home regions has been largely studied in the international business literature. The main conclusion of this stream of literature is that FDI tends to have positive effects on firm productivity

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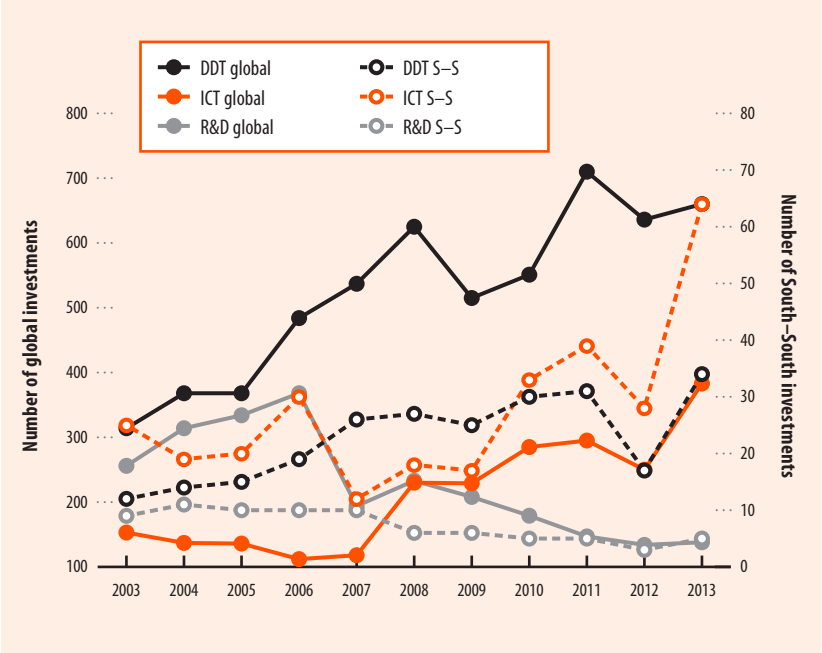
Figure 1: Evolution of number of technology-related investments, 2003–13



Source: Authors' elaboration, based on fDi Markets database.
Note: Global data are shown on the left axis and the solid lines; South–South data are shown on the right axis with dotted lines. The authors are particularly grateful to Davide Castellani for providing the data for this graph.

because it lowers costs, while it has a negative effect on the productivity and growth of the home region because of its hollowing out effects. However, the final positive effect on the firm or the potential negative effect on the home region is contingent on a variety of factors, notably the absorptive capacity of the firm.

TFDI is a special case of FDI that has been much less studied. In contrast with general FDI, existing evidence of the impact of TFDI points to its potential positive influence for both the firm and the home region. R&D offshoring can improve overall firm R&D efficiency;[5] it does this by reducing costs and acquiring complementary knowledge needed for innovation.[6] At the same time, TFDI is associated with significantly higher productivity growth in the home region than pure offshoring in manufacturing,[7] as well as with increased innovation capabilities in the host region.[8] However, the positive impacts are not automatic and will ultimately depend on a variety of factors such as the degree of autonomy of the subsidiary;[9] the absorptive capacity and international experience of the firm;[10] the presence of innovation-complementary assets in the host region;[11] and, more generally, the institutional distance between the host and the home countries.[12]

A critical question is whether the same pattern can be observed for technology-driven investments by multinationals from the Global South—that is, emerging-market multinationals (EMNEs). The literature on the technology-driven investments of EMNEs is far less prolific and much more recent, and its impact is still being researched. In a recent article, Awate et al. (2014) compare the R&D internationalization processes of a multinational from a developed country with that of an EMNE. They conclude that the investments of the multinational from the North are made for competence exploitation to undertake adaptations or to realize cost advantages, and that the R&D conducted in the headquarters is the main knowledge source of the subsidiary. In contrast, EMNEs use their technology investments abroad to acquire knowledge and catch up, while the technological level of their headquarters is usually lower than that of the subsidiary.[13] Minin and Zhang (2010), however, reach different conclusions when looking at Chinese investments abroad. They find that multinationals from the South use different strategies according to different learning goals, and that some investments had the clear purpose of exploiting technologies developed elsewhere (in either a developed or a developing country) rather than acquiring knowledge.

The extent to which these EMNEs can benefit from the R&D and other technology-related investments abroad depends largely on their absorptive capacity and previous experience;[14] in this respect, there are no significant differences with MNCs from the North. However, some of the limitations of technology spillovers derived from the greater technology distance between host and home countries in North–South investments can partially disappear in South–South investments: the technology distance between the countries is shorter, facilitating the assimilation of the technology by the host country,[15] and achieving higher degrees of novelty.[16] Furthermore, EMNEs seem to have a comparative advantage with respect to their counterparts in the North: they tend to perform better in institutionally different environments than multinationals from the North or, in other

words, the institutional distance seems to matter less for emerging multinationals.[17]

In sum, TFDI is generally associated with positive impacts for the firm and the host region. However, its final impact depends on a variety of factors, including the degree of autonomy of the subsidiary, the absorptive capacity of the firm, its previous international experience, and the institutional distance. The same factors seem to play a role in the R&D FDI of EMNEs with one exception—they may be better endowed to deal with institutional distance. This is an aspect that will be further discussed later in this chapter.

Global trends in TFDI

Using the data from fDi Markets from 2003 to 2013 and considering the number of investments by destination worldwide, Castelli and Castellani (2013) clearly identify that the most important destinations of technology-related projects, both for applied research (DDT) and basic research (R&D), were precisely two countries in the Global South: China and India. In the period indicated, China received nearly 17% of all the R&D cross-border investments and 12.8% of all DDT investment projects, while India was the recipient of 14.7% of the R&D and 20.3% of the DDT investment projects.[18]

However, the investment growth rate in those two countries for TFDI has not been steadily growing over the considered period: the number of TFDI projects towards China had dropped 2.3% and towards India had dropped 7.3% by 2012.[19] Interestingly, the data show that the decline in TFDI projects towards China and India has occurred in parallel with an increase in TFDIs from China and India, including to the Global South, as will be discussed in the next section.

A critical question is whether the observed decline reflects a decreasing importance of the Global South, particularly of China and India as countries of destination of TFDI, or is the result of a general decline in the number of TFDI projects as a whole. As can be observed in Figure 1, which compares the trends in R&D, DDT, and ICT investments worldwide with their South–South counterparts, the general trend has been a decline in the number of R&D investments (dotted grey line) while the number of DDT- and ICT-related investments shows an increase over the same period.

The graph clearly points out the relative importance of TFDI South–South with respect to the total number of technology related investments globally: generally only 10% of the total TFDI is South–South. In other words, TFDI in the Global South is still a rather marginal phenomenon. Most of the EMNEs that invest in technology tend to go North, probably for asset seeking, as predicted in the literature.[20]

Figure 1 also shows that South–South TFDI shows a general pattern over time similar to that of global TFDI. The clear exceptions here are the investments in ICTs, which exhibit a growth rate markedly higher in the Global South (although the number of projects is still much lower). This result is rather surprising—the ICT industry has gradually moved to the South;[21] in fact, some of the most important hubs in the ICT industry are now located in the Global South,[22] and some of the most important global actors are also located there.[23] The implications are important. ICTs comprise important enabling technologies and their dissemination and widespread use in the Global South (as discussed in previous GII reports) can enable growth and development through new products, new services, new business models, better information, and so on. This is very important for less-developed regions in the Global South, including many African countries, as discussed next.

South–South investments: Geographical patterns

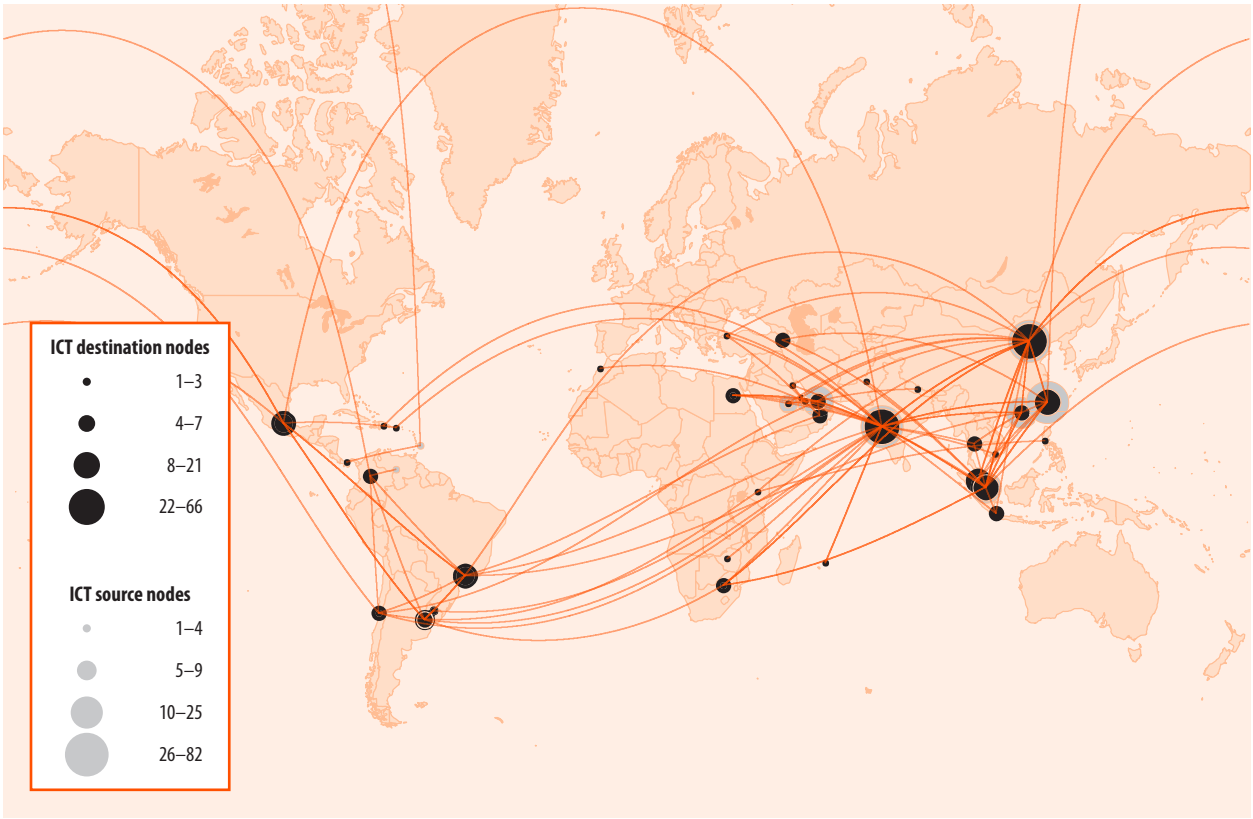
The geographical patterns in South–South TFDI can be useful in assessing the actual extent and nature of the phenomenon and their implications for development. The first step in this process is to determine just what patterns and main players are evident from the data. This section looks first at general patterns, and then considers details of those patterns for different regions.

Geographical patterns

Figure 1 shows that the majority of South–South TFDI projects are related to ICTs (47% of total South–South TFDI) and DDT (36%). Purely R&D investments comprise only 10% of the total, while technical support centres are just 7%. Taken together, the total number of South–South TFDI grew at a 14% rate between 2003 and 2014. DDT and ICTs were the predominant activities. R&D and technology support centres decreased or were scarce in most of the Southern world regions.

The Southern world region receiving the highest number of inward TFDIs from the Global South was Asia (51%). However, the number of overall investments in this region has remained almost the same for the whole period, with a growth rate of 1%. In contrast, investments to Africa and Latin America and the Caribbean grew at a much faster rate: 15% and 14%, respectively, almost

Figure 2: Geography of cross-border investments in DDT within the Global South, 2003–14



Source: Authors' elaboration, based on fDi Markets database.

catching up with the number of investments to Asia. In fact, during 2014 Africa got more TFDIs than any other Southern world region.

Outward TFDIs grew from all regions during the considered period, but especially from Africa at a rate of 20% and Latin America and the Caribbean at 14%. This growth is mainly the result of flows between countries within the same world region, as will be discussed next. Latin America and the Caribbean is the extreme case, with only 4% of outward investments going to other Southern world regions. Two figures illustrate the geography of the South–South TFDIs: Figure 2 shows South–South DDT investments, while Figure 3 shows South–South ICT investments.

Africa

TFDI in Africa is almost exclusively related to ICTs: investments in ICTs represented 80% of all TFDI projects in the region.[24] Furthermore, these investments grew at a very high rate between 2003 and 2014—22%—reaching their peak in 2013. Notably, half of these investments came from within Africa (90% of all ICT investments originating in Africa remained in Africa), particularly from Mauritius and South Africa—which, not surprisingly, are also ranked 1st and 2nd, respectively, for Sub-Saharan African countries in the 2015 Global Innovation Index.

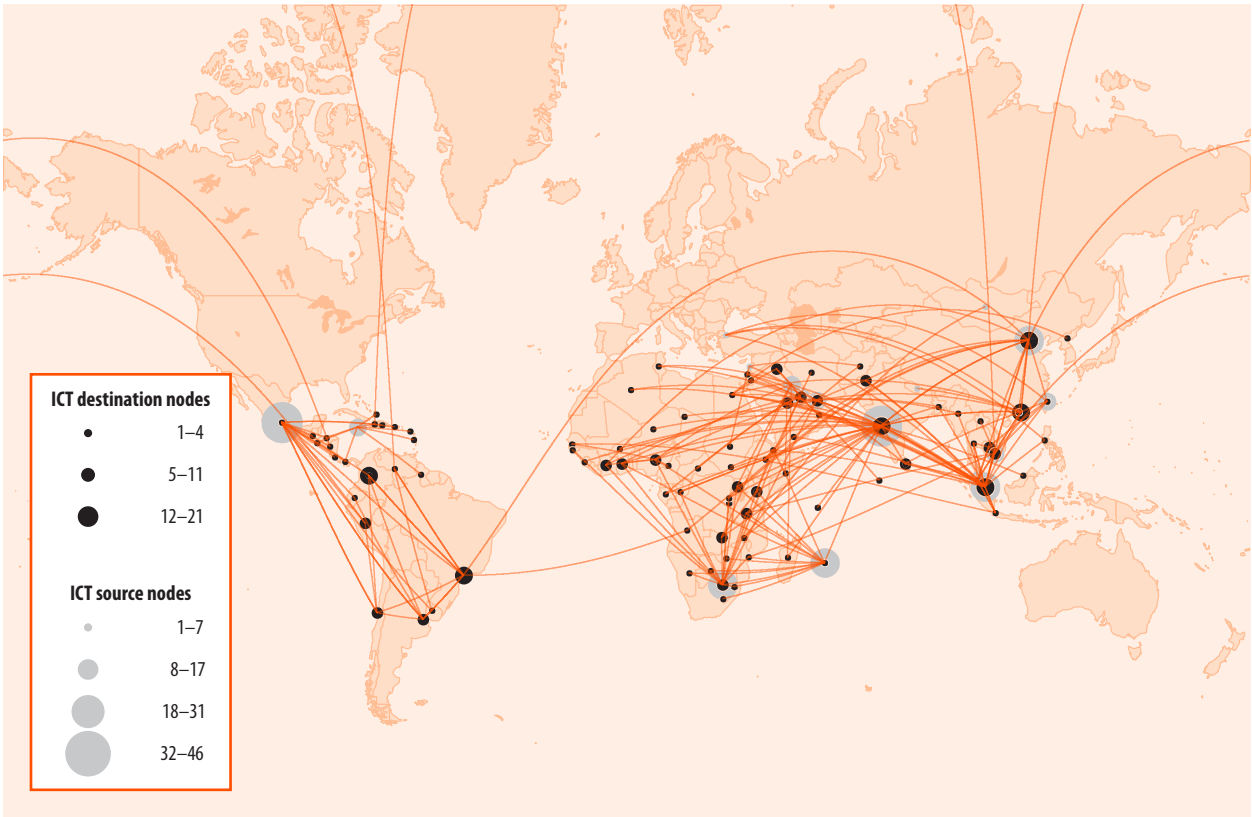
In contrast with the other regions, Africa has few DDT investments, instead playing a prominent role in the network of South–South technology support centre investments. Kenya is a major origin node of investment flows, together with India and China. All of Kenya's investments were made outside Africa, towards Asia and Latin America and the Caribbean. Kenya's investment source is just one company—Comcraft group—which has a network of subsidiaries in five countries, primarily in software and information technology services.

Latin America and the Caribbean

South–South TFDI to Latin America and the Caribbean is characterized by high volatility and discontinuity.[25] DDT and ICTs account for 90% of all Latin American and the Caribbean TFDI.

For the period 2003–14, DDT is the region's fastest-growing TFDI activity, with a growth rate of 17%.

Figure 3: Geography of cross-border investments in ICTs within the Global South, 2003–14



Source: Authors' elaboration, based on fDi Markets database.

About 60% of DDT investments to Latin America and the Caribbean came from Asia, 36% from within Latin America and the Caribbean; only 2% came from Africa and 2% from the Middle East. From Asia, investments came mainly from India, with investments in software and information technology services in Latin America and the Caribbean since 2003; and from China, with more recent investments (since 2010) in communications. Intra-regional DDT investments originate primarily from Argentina, Brazil, Chile, and Mexico, with the biggest destination nodes in Brazil and Mexico. These investments were mainly in software and information technology services–related projects.

The biggest TFDI activity in Latin America and the Caribbean is in ICTs. However, the growth rate of ICT investments between 2003 and 2014 is a bit slower (12%) than that of DDT investments. Most ICT investments in the region (90%) came from within Latin America and the Caribbean. The biggest origin of these investments was Mexico (the origin of half of all ICT investments); the main destinations were Brazil and Colombia.

The Middle East

The Middle East was the world region with the fewest South–South TFDI projects,[26] and no clear trend could be identified for any of the TFDI activities during the whole period. Particular to TFDI to the Middle East, when compared with the other Southern world regions, was the wider range of industry sectors that it included (ICTs, metals, automotive, and life sciences).

Relevant aspects of TFDIs originating in the Middle East were the prominence of investments related to life sciences and the number of ICT investments destined for Africa (37%), which was equal to the number of investments remaining in the Middle East.

Asia

The number of South–South TFDIs to Asia grew at a slower rate, 1%, than that of other world regions.[27] This means that DDT, technology support centres, and ICT investments grew at a rate of 3% and R&D dropped at a 14% rate.

Despite this drop, Asia still dominates the investment scene for R&D in the Global South. Eighty percent

Table 1: Most important investors in TFDI within the Global South

Region	Description	Main companies for outward TFDI (headquarter country, main activity, number of investments)	Main companies for inward TFDI (headquarter country, main activity, number of investments)[a]
Africa	ICT investments are by far the most important investments in the region. South Africa, Kenya, and Mauritius are the most important origins of outward investments, which tend to have another African country as their destination. Strong intra-region TFDI is evident.	• MTN group (South Africa, ICTs, 16) • Comcraft Group (Kenya, technology support centres, 12) • Seacom (Mauritius, ICTs, 10) • Altech Group (South Africa, ICTs, 6) • Liquid Telecom (Mauritius, ICTs, 6)	• Bharti Group (India, ICTs, 17) • Seacom (Mauritius, ICTs, 10) • Tech Mahindra (India, technology support centres, 7) • Altech Group (South Africa, ICTs, 6) • Liquid Telecom (Mauritius, ICTs, 6)
Latin America and the Caribbean	DDT investments occur mostly within the region, but not exclusively. Investments are also made in South Africa, the Middle East, and China. Interestingly, ICT investments from a Latin American and the Caribbean company go exclusively to other Latin American and the Caribbean countries. Firms from Mexico, Argentina, and Bermuda are the most important origins of investments from the region.	• América Móvil (Mexico, ICTs, 32) • Digicel (Bermuda, ICTs, 10) • TelMex (Mexico, ICTs, 9) • Grupo Assa (Argentina, DDT, 5) • Globalfono (Argentina, ICTs, 4)	• América Móvil (Mexico, ICTs, 19) • Digicel (Bermuda, ICTs, 9) • TelMex (Mexico, ICTs, 8) • Grupo Assa (Argentina, DDT, 5) • Huawei technologies (China, DDT, 4) • TCS (India, DDT, 4)
Middle East	Although there is an extensive network of investments within the region, there is also a clear international focus, with DDT investments to Chile, northern Africa, India, and China. ICT investments are much more extended geographically, including to central and north African countries and to Asia.	• Zain (Kuwait, ICTs, 14) • Etisalat (UAE, ICTs, 9) • Partners & Partners (Qatar, DDT, 7) • Ooredoo (Qatar, ICTs, 6) • SABIC (Saudi Arabia, DDT, 5)	• Star Metropolis (UAE, R&D, 6) • Qatar Heart Laboratory Holding (Qatar, DDT, 4) • Huawei Technologies (China, technology support centres, 3) • Eastern Biotech & Life Sciences (UAE, DDT, 2)
Asia	Companies headquartered in Asia are by far the most active in TFDI and the ones with the most global scope (with DDT and ICT investments in Latin America and the Caribbean, Africa, the Middle East, and Asia.	• Bharti Group (India, ICTs, 24) • Huawei Technologies (China, DDT, 14) • Tata Group (India, DDT, 11) • Metropolis Health Services Group (India, R&D, 10)	• Mahindra Satyam Computer Service (India, ICTs, 9) • PacNet international (Singapore, ICTs, 9) • Media Tek (Taiwan, Province of China, DDT, 8)

Source: Authors' elaboration, based on fDi Markets database.
[a] 'Inward' is at the level of the country, not the region. That is, a South African company that invests in Kenya would be classified as inward FDI in Kenya and outward in South Africa.

of all South–South R&D flows took place within the Asian region. The main origin of investments was India, and the main destination was China. R&D investments were mainly in the communications and pharmaceutical sectors.

Considering the whole period, DDT has been the predominant TFDI activity in Asia for South–South investments. Asia was the origin for 76% of DDT investment flows and the destination for 65% of them; most investments had China or India as either their origin or destination.

Investments in ICTs in the region rose quickly after 2011, so by the end of the period this sector was receiving the most South–South TFDI in the Global South. Moreover, the number of ICT investments in 2014 was twice that of 2013. India, Singapore, and China were the main origins of investment flows; their main destinations were in Asia (76%) and Africa (23%).

India and China are, therefore, not only the most important destination of cross-border TFDI projects globally but also the most important source of TFDIs to the Global South, particularly DDT and ICTs. The nature of the investments suggest that EMNEs from China and India follow predominantly an asset exploiting strategy—that is, these investments are more closely related to the development and adaptation of products to particular markets that have been developed somewhere else. An intriguing question worth investigating in the future is whether Chinese and Indian multinationals may be acting as gatekeepers of technology from the North to the South, as technology intermediaries.

Main players

Data from fDi Markets allow identification of the companies responsible for the investments, their main sector of activity, the number of their investments, and their nature as well as their destination. Table 1 shows the main players in TFDI within the Global South. The presence of

Box 1: Company views on the potential benefits of South–South TFDI

Four examples from companies from three different Southern world regions are presented here to illustrate different characteristics of the potential benefit impact, for both home and host countries, of South–South TFDI to product innovation. See also Table 1.

Huawei Technologies opened its first research and development (R&D) centre outside China in Bangalore, India, in 1999.[1] The R&D centre in Bangalore has been the source of some innovative solutions that later were commercialized worldwide. A prime example of innovative solutions developed at its Bangalore centre is the single-RAN (radio access network) launched in 2006. This network enabled the telecommunication operators to 'graft' the latest technologies—such as a 3G or an LTE (long-term evolution) service—onto their networks. Another product being developed at the Bangalore centre, which has already been launched in Latin America and the Caribbean, is the technology that enables Voice over LTE. These and many other examples highlight the key role the Indian subsidiary is playing in the innovation strategy of Huawei. This has also led the Chinese giant to further invest US$170 million in R&D in India in 2015, as has been announced in the press.[2] This case underlines the importance of South–South TFDI where both the host and the home countries benefit from each other. Although China leveraged the Indian pool of engineering talent and expertise to increase its global presence, India managed to attract investment in R&D and to engage its workforce to develop cutting-edge technology.

ZTE Corporation is a Chinese multinational telecommunications equipment and systems manufacturer, headquartered in Shenzhen, China, founded in 1985.[3] ZTE has an R&D unit in Bangalore, India, in which the company has invested approximately US$40 million in the second half of the last decade.[4] ZTE India's R&D enables it to tap into Bangalore´s world-class expertise in software.[5] The Bangalore unit develops a range of telecommunication software applications in the mobile value-added service (VAS) space such as caller ring-back tones, call centre applications, and billing solutions.[6] The investment in India for R&D accounts for 10% to 15% of the total global R&D spend of ZTE.[7]

Globant is an Argentina-based information technology and software development company with four investments in Latin America, including a DDT investment in Uruguay. The investments in Uruguay are considered to be crucial to the development of innovative software products for the company.[8]

Seacom, an ICT company headquartered in Mauritius, is behind some of the largest investments in ICTs in Africa, such as the instalment of the first undersea fibre optics cable along the east coast of Africa. The Internet cable is believed to have had a major impact on the business environment, for example in Nairobi, Kenya, by cutting the costs of Internet access by 120% while increasing access by a factor of 100.[9]

Notes

1 Fu, 2015.
2 Sen, 2013.
3 Fu, 2015.
4 live mint, 2010.
5 Chaminade and Vang, 2008.
6 Parbat, 2012.
7 live mint, 2010.
8 Gonzalo et al., 2013.
9 Turak, 2016.

the same firm as both inward and outward FDI indicates that the largest majority of investments are inside the region. Furthermore it is possible to see that the majority of the South–South TFDI is in the hands of a handful of EMNEs, many of which belong to large business groups.[28] That is the case for the Indian Bharti Group, Tech Mahindra, and the Tata Group, as well as the Chinese Huawei and ZTE. The most dominant players in Latin America and the Caribbean are América Móvil, Digicel, TelMex, and Grupo Assa, while Seacom, Altech, and Liquid Telecom are the corresponding African ones.

Towards a win-win strategy

The low number of EMNEs conducting TFDI in the Global South significantly limits the ability to draw evidence-based conclusions about the benefits of South–South TFDI for both the host and the home countries beyond what was discussed in the second section of this chapter. This limitation is particularly evident with regard to long-term benefits such as upgrading skills and building up innovation capabilities, since South–South TFDI is still in its infancy. However, anecdotal evidence collected from company websites and local newspapers suggests that a win-win strategy is possible, with potential benefits both from the host and the home economies in line with what the literature suggests. Box 1 provides some examples of perceived benefits of South–South TFDI in R&D, DDT, and ICTs and in different regions of the Global South.

Asset creation strategies by EMNEs may provide access to specialized and complementary knowledge—such as software capabilities

for ICT telecommunication equipment manufacturers—thus enabling the development of new products and services. Those innovations can subsequently be exploited in a variety of countries, including other countries in the Global South, thus generating economies of scale and further spillovers. An example of this is seen in the Huawei Voice over LTE, developed in Bangalore and commercialized in Latin America and the Caribbean and Europe; see Box 1). Innovations developed in the South and for the South may be able to better address the needs of developing countries and may thus provide EMNEs with a comparative advantage over the MNEs from the North. Additionally, these cases suggest that TFDI may lead to an upgrading of skills in the host country (like Huawei in Bangalore).

ICT-related investments—especially those related to ICT infrastructure, which characterize the lion's share of TFDIs into Africa and Latin America and the Caribbean—can also have a significant impact on the host country. ICTs and their development potential in developing countries are generally analysed from three different perspectives.[29] First, host countries can catch up to advanced economies and improve both their competitiveness capabilities and those of local business organizations in global markets. ICT investments are considered to impact the skills and productivity of labour as well as to generate more rapid and long-run economic growth.[30] Second, both host countries and home countries see the emergence of new ICT-based business models, expanding their information bases and lowering the cost of access to information. And third, the impact of ICTs is evident as they transform socioeconomic conditions through governments going digital in host countries, thus improving social services delivery, increasing democratic participation, and improving access to public services.[31]

In sum, the analysis of South–South TFDI investments using fDi Markets data reveals that, although South–South TFDI is in its infancy, it is generally growing and is clearly dominated by investments in ICTs. Although the limited number of investments prevents the drawing of conclusions on their impact, particularly in the long term, anecdotal evidence suggests that a win-win strategy is possible. This strategy has a positive impact both in the host and home countries in the form of access to complementary knowledge, better fit of technological solutions to specific development challenges, economies of scale, development of skills and capabilities and basic ICT infrastructure; these in turn can impact development trajectories. However, grasping the potential benefits is not automatic and will depend on a variety of factors, such as the absorptive capacity and international experience of the firm, the presence of a dynamic innovation environment in the host country, and, more generally, the institutional distance between the host and the home countries.

Notes

1 For a discussion of the assimilation of technology by the host country, see Amighini and Sanfilippo, 2014; for a discussion of higher degrees of novelty, see Harirchi and Chaminade, 2014.

2 The 'Global South' is hereby defined following the Brandt Report (1980) as considering all countries in the Southern hemisphere except Australia, Japan, the Republic of Korea, and New Zealand. The Brandt North–South divide is considered to be not only a geographical but also a socioeconomic and political division.

3 Information about the fDi Markets database is available at http://www.fdimarkets.com/.

4 It is important to stress that the data do not cover other forms of investments, such as mergers and acquisitions, which may be quite important in certain industries.

5 Dachs et al., 2012.

6 Criscuolo, 2009; Dachs et al., 2012; Ebersberger et al., 2011.

7 Castellani and Pieri, 2013.

8 Fu, 2008.

9 Giuliani et al., 2014.

10 Schmiele, 2012.

11 Fu, 2008.

12 Coe et al., 2009.

13 Buckley et al., 2014.

14 Buckley et al., 2014; Fu, 2008.

15 Amighini and Sanfilippo, 2014.

16 Harirchi and Chaminade, 2014.

17 Demir and Hu, 2015.

18 In the same period, the USA was the recipient of 7.9% of the R&D projects and the same percentage for DDT projects.

19 Castelli and Castellani, 2013. The growth trend has not been equal for all types of projects. For example, the number of R&D investments that had China or India as the main country of destination dropped at a rate of –17% for China and –18% for India. At the same time, the number of DDT projects has increased for China at a 4% rate and decreased for India at the same rate, 4%.

20 Awate et al., 2014; Buckley et al., 2014.

21 Ernst, 2009; Yeung, 2007.

22 Chaminade and Vang, 2008.

23 Lee and Malerba, 2014.

24 African countries involved in South–South TFDI from 2003 to 2014 according to the fDi Markets database include Algeria, Angola, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Djibouti, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea Bissau, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe.

25 Latin America and the Caribbean countries involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Turks and Caicos Islands, Uruguay, and Venezuela.

26 The Middle East countries involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Bahrain, the Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, the State of Palestine, Qatar, Saudi Arabia, the United Arab Emirates, and Yemen.

27 Asian economies involved in South–South TFDI from 2003 to 2014 according to fDi Markets database include Afghanistan, Armenia, Bangladesh, Brunei, Cambodia, China, Hong Kong (China), India, Indonesia, Lao People's Democratic Republic, Macao (China), Malaysia, Maldives, Mongolia, Myanmar, Nepal, the Democratic People's Republic of Korea, Pakistan, the Philippines, Singapore, Sri Lanka, Taiwan (China), Thailand, and Viet Nam.

28 The concentration of investments in a handful of companies can be the consequence of the high costs of FDI in comparison to other mechanisms to access knowledge to innovate—only large firms, mostly part of a larger business group, can afford this form of mechanism to access knowledge.

29 Avgerou, 2008.

30 See Szirmai, 2012, and World Bank, 2016, for a discussion of more rapid growth; see Pradhan et al., 2015, for a discussion of long-run economic growth.

31 UNCTAD, 2015.

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Innovating Together? The Age of Innovation Diplomacy

Kirsten Bound, Nesta, United Kingdom

As the globalization of science and innovation intensifies, policy makers around the world are looking for new ways to shape and influence its dynamics.

Until recently, these efforts have focused on *science diplomacy:* enabling international scientific research partnerships and influencing foreign policies with scientific evidence and advice. However, there is a growing interest in facilitating international collaboration on innovation, with a range of new collaborative approaches emerging.

At first blush, these efforts at *innovation diplomacy* look merely like a continuation of science diplomacy into a somewhat more commercial arena. Yet this is precisely what makes international collaboration more complex: thorny questions need to be resolved about which parties in the relationship are capturing the commercial as well as the public benefits. This is not to say that collaborating on innovation is a zero-sum game; on the contrary, such collaboration often results in strong mutual advantages. However, recent experience has shown that policy makers, businesses, and other stakeholders need a more sophisticated approach to assessing the risks and opportunities found at every stage of the innovation value chain.

This chapter describes the shift from science diplomacy to innovation diplomacy, drawing attention to the new challenges encountered and the new skillsets required. It then highlights the range of initiatives implemented by policy makers around the world to shape these dynamics for both national and mutual interest. Finally, it sets out steps that policy makers need to put in place for a more effective approach to innovation diplomacy in the future.

From science diplomacy to innovation diplomacy

Diplomats have never really had a monopoly on influencing international relations. The power of the international scientific community to shape international relationships, for instance—from sidestepping politics to helping avoid military conflict—has been demonstrated as early as the 18th century. The United Kingdom (UK)'s Royal Society appointed its first Foreign Secretary in 1723, nearly 60 years before the British government created an equivalent post.[1]

Yet there is no doubt that science has become an ever more important force for intermediating global relations in recent decades. In their analysis of the trend, the Royal Society outlines three different ways in which governments have sought to support and shape these collaborative relationships:[2]

- informing foreign policy objectives with scientific advice (science in diplomacy);
- facilitating international science cooperation (diplomacy for science); and
- using scientific cooperation to improve international relations between countries (science for diplomacy).

Although science diplomacy may have multiple objectives, it is most commonly couched in the language of global public goods. A former Chief Scientific Advisor at the US State Department (a role first created in 2001, and one that has since been replicated by many countries around the world) defined 'science diplomacy' as 'the use of scientific interactions among nations to address the common problems facing humanity and to build constructive, knowledge based international partnerships.'[3]

The international networks and institutions used for science diplomacy have grown significantly in profile and professionalism in recent years: from the annual G7 meeting of science ministers last held in Berlin in October 2015 and the first World Summit of official government scientific advisers held in Auckland in 2014 to the creation of a new Scientific Advisory Board to the UN.[4]

Yet as science has become ever more a global endeavour, so has innovation—not just with the relocation of multinational corporation R&D, but

also with the globalization of many kinds of value chains and the ability to commercially exploit discoveries ever further from their origin.

In response, a shift is under way to move beyond the traditional agendas of science diplomacy—which are often operationalized by promoting academic research collaborations—to the more expansive and at times treacherous terrain of innovation diplomacy. In this diplomacy, collaborative opportunities and risks need to be assessed across every link in the innovation value chain.[5]

Although there is no agreed definition of 'innovation diplomacy', the term is widely considered to include publicly funded support for the following four types of activities:

- exerting soft power and influence through the attractiveness (to talent, ideas, and investment) of a nation, region, or cluster as an innovation hub;
- developing early-stage international pre-commercial and commercial partnerships between businesses, or between businesses and universities, that sow the seeds for future national economic growth and competitiveness;
- creating the framework conditions (intellectual property regimes, migration rules, trade conditions, and information about opportunities and threats) for regional and global innovation partnerships to flourish; and
- encouraging and enabling collaborations between public, private, and non-governmental actors to address global grand challenges from health pandemics to climate change.

Innovation policy initiatives are already undertaken under conditions of 'radical uncertainty'.[6] International collaboration adds a host of additional challenges that range from contrasting national intellectual property regimes and enforcement capabilities and shifts in the alignment of incentives and interests between public and private actors acting overseas to unequal national abilities to absorb and exploit the results of partnerships. Although most innovation diplomacy initiatives are at least intended to allow partners to reap mutual advantage, some analysts have warned of a growing trend in 'innovation mercantilism' in which countries try to exploit international collaborations and trade scenarios to boost domestic innovation capacity—for example, through forced technology transfer or discriminatory public procurement.[7]

Innovation diplomacy should not be seen merely as an 'add-on' to science diplomacy, but as a distinct set of activities and capabilities. The next section looks at how different countries are undertaking innovation diplomacy.

How policy makers around the world approach innovation diplomacy

Despite a dearth of published strategies for innovation diplomacy, the number of bilateral and multilateral dialogues, networks, programmes, and funds designed to boost international innovation collaborations is growing all the time.

A toolkit of practical initiatives for innovation diplomacy is emerging that reaches beyond the realm of foreign affairs to engage several different ministries. For example:

- **Incentivizing collaboration through new funding opportunities.** Examples include collaborative R&D partnerships—both independent bilateral funds and matched funding for bilateral R&D partnerships—which are gradually becoming more common. MATIMOP, the Israeli Industry Centre for R&D, operates over 40 of these international partnerships.[8]
- **Influencing policy frameworks and conditions.** For example, policy dialogues can take multiple forms, from innovation policy and intellectual property dialogues to chief executive forums or joint economic and trade commissions. They can often proliferate—which requires coordination, as seen recently with the latest approach to refining and consolidating the US-India Strategic and Commercial Dialogue in September 2015.[9]
- **Improving access to information and capabilities.** International institutional networks are an example. Internationalizing institutional footprints has become a common strategy for leading global universities and research institutes. This has been far less true for publicly funded organizations that focus on innovation support. Germany's network of Fraunhofer Institutes, with bases in over a dozen countries beyond Europe, is a notable exception.[10]
- **Clarifying national priorities and objectives for innovation to chosen partners.** Examples would include published regional or national strategies. Despite the obvious benefit in helping diplomats craft engagement models, these formal strategies are extremely rare. The political challenges to implementing this type of long-term strategy are exemplified by the fact that one of the best-known instances of this kind of strategy, Australia in the Asian Century,[11] developed

in 2012 under Prime Minister Julia Gillard, was 'officially dumped' a year after its release by Tony Abott's government.[12]

- **Addressing cross-border innovation challenges.** Examples include building global coalitions: These are often facilitated by multilateral or non-governmental actors. Notable recent efforts include Mission Innovation, a commitment by 20 countries and a host of leading industrialists at the United Nations Climate Change Conference in Paris (COP 21) held in November 2015 to work together to accelerate the green energy revolution.[13]

The case of the UK

Some countries have taken very visible steps to improve their ability to shape and influence global science and innovation relationships and outcomes. A case in point is the UK. The UK boasts one of the most highly internationalized systems of science and innovation in the world. Approximately 46% of the UK's scientific publications have an international co-author, and an exceptionally high proportion of UK business R&D is funded from abroad.[14]

The last 10 years have seen a significant increase in the UK's efforts to build capabilities for influencing and enabling international collaboration on science and innovation. Part of this is the result of greater information sharing. The Global Science and Innovation Forum, for instance, chaired by the UK government's chief scientific advisor, helps coordinate the various efforts of UK ministries, funding bodies, academies, and government-funded agencies. Part of this is the result of growing infrastructure—for example, the UK's Network of Science and Innovation attachés has grown to over 90 staff, based in embassies and consulates in 28 countries and 47 cities around the world, and is supplemented by an international network of IP experts.[15] Additionally, in a move that would have been seen as countercultural to the UK's bottom-up approach to science in the past, the UK research funding body Research Councils UK now has several permanent overseas offices, including in India and China.

One of the biggest shifts, however, has been in the creation of significant new funds to enable global collaborations not only in research, but also in innovation. One example is the Newton Fund. Launched in 2014, this fund originally committed £75 million a year for five years to support collaboration with 15 emerging economies in three types of activity:

- **People:** increasing capacity in science and innovation, individually and institutionally, in partner countries;
- **Research:** establishing research collaborations on development topics; and
- **Translation:** translating science into commercial activities and creating collaborative solutions to development challenges and strengthening innovation systems.

In 2015, the Newton Fund was extended by two years (from 2019 to 2021) while the UK's annual commitment to the fund was set to double—from £75 million per year to £150 million per year by 2021—leading to an overall investment of £735 million, with partner countries expected to provide matched resources.

A similar level of ambition is displayed by the 2015 commitment from the UK's Foreign Office to create a £1.3 billion Prosperity Fund over the next five years to 'promote the economic reform and development needed for growth' in priority partner countries.[16]

The case of China

Another notable case is that of China. China's approach to international collaboration as a whole is increasingly strategic.[17] Ever since it began the process of opening up in 1978, foreign policy has been used to advance economic development. More recently, an intensifying web of international connections has spread across every aspect of China's innovation system— from joint academic research to technology transfer and licensing, foreign direct investment, and mergers and acquisitions.[18] As a result, the Chinese innovation system is now densely connected to sources of expertise elsewhere. One thing that distinguishes China's innovation pathway from that of Japan or the Republic of Korea is its willingness, where necessary, 'to buy expertise off the shelf'.[19] Time and again, examples of highly targeted collaborations in research and innovation are evident.[20] As Adam Segal, a China expert at the US Council on Foreign Relations, outlined in his testimony to Congress, 'One of China's great strengths has been a laser-like focus on shaping foreign interactions to serve national innovation goals.'[21]

Steps towards a more effective and impactful approach to innovation diplomacy

Although it is possible to discern a broad range of strategies and a growing prioritization of innovation diplomacy in many countries, it is far

harder to be clear about *what works*—and about the specific link between a particular intervention and its outcome. Evaluating diplomatic initiatives is notoriously difficult. Their influence is often indirect and very long term. However, instead of waiting for a future historian's account of the impact of innovation diplomacy, it is useful to consider whether it is possible (1) to construct a better framework for analysis by identifying the players and principles of innovation diplomacy; (2) to identify and improve the range of tools and public initiatives in question and determine how they map onto different strategic goals; and (3) to consider whether the right data are being collected to judge what is working.

First, it is clear that innovation diplomacy is not merely a subset of science diplomacy. Because of this, policy makers need to be cautious about applying the approaches of science diplomacy to innovation diplomacy. Acknowledging the wider range of players (and therefore interests and incentives) involved is a first step. These players include:

- national innovation agencies, which are playing a greater role as their initiatives become more internationalized;[22]
- companies, both large and small, with wide-ranging risk appetites as well as widely varied preparedness and commitments to corporate nationality;[23]
- philanthropic and powerful non-governmental organizations, such as the Bill & Melinda Gates Foundation; and
- new supranational or multilateral bodies—such as the EU's proposed European Innovation Council—which stem from a recognition that current science diplomacy initiatives do not meet the needs of small and medium-sized enterprises or provide sufficient support to scaling.[24]

Second, investment must be made in mapping, evaluating, and improving the toolkit of public programmes, exploiting what has been learned about successfully promoting open innovation in recent decades. Much of the focus of international economic relations to date has been on the overall enabling conditions, legal frameworks, and trade agreements, with efforts to connect individuals often limited to one-off workshops and trade missions. However, support to build relationships and trust over time can be critical to the success of innovation partnerships.[25] As Nick Rousseau, former Head of Innovation Strategy at the UK's Department of Business Innovation and Skills, points out, 'We need to build skills and relationships across governments to facilitate the human side of innovation diplomacy, including recognition of the extensive time and effort involved in reaching agreement about shared priorities across such a diverse range of stakeholders and perspectives.'[26]

Given what has been learned about the complementary investments in innovation required to exploit R&D spending (such as design, organizational learning, and training),[27] innovation diplomacy initiatives should not be limited to forging R&D partnerships.

Indeed, one of the most valuable aspects of innovation diplomacy initiatives could be to improve the quality and flow of information to companies, universities, and policy makers about the new opportunities and dynamics of innovation around the world. By now, the tropes of globalization are entirely familiar: these include the emergence of transnational production and innovation chains; the growing flows of people, goods, money, and ideas through multiple networks; the shift of economic and hard power towards new strategic centres; and the growing importance of soft power, culture, and people-to-people connections in shaping the evolution and performance of different communities. Policy makers and companies are getting used to the idea that disruptive technologies and business models could arise from and be exploited by any number of emerging innovation hubs. There is constant analysis of what these new forms of power mean—from social media storms that could topple dictators to new business models and methods that range from Uber to 3D printing that might eclipse existing industries. Yet this analysis veers from wildly romanticized to dangerously underestimated. Innovation diplomacy efforts could support a more balanced analysis that helps companies and other stakeholders make better strategic decisions about innovation investment and collaboration around the world.

Third, and finally, if 'what gets measured gets done', it is important to ensure that the right things are being measured. That has implications for how innovation diplomacy efforts are tracked and evaluated. Policy makers need to invest in their theory of change for innovation diplomacy, and they need to get far better at articulating desired goals and outcomes. Standard metrics such as joint publications and joint patents are only one part of the story of judging the impact of collaboration, while even metrics like the number of joint ventures agreed are in danger of being lagging indicators that provide information only at an advanced stage. What is required is to see how

relationships are blossoming early on, in real time, using innovative sources of data such as web scraping, social media, and collaboration platforms (such as GitHub in software development)—these better reflect the wider intangible investments in relationships beyond formal R&D, and thus eventually lead to successful innovation outcomes.

Notes

1 Royal Society, 2010.

2 Royal Society, 2010.

3 Royal Society, 2010, p. 2.

4 See G7 Germany, 2015; the International Network for Government Science Advice, available at http://www.ingsa.org/; and UNESCO, 2014.

5 Wilsdon et al., 2013.

6 Bakhshi et al., 2011.

7 Atkinson, 2013.

8 Information about MATIMOP is available at http://www.matimop.org.il/bilateral.html.

9 U.S. Department of State, 2015.

10 Information about Fraunhofer is available at http://www.fraunhofer.de/en/institutes/international.html.

11 Australian Government, 2012; Bason, 2014; Bentley, 2104.

12 Beeson, 2013.

13 Information about Mission Innovation is available at http://mission-innovation.net/.

14 BIS, 2011, p. 2; BIS, 2012—see Figure 24, p. 34.

15 Nesta's Innovation Policy Toolkit articulates a range of case studies of the Science and Innovation Network's efforts in innovation diplomacy. See http://www.nesta.org.uk/innovation-policy-toolkit.

16 See the UK government's Cross-Government Prosperity Fund, available at https://www.gov.uk/government/publications/cross-government-prosperity-fund-programme.

17 Simon, 2012.

18 Bound et al., 2013.

19 Breznitz and Murphree, 2013.

20 Shambaugh, 2013.

21 Segal, 2011.

22 Glennie and Bound, 2016.

23 Jones, 2006.

24 Information about the European Commission's Research & Innovation website and its 'Designing a European Innovation Council: A Call for Ideas' is available at https://ec.europa.eu/research/eic/index.cfm.

25 Reid et al., 2015.

26 Private communication from Nick Rousseau, BIS, March 2016.

27 Information about Nesta's Innovation Index project is available at http://www.nesta.org.uk/project/innovation-index.

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Local Needs, Global Challenges: The Meaning of Demand-Side Policies for Innovation and Development

Jakob Edler, Manchester Institute of Innovation Research, Alliance Manchester Business School, University of Manchester

In very generic terms, 'innovation policy' is traditionally conceived as a way to support the capability of countries or regions and their innovation systems in producing novelties and putting them to use. The academic and political debate about innovation policy has focused for decades on supporting the generation of innovations. This is best illustrated by the concepts and indicators used to assess and compare the innovativeness and competitiveness of countries, which concentrate primarily on supply-side conditions, activities, capabilities, and interactions. Moreover, innovation policy rationales and policy instruments have been developed mainly in the context of developed countries.

This chapter argues that this traditional take on innovation policy severely limits its potential to deliver innovations across the globe, in particular in developing and emerging countries. It suggests that attention should be paid to demand and the demand conditions for innovation, and that the conditions of developing and emerging countries should be taken firmly into account to make a difference at national and international levels. In doing so, the chapter introduces the concept and rationale of demand-side innovation policy and links it to the debate on innovation policy for development.

Demand-side policies: Justifications

The function of innovation is threefold, and it is an important starting point to stress that for all three of these functions the understanding and support of *demand* is essential.

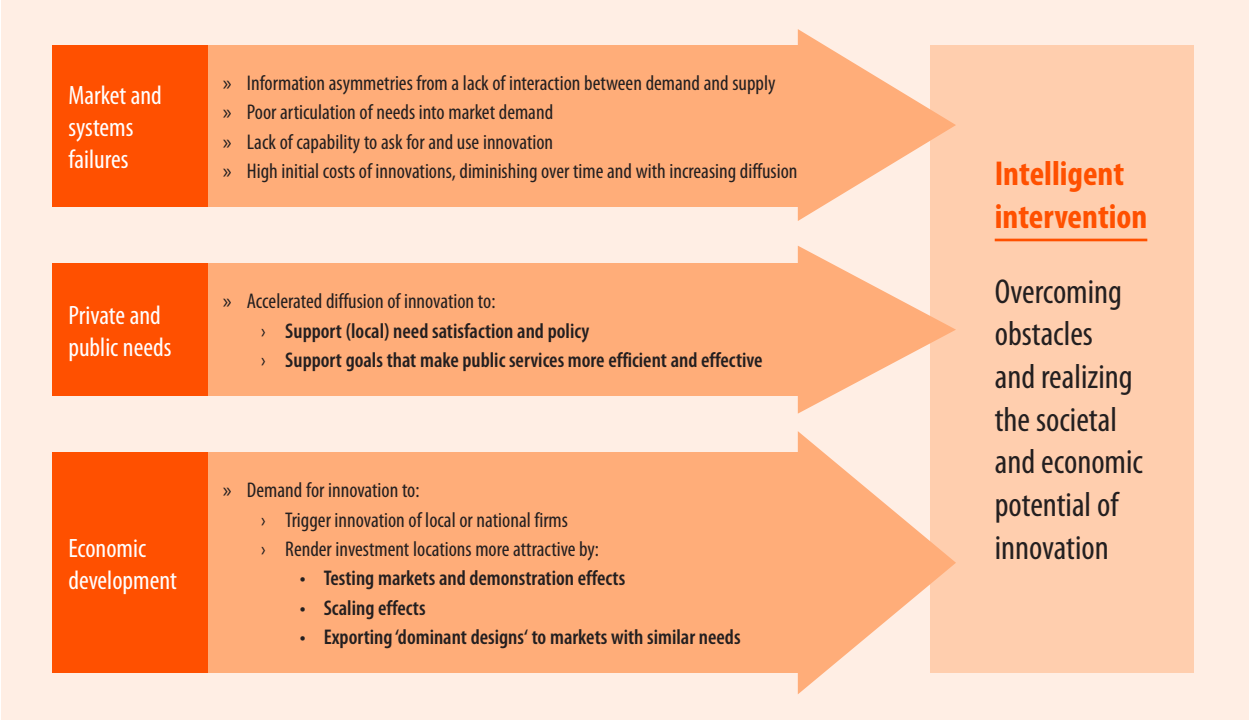
The first function of innovation is to *drive economic development,* which in terms of policy and analysis—despite many regional and even city-wide approaches—is still largely associated with the nation state. It is critical to note that the economic dynamics of countries depend as much on *demand*—that is, on the speed of adopting and absorbing innovations—as they do on the generation of innovation itself.[1] In fact, for considerable time economists have regarded favourable conditions for innovation diffusion as the most important driver for economic development.[2] The constructive role of lead users in testing, further improving, or even co-generating innovations is an essential element of these favourable demand conditions.[3] Thus systems with an advanced demand for innovation offer better context conditions for firms to invest in innovation, often leading to export advantages as international demand catches up.[4] This can be seen in a broad innovation survey, where European companies indicated that uncertainty in the demand for their innovations is the major obstacle for innovation and demanded support on the demand side—rather than for their own research and development activities.[5]

Second, innovation systems need to help *satisfy national and local needs*. In market economies, needs are fulfilled only if they are articulated as *demand*—that is, as signals to potential suppliers to buy for a certain price. Innovation systems are of limited legitimacy if the innovation they offer cannot respond to the needs of their own populations—that is, if they are not orientated towards local demand.

Expanding this understanding of innovation as serving needs on the global scale leads us to the third function of innovation: Innovations are essential for *tackling the big global challenges*. However, simply producing ever-more sophisticated technologies that are not rolled out broadly and globally will not be sufficient to tackle global challenges such as the reduction of carbon emission. For that to happen, broad diffusion and application of innovative energy-efficient products and processes are required. This means that *demand* must be articulated and must connect with supply, and potential buyers and users must be able to understand and use innovations that address the challenges defined.

Although demand capabilities and conditions are important for all three innovation functions, for a very long time they have not received due attention in innovation policy discourse and practice.

Figure 1: Justifications for innovation policy intervention on the demand side



Despite acknowledging the importance of demand, neoclassical economists are in general still very sceptical about policy that supports demand for innovation, claiming this to be a counterproductive intervention into market forces. However, three sets of justifications for policy interventions that tackle the demand side exist (see Figure 1).[6] First, numerous market and system failures occur on the demand side and between demand and supply. Often innovations are not bought and used because of a lack of information about their added value or because of a lack of capabilities to use them. Furthermore, needs are sometimes poorly articulated, and thus suppliers are not aware of a potential demand for solutions they could provide. Moreover, innovations are initially often too costly for potential users. All of those failures turn into a policy problem if the diffusion of that innovation would greatly add societal benefit.

A second set of justifications is genuinely political and refers to the orientation towards needs and grand challenges: it is a prime task of the state to provide solutions to societal problems and to support the satisfaction of societal needs, at local and global levels. Measures to increase the deployment and diffusion of innovative solutions can significantly contribute to that purpose. Finally, there is an immediate economic argument. The academic literature has shown the positive effects of forefront demand for innovation on the attractiveness of locations as places to generate innovation.[7] Local and national firms thrive when they are co-located with consumers or firms willing and able to buy and adopt their innovations, and those firms in countries with leading-edge demand tend subsequently to export their innovations to foreign markets. Support on the demand side can thus be a means of intelligent industrial policy that is, at the same time, linked to societal needs.

Demand-side policies: Instrumentation

The demand-side instruments available for the state are numerous, but they can be classified into five groups where strategic demand-side approaches can combine those measures and ensure that corresponding supply-side measures are in place:[8]

- The state can act as *buyer*. The most direct leverage for the state is public procurement of innovation, whereby the state *strategically* decides to invest in innovations that help to satisfy societal

demands or make public services more effective and efficient.

- The state action can apply so-called *price-based measures*. Subsidies or tax allowances reduce the price for innovations in their early stage in order to set in motion a virtuous cycle of diffusion and cost reduction through economies of scale.
- There are numerous non-financial measures by which the state can *improve the capabilities and readiness* of potential customers to buy and use an innovation. Those instruments include awareness measures, labels and demonstration projects to build up trust in innovations, and education programmes designed to enable consumers and firms to use innovations effectively.
- The state can support the *articulation of needs* (e.g., through needs-based foresight activities);[9] translating those needs into signals of demands for innovation is important to direct innovation activities towards demands.
- The state can support the *user* of innovation in *generating or co-generating innovation,* including so-called social innovation initiatives.

Existing evidence has shown that the design and deployment of demand-side measures to stimulate innovation is challenging, but it can have a considerable impact on innovation generation and especially on innovation diffusion.[10] In many countries in the Organisation for Economic Co-operation and Development (OECD), a re-orientation towards demand-side rationales and instruments has begun.[11] It is not yet clear whether this signals the beginning of much more directionality and societal orientation in innovation policy in the OECD world, which would necessitate a more radical shift in the governance of innovation policy.[12] What is clear, however, is that just as in the OECD world, developing and emerging countries would equally benefit from such a shift in their innovation policy. A shift towards the demand side could link the local and national development agenda much better to the innovation agenda. In fact, such a shift towards recognizing and supporting the demand for innovation is urgently needed on a global scale for innovations to make a speedy and recognizable impact on local needs, global challenges, and economic development.

A demand-side rationale for innovation-based development

The vast majority of scholars working in science, technology, and innovation (STI) policy in developing countries agree that traditional supply-side STI policy has failed to deliver economic development, and in particular has failed to include the poor.[13] One major problem identified is governance failure and a lack of policy and governance models appropriate for innovation policy in emerging (and developing) countries.[14] The argument put forward in this chapter is that the concept of innovation has to be broadened, and that the rationales and instruments of demand-side policies need to be further developed and deployed broadly across the developing world to support and increase the generation and diffusion of innovation for the benefit of local *and* global needs. This broader approach will open up new opportunities for South–South trade between countries with similar needs and capabilities. This could contribute to an uplift of innovation capabilities in the developing world that could turn a vicious cycle of innovation dependency into a virtuous cycle of contributions to global innovation. At the same time, the development and rollout of demand-side innovation policy for developing countries would be an opportunity to experiment with policy support measures and to expand the toolbox of demand-side innovation policy itself.

As mentioned above, traditional STI policy for developed as well as developing countries is built on the paradigm according to which innovation is mainly a result of scientific knowledge and technologies employed; in this paradigm, actors and entire innovation systems learn through the spread of scientific and technological knowledge. However, countries with poor scientific and technological capacities rely largely on alternative forms of learning and innovating. As Lundvall, among many, has stressed, there are other forms of learning: 'learning by doing, using and interacting'.[15] In fact, even in developed countries, the bulk of innovation generated and diffused is not based on scientific knowledge. Therefore the ability to learn by using and doing is important. Support for this ability is a major pre-requisite for the absorption and diffusion of innovation in the economy and in society more broadly. Zanello et al. (2015), in a broad review of evidence on innovation diffusion, claim that the transfer, adoption, and adaptation of knowledge to low-income countries '… constitute an important issue to understand and promote economic growth and global development …'.[16] However, a range of specific obstacles exists for developing countries—in particular, the lack of absorptive capacity for products that are often not originally designed for those countries' specific local needs.[17]

All this calls for capability building on the side of the users to improve the ability to use innovations;[18] for more awareness and communication about innovation supply and need; and, finally, for more emphasis on the generation of innovation by those who need it themselves.

Consequently, a demand-side innovation policy approach for developing countries would start with their specific need for innovation and the particular ways in which they would use it. This would link to and build on existing approaches of 'inclusive innovation',[19] 'inclusive development',[20] and 'innovation for inclusive growth'.[21] Those approaches should *not* be seen merely as 'innovations for the poor',[22] but rather should be understood as an opportunity for major change in innovation policy development, based on a 'radical shift in how we think about innovation'.[23] All those approaches start from the premise that local needs often cannot be satisfied through existing, mostly international, supply. Instead, initiatives are needed that are seen as directly contributing to local and national 'problem solving';[24] such initiatives involve those who have the need, include them in the development of innovation, and—ideally—support the scaling up of those inclusive innovations for diffusion within and between countries for a global spread.[25]

Mobilizing demand-side instruments for innovation-based development

To trigger those innovation-oriented approaches, demand-side innovation policy approaches as outlined above can be mobilized. Three examples can illustrate this approach. First, in line with the demand- and need-driven paradigm of innovation policy, the starting point should be to foster the *articulation* of needs. This articulation can take advantage of foresight techniques. Existing foresight processes all too often focus on the development trajectories of new technologies and how they could be deployed in developed and developing countries. But foresight can be need- and challenge-oriented, can include users at all levels of society, and can focus on (future) needs and jointly explore creative ways in which those needs can be satisfied.[26] On that basis, needs can be translated into research and development activities.[27] Those exercises could be performed jointly by countries with similar conditions in terms of economic development, socioeconomic context, geographical conditions, and so on. International need-driven foresight can unearth commonalities between different regions in a country or between different countries, allowing for synergies in innovation generation and developing markets for innovation that are attractive to providers. Thus groups of countries or global or regional international organizations could employ joint 'need-and-solution' foresight activities.

A second way to start innovation development and deployment with local needs is illustrated by the impressive Massachusetts Institute of Technology (MIT) D-Lab. This initiative supports concrete, need-driven innovation activities of users and, in order to ensure rollout, assists in the capacity building for the actual use of bottom-up innovations as well as the build-up of global networks. Since 2011 the MIT D-Lab has been rolling out a programme intended to scale up and transfer proven solutions, cooperating with a range of national and international organizations with a wide reach in similar contexts.[28] Again, there is no reason why scaling up and good practice should be confined to specific localities or nations.

Third, public bodies can think creatively about the way they procure. The idea of procurement of innovation as a policy means to foster innovation has been discussed in the OECD world for a number of years now.[29] The organizational and institutional obstacles to asking for and buying innovation in the public sector are high in any country, because public purchasing is often averse to risk taking, learning, and engaging with suppliers.[30] In addition, many emerging and developing countries also endure a high level of corruption and low level of trust in public procurement. However, as a current study for the Inter-American Development Bank has shown, there are opportunities in emerging and developing countries to define local needs and engage with suppliers in ways that increase the likelihood of producing meaningful innovations for the public sector. As that report notes, a trend of considering the use of public purchasing for locally meaningful innovation is emerging,[31] whereby the initial purchase of an innovation can serve as a trigger for broader diffusion and adoption in the private market. In some cases, initial supply may come from foreign firms, but the practical application and modification of innovation in a local context leads to innovative processes and products in local supply chains, to learning, and eventually to added value activities across the economy. Furthermore, if public bodies define needs locally in consultation with public and private users as well as potential suppliers, the local production of innovation and/or the co-generation of innovative solutions is more likely to follow.

Conclusions

This chapter argues that the debate on development, frugal innovation, and innovation for developing and emerging countries should be linked with a broader discourse on innovation policy that focuses on needs and the demand conditions for innovation. There is a good social and economic justification for innovation policy for the demand side, and this justification is even more compelling for developing countries. Innovation policy is not only about the immediate economic effect of who supplies the innovation in the first instance, but also about contributing to development and need satisfaction through diffusion. Innovation generated on the basis of demand measures is much more likely to satisfy local needs and enable learning across societies.

Besides, the adoption and use of innovation in a country is economically beneficial not only through the use of the innovation. Because policy starts with needs and demands articulated in the developing country, the likelihood that the generation of innovation happens in the country is higher because users have to be involved or mobilized. Furthermore, the supply of innovative solutions through international firms also tends to trigger innovative adaptation on the local supply side, and local suppliers and service providers upgrade and adjust their skills. A whole range of policy instruments is available to support the articulation of demands and the co-generation of innovation between suppliers and users, as well as the uptake and diffusion of innovative solutions that work in a given context. Policy activities should thus focus much more on the combination of satisfying local needs and generating innovative solutions.

Those measures are not confined to local or national contexts only; rather, they can be deployed also at the international level. Markets for innovative niche solutions can be scaled up if a cross-national awareness about similar needs and corresponding solutions is actively created. International policy can focus on joint foresight activities, on exchange of good practice, on supporting the scaling-up activities, and on supporting South–South trade opportunities for locally produced solutions that satisfy similar needs in other locations.

In the end, the support measures outlined above would enhance the ability of populations and systems in developing and emerging countries to develop innovation themselves, for their own needs and for the needs of others. In doing so they would also help the diffusion of innovation across developing countries and make it more attractive for international suppliers to modify their products to better fit the local needs. Only the combination of international supply and local production of innovation as well as active demand-side policies will lead to the scaling up of diffusion and use of appropriate innovations needed to make a real global difference.

Notes

1 Di Stefano et al., 2012.

2 See, for example, Freeman, 1994.

3 Flowers et al., 2010; Herstatt and Von Hippel, 1992; Von Hippel, 1976, 1986.

4 Beise, 2004; Beise-Zee and Rammer, 2006; Meyer-Krahmer, 2004.

5 Gallup, 2011.

6 See also Edler, 2010; OECD, 2010.

7 Beise, 2004; Quitzow et al., 2014.

8 This typology builds on and expands the typology put forward in Edler, 2010.

9 'Foresight' can be defined as 'a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at enabling present-day decisions and mobilising joint actions' (FOREN, 2001, p. v).

10 Edler, 2016.

11 Izsak and Edler, 2011; Izsak and Griniece, 2012; OECD, 2011.

12 Edler and Nowotny, 2015.

13 Arocena and Sutz, 2012; Cozzens, 2014; George et al., 2012; Padilla-Pérez and Gaudin, 2014; Zanello et al., 2015.

14 Kuhlmann and Ordonez-Matamoros 2016, forthcoming.

15 Lundvall, 2010.

16 Zanello et al., 2015, p. 2.

17 Chataway et al., 2014.

18 Chaminade et al., 2009.

19 Arocena and Sutz, 2012; Chataway et al., 2014; Heeks et al., 2014; World Bank, 2010.

20 Cozzens, 2014; George et al., 2012; Johnson and Andersen, 2012.

21 Bresson et al., 2015; George et al., 2012.

22 World Bank, 2010.

23 STEPS Centre, 2010, p. 2.

24 Cozzens, 2014.

25 OECD, 2015.

26 George et al., 2012.

27 Cozzens, 2014.

28 See https://d-lab.mit.edu/scale-ups/overview.

29 OECD, 2011.

30 Uyarra et al., 2014.

31 Munoz et al. 2016.

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Becoming a Global Player by Creating a New Market Category: The Case of AMOREPACIFIC

Hyunjee Hannah Kim, Seoul National University

Jeehye Jennifer Rho and **Seonjoo Lee,** AMOREPACIFIC

Jaeyong Song, Seoul National University

Innovation has long been viewed as a source of sustainable competitive advantage for a firm.[1] However, innovation has become a core challenge for many organizations because they face ever-increasing levels of competition and rapid changes in technology.[2] In most technological sectors, firms in developed countries such as the United States of America (USA), Japan, and some countries in Europe have accumulated technological capabilities for many years and are now recognized as global technology leaders. Firms in emerging economies are behind these incumbent leaders. However, recently a few leading firms in emerging economies have rapidly developed their own technological capabilities and transformed themselves into innovators so that they could catch up with incumbent leaders in developed countries and globalize successfully.[3]

AMOREPACIFIC, which has been the number 1 beauty company in the Republic of Korea (Korea) for more than 70 years, provides an excellent case study of an organization that has globalized through innovation (see Chapter 7 about another organization—MasterCard—involved in radical innovation). Because AMOREPACIFIC's market originated in Korea, which comprises only 3% of the global beauty market, this remarkable growth could not have been achieved without the successful implementation of a series of innovations. AMOREPACIFIC, recently making the quantum leap from a regional to a global player in the cosmetics industry, built its business and brand both in domestic and in overseas markets by continuously creating new product categories. The most important of these, and the one that has propelled AMOREPACIFIC into the global arena, is the cushion compact.

The cushion compact is a new type of face makeup product that integrates coverage, UV (ultraviolet) sun protection, cooling and sweat-proof properties, and moisturizing benefits in a special sponge that is soaked with liquid foundation and stored in a double-sided airtight container. This product is more than a simple upgrade of previously existing face makeup products: it is an example of a breakthrough innovation that created a whole new category. By meeting customers' unmet need for convenient, quickly applied, and flawless face makeup, AMOREPACIFIC created a new market category in face makeup that, in turn, allowed it to gain a prominent position as an innovator in the global cosmetics market. Its success has led other global industry leaders to launch their own cushion compact products at a later point in time, following AMOREPACIFIC's lead.

In most studies, innovation is considered to be a generic concept rather than a process consisting of two distinct stages: the creativity stage, which generates new ideas; and the implementation stage, which successfully implements those creative ideas.[4] This chapter will consider the example of AMOREPACIFIC's successful transformation into a global player by investigating the company's breakthrough innovation and analysing it in terms of these two stages. It will also examine the new challenges the company is facing as it grows its presence in the global cosmetics market.

Creating a new market category and new customer value proposition

Christensen's concept of 'disruptive innovation' considers that success starts not by thinking about new business models but rather by thinking about the opportunity to satisfy 'a real customer who needs a job done'.[5] In order to be successful, a company must determine how to create value for customers—that is, how to solve a problem faced by a particular group of customers. Once a company understands the scope of the 'job' (the problem faced by the customer) and the process for solving it, it can then design a new product to meet those needs. In general, the larger the problem and the lower the level of customer satisfaction with current options for solving it, the better the company's new solution will appear compared to existing products. Without creating

a new customer value proposition, sustainable innovation could not be achieved.

AMOREPACIFIC was able to create a new customer value proposition by understanding the lifestyles of their customers and discovering their unmet needs instead of focusing solely on customers' patterns of using existing cosmetic products. The company is known for its vertically integrated channels and its variety of sub-brands. Together these allow the company to cover all points of contact with customers in the domestic market. These include places where customers and AMOREPACIFIC interact, from department stores to home shopping and e-commerce; they also include different customer segments, from luxury to mass market buyers. AMOREPACIFIC has built and operates a Customer Strategy Team that collects and analyses quantitative data and a Beauty Research Team that studies qualitative data through these multiple avenues.

The findings of these teams included data on the number of beauty products regularly used by most Korean women and the time they spent in applying those products. The teams also found that the majority of women customers have become aware of the need for convenient and frequent applications of face makeup products with UV protection.

Based on the data it collected, AMOREPACIFIC was able to engineer a new product that addressed the unmet needs of its customers and changed the way they regard beauty products. The cushion compact itself is a face makeup product that serves several functions, sold in a unique container that makes carrying and applying makeup easy. The cushion compact not only dramatically reduced the time needed to apply cosmetics (shortened, on average, from 13 minutes to 7) and the number of base makeup products needed (on average, from 2.2 products down to 1.7), but it also addressed customers' desire for convenience while providing sufficient coverage. Moreover, the greater convenience encouraged those who did not typically use face makeup to try it, resulting in an expansion of AMOREPACIFIC's customer base. By solving an important problem for busy working women in modern society, the cushion innovation created a new market category, both replacing and expanding an existing face makeup category in the beauty products market.

Supporting systems for idea generation and implementation

Based on earlier work by Christensen and his colleagues, Johnson et al. argue that once a customer value proposition is clearly identified, it is important to align it with key resources and processes to generate a successful business model.[6] Innovation in organizations may progress through stages,[7] and scholars have shown how different organizational systems are required for two stages of the innovative process: idea generation and implementation.[8] AMOREPACIFIC was able to maintain success by supporting the innovation of their new products by implementing appropriate organizational cultures and processes at the proper times during the innovative process.

Psychological safety in the idea generation phase

Recent literature reviews on innovation support the concept that team climate has significant influence on the generation of creative ideas.[9] This is because innovative ideas are generated when individual thinkers within the organization exchange risky and novel ideas.[10] A supportive team climate is critical for individuals to feel comfortable sharing and developing their ideas. Edmondson (1999) defines this team climate as one of 'psychological safety': a shared belief that a person is safe to take (interpersonal) risks. Furthermore, psychological safety is closely related to innovation in various work environments: it leads to the belief that mistakes and errors are tolerated and accepted, which in turn enhances an individual's cognitive capacity and perceived instrumentality. Tolerance and the acceptance of mistakes reduce cognitive load and enhance relative cognitive capacity.[11] When psychological safety is elevated, uncertainty and anxiety about performance are assuaged and thinking can shift to enable the search for innovative ideas. In addition, tolerance and the acceptance of mistakes encourage perceived instrumentality, which Malka and Covington (2005) define as an individual's recognition that his or her current behaviour is instrumental to achieving a valued future goal. In short, individuals are more likely to be motivated to engage in generating and implementing innovative ideas when perceived instrumentality is high and they are in a psychologically safe environment.

In the case of AMOREPACIFIC, after the company determined the unmet need for convenient, flawless face makeup that includes UV protection, it still had to find the right solution. The idea of the cushion compact was first developed by a research and development (R&D) staff member. Motivated by noticing how the ink in stamp pads does not flow, thus allowing it to be evenly stamped, he suggested that the company develop a technology

to control liquidity as ink stamp pads do. Without a psychologically safe company culture, this somewhat wild idea from a lower-level R&D researcher would not even have been put forward. However, the organization encouraged him and his team to develop this idea, so they tested different types of sponges made from a wide range of materials. After over 1,000 hours of brainstorming sessions and more than 3,600 tests, he and his team were able to develop AMOREPACIFIC's current cushion product, which features a new type of cell-trap technology. The cushion has an airtight container that utilizes specialized expandable urethane foam and provides newly developed UV protection, low viscosity, and many traditional benefits of face makeup.

Less hierarchy and more cross-function

Having articulated a value proposition for the customer and generated a business model, companies must next consider the key processes needed to deliver that value.[12] Developing a new product with a new technology requires sharing detailed processes between various departments within the company. Hulsheger et al. (2009) emphasize that meta-analysis of the factors impacting innovation and process-relevant variables, such as task orientation and communication, are more important in generating innovative performance than key resources such as team composition.

The case of AMOREPACIFIC is unusual because it defies its cultural norms. Traditionally, large Korean companies tend to rely on hierarchical, isolated working processes in which everybody has a place and these processes need no justification to manage organizations efficiently. Most organizations in Korea are structured with a hierarchy of six to ten levels. AMOREPACIFIC, however, successfully supported the innovation process by creating a working process structured for a flatter hierarchy and increased cross-functionality. It structured its corporate culture with only four hierarchical levels: executives, leaders (team or project leaders), professionals, and associates. Additionally, all employees refer to one another by name only, as opposed to the name-and-status designation used in most other Korean companies.

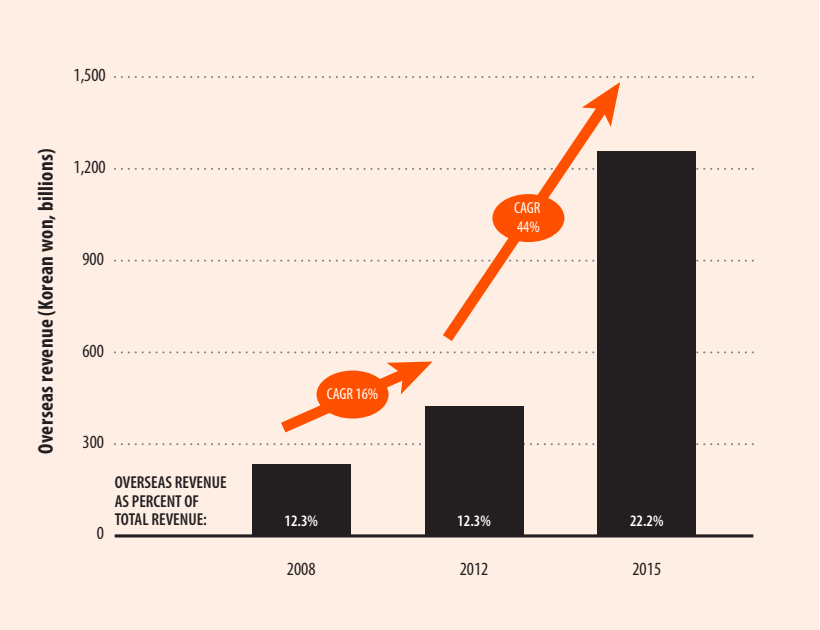
This less hierarchical structure has enabled the organization to be more fluid and flexible to foster cross-functional collaboration. Product ideas are often shared freely between members in different departments—such as marketing, R&D, and supply chain management (SCM), which covers materials procurement and package development. When the cushion idea was first developed by R&D department staff members, a collaboration network was established consisting of members of the R&D, marketing, design, and SCM departments. All aspects of cushion product development—including testing more than 200 types of sponges and conducting more than 3,600 tests with employees and customers—were made possible through this collaborative network. Collaboration among departments made it possible for AMOREPACIFIC to understand customers' needs and receive customer feedback, as well as to implement those findings into high-level technological development.

Culture of endurance

Christensen and his colleagues show how difficult it is for large companies, which have secured sustainable or strong profitability with their current business, to adopt disruptive innovation strategies because disruptive innovation may dilute current profitability and usually results in lower profit margins.[13] Discovering new customers, manufacturing products with new and different technology, and creating new channels to better access new types or segments of customers all contribute to low profit margins before a critical mass is achieved. Hence corporate support in the beginning of the process is essential to endure these low margins.

Interestingly, AMOREPACIFIC first developed the cushion compact in 2008 but it did not become a success in the Korean beauty market until 2011. Because it was very different from other existing face makeup products, customers needed to be educated about its benefits; furthermore, the cost of its materials was much higher than the cost involved in producing conventional products. Continuing to invest resources and effort in this product for three years, before it caught on, involved a high level of risk. However, even in the first three years after its launch, AMOREPACIFIC did not pressure the cushion team but instead encouraged them to try different channels to promote the new concept to the right customers. Because the cushion was an innovative product with a brand new concept, AMOREPACIFIC focused on explaining the concept and demonstrating its use. To increase product trials, the company explored various existing sales channels to interact with customers. It finally found success in television home-shopping channels. This medium turned out to be more effective than television advertisements, which are far-reaching but very brief (only 15 seconds). Despite the cushion's lack of profit during its initial three years, AMOREPACIFIC's culture of endurance allowed the new product

Figure 1: Revenue growth from the overseas market



Source: AMOREPACIFIC internal data.

to be nurtured through different trials until it achieved success.

Opportunities and challenges of globalization

Because disruption can take time, incumbents frequently overlook disrupters. Hence it is important to expand beyond the usual customer base before the product can become commoditized by the established global players.[14] AMOREPACIFIC is in the process of bringing the cushion compact to global markets, and is successfully expanding its presence in other Asian countries and North America. Its sales from the overseas market increased sharply at a 44% compound annual growth rate (CAGR) between 2012 and 2015, compared to 16% CAGR from 2008 to 2012 (Figure 1). The Bloomberg Billionaires Index has named the company the biggest market value mover over the past 12 months (Figure 2).

'K-Beauty'—an umbrella term for all Korean cosmetics—has been attracting fans in global markets;[15] with global interest in K-Beauty, AMOREPACIFIC is in the forefront of the K-Beauty trend. By introducing the cushion category to the global market, AMOREPACIFIC has been able to establish its position as a global innovator and raise interest in K-Beauty.[16]

Communicating to global customers

A product may be successful in a domestic setting but it is not necessarily easy to present it in an international one. In AMOREPACIFIC's case, seeing the success of its cushion compact in the Korean domestic market, the company's top management believed that the innovative product would not only be able to capture global customers' unmet need of fast, convenient, and flawless face makeup but would also be able to fortify the company's brand as innovator. However, communicating the concept and benefit of this new product to global customers was not an easy task, especially given the still-small business scale of the company in the overseas market. Unlike in Korea, where the company enjoys top-level brand awareness and customer loyalty, the company's brands were not widely known to the broad base of customers in foreign markets. AMOREPACIFIC's marketers faced the challenge of converting customers from using the conventional makeup products of well-known brands to the new and as-yet unknown cushion product from a less well known, Korean brand. Furthermore, it had a limited budget compared to the budgets of established global players.

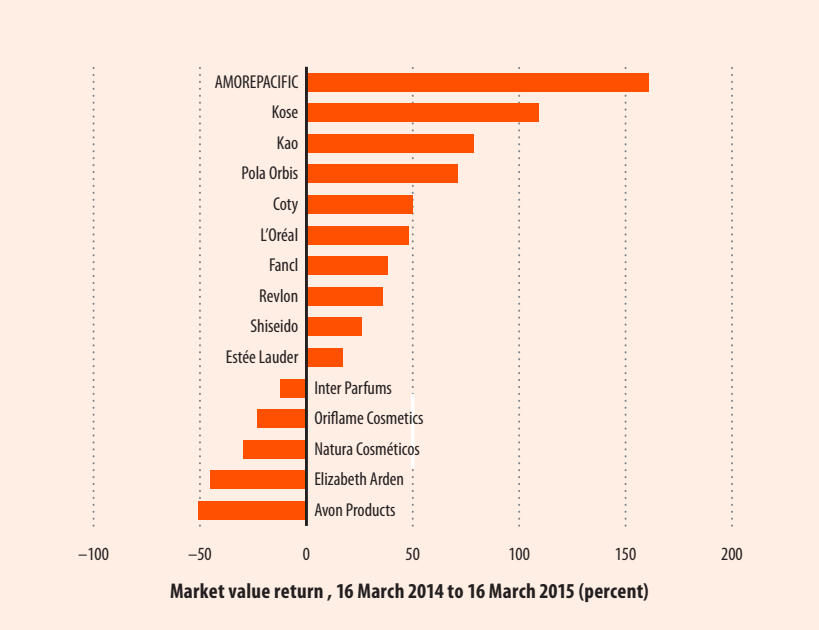
To attract global consumers quickly and efficiently, AMOREPACIFIC is aggressively leveraging digital marketing channels rather than traditional marketing ones. For instance, through YouTube, Instagram, Facebook, Weibo, and WeChat, it has been focusing on expanding communication with customers not only by promoting its products but also by explaining how to use the new cushion compact and sharing educational tutorials. Internally, AMOREPACIFIC has set up an in-house platform called the Digital Factory to support these digital marketing efforts by developing and distributing new digital contents in a timely manner.

Meeting local tastes

Beyond merely communicating with customers on a global scale about a new product, that product must be adapted to local tastes and circumstances in the new environment. For

AMOREPACIFIC, this means that it must customize cushion products with varying colours, moisture levels, textures, and different functions depending on the climate, culture, and practices of customers in each local market. For example, it is marketing the cushion compact with a greater emphasis on moisturizing and glow in the Chinese market to overcome the extremely cold, dry weather; at the same time, it is marketing a cushion compact with a more matte texture and dewy finish in the South Asian market. However, in order to expand its presence and compete successfully with other established global companies, it is important to accelerate localization. AMOREPACIFIC believes that building global R&D capacity to research local customers' needs and develop localized solutions is essential to sustain innovations in global markets and achieve localization. Besides its R&D in Korea, the company has built a local R&D centre in China and is strengthening R&D systems in other markets such as Southeast Asia and the USA.

Figure 2: Market value return over 12 months of the 15 largest cosmetics companies



Source: Based on Lee et al., 2015; data from Bloomberg Markets.

Sustaining leadership among global players

Although AMOREPACIFIC has been able to begin successfully expanding to global markets, several challenges remain. Most importantly, the company needs to remain competitive going forward. Established, competing companies in the beauty market began full-scale production of cushion products at a later point in time around 2015; others launched or will launch their own cushion products in 2016. Many of the established Western brands are aggressively marketing cushion compacts in overseas markets where AMOREPACIFIC has a comparatively small or no presence. Although AMOREPACIFIC can accelerate its first-mover advantage by upgrading its technology and appealing to customers as the company that originally created this market category, it will be difficult to maintain this status in the future as cushion product innovation becomes more commoditized.

AMOREPACIFIC recognizes this challenge and is trying to continue innovating in cushion compacts to stay ahead of the competition while continuing its global expansion. It is not only the first company that created this product category, but, with its accumulated knowledge of the product and technology, it can also provide the best cushion compact to its customers. The company's various brands have been introducing differentiated cushion compacts; some provide skincare benefits such as brightening and anti-aging in addition to the face makeup function, while others have a new package design to improve portability and ease of use. Through such innovation, AMOREPACIFIC is trying to sustain its leadership.

Moreover, AMOREPACIFIC plans to build on its experiences of innovation success with the cushion compact, applying the lessons it learned there to continue innovating so that it can bring another breakthrough innovation to the market.

Preserving creativity and flexibility

Globalization can have an impact on a company's structure and process. For AMOREPACIFIC, as it expands its business globally its organization and work processes are becoming bigger and more complex, leading to greater division of work, more specialization, and increased systematization. Such changes in organizational structure and work process make it difficult to maintain its particular advantage of flexibility, which originates in

its less hierarchical and more cross-functional working culture. In order to sustain its creativity and flexibility, AMOREPACIFIC is in the process of developing its global R&D organizations and systems that enable cross-functional collaboration. In addition, it is adopting various programmes to generate and incubate the next generations of breakthrough ideas.

Conclusions

AMOREPACIFIC is a highly successful Korean company that is in the process of making the quantum leap from a regional player to a global player in the cosmetics market. By creating the new market category of cushion compacts, AMOREPACIFIC has enabled global consumers to significantly reduce the time spent on applying base makeup and increase its ease, resulting in a significant, innovative change in face makeup culture. This achievement was possible because of AMOREPACIFIC's focus on understanding the unmet needs of their customers; its psychologically safe environment, which allows employees to voice and implement novel ideas; and a company culture that focuses less on hierarchy and more on cross-functional working.

AMOREPACIFIC's path to continuing its progress towards global player status depends on several factors: how it secures market leadership in the cushion compact market category in unexploited global markets; how it sustains its competitive advantage among other global players; and—possibly most importantly—how it maintains its flexibility around its growing, more structured organization. The company plans to continue bringing new innovations to the market by actively adopting digital media, strengthening local R&D, and building an organizational culture and system that fosters creativity and flexibility.

Notes

1 Song et al., 2003; Song, 2014.

2 Greenhalgh et al., 2005.

3 Song, forthcoming; Kang and Song, forthcoming.

4 Anderson et al., 2014; George, 2007.

5 Johnson et al., 2008, discuss Christensen's concept of disruption in the context of innovation. See also Christensen, 1997; Christensen and Raynor, 2003; and Christensend et al., 2105.

6 Johnson et al., 2008.

7 Rogers, 2003.

8 Choi and Chang, 2009.

9 Anderson et al., 2014; Hülsheger et al., 2009; Oldham and Cummings, 1996; West and Sacramento, 2012; Woodman et al. 1993.

10 Sutton and Hargadon, 1996.

11 Caldwell and O'Reilly, 2003.

12 Christensen and Raynor, 2003.

13 Christensen et al., 2015.

14 Christensen et al., 2015.

15 Wood, 2016.

16 AMOREPACIFIC sold more than 6.5 million units of cushion compacts in overseas markets in 2015, which is nearly 20% of its total cushion sales. It has expanded its footprint in more than 10 countries, with 13 brands and 19 different cushion products. Cara Song, the consumer product analyst at Nomura Securities in Korea, expects that in 2016 AMOREPACIFIC would become the number 2 company by revenue in the cosmetics industry in China—a huge leap from its current China rank of number 5 (see Lee et al. 2015). Although the global market offers great potential for AMOREPACIFIC and its cushion compact, expanding into the global market poses several challenges for the company.

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Radical Innovation Is Collaborative, Disruptive, and Sustainable

Garry Lyons, MasterCard, Ireland

We live in an age where technology and data capabilities are advancing at an unparalleled rate—faster than at any other time in human history—and presenting huge opportunities across every industry. This is sometimes called the '4th Industrial Revolution': Traditional industries are being transformed through technology, and everyone and everything are becoming digitally connected.

In terms specifically of financial services, this digital shift is the most significant transformation since the introduction of plastic credit cards. The pace of change is expected to accelerate over the next five years as it becomes possible for people to perform financial transactions using any device and through any channel.

As a leading global technology company in the payments and commerce industry, MasterCard is considering new solutions to improve financial services and looking for ways to innovate faster than ever before. The company has a vision of a world beyond cash; the digital revolution can ensure that every consumer will have access to a digitally enabled account.

Innovation surrounds us

Rapid technological change provides a constant wave of new experiences and opportunities across all aspects of society. These advances, coupled with the ever-growing number of connected devices, drive higher expectations from consumers, banks, and merchants alike. The result is a continued push for improvement.

By 2020, there will be an estimated 50 billion connected devices,[1] fueling the ability to provide transformative benefits to companies of all sizes as well as benefits to consumers looking for increasingly personalized products and experiences that make their lives easier.

Innovation is no longer viewed as 'nice' but not essential. Nearly 75% of US private company executives today say that innovation is as important to the success of their companies as effective operations.[2] Those who invest in innovation will position themselves to effectively meet evolving consumer and industry needs and defend themselves against the risk of being left behind (see Chapter 6 for an example of a company that invested in innovation and successfully leveraged itself into a global enterprise).

Looking at the future with a fresh perspective

To leverage the company's rich history of innovation, MasterCard Labs was established in 2010 as a way to invest its resources in innovation. MasterCard currently serves 2.3 billion cardholders and is connected to 40 million merchants in 210 countries. It works with 150 currencies across a worldwide network of partners within the financial community.

The company's Chief Executive Officer, Ajay Banga, recognized the opportunity to look at the future with a fresh perspective through the MasterCard Labs. The aim of the Labs is to help to create new products, to identify problems and determine solutions, and to foster a more innovative culture. Together, these perspectives have enabled customers and partners to innovate more effectively.

The workforce in MasterCard Labs often includes people who may not have had direct experience in the industry. That is an intentional configuration. The company benefits from bringing in smart, creative, passionate people who provide unique insights into new ways for MasterCard to evolve, unencumbered by traditional concerns or expectations.

Innovation without execution is mere ideation

Real innovation—disruptive, radical innovation—occurs when innovators *take risks, try lots of things, and fail smart.*

The 'fail smart' mantra is a key part of the MasterCard Labs culture. One of the company's roles is to go 'beyond the payment' by identifying and developing solutions that expand the company's presence in the commerce space. No one wakes up excited about making a payment. Payments are one part of much richer consumer

experiences that address needs before, during, and after a transaction.

Countless examples illustrate instances where going beyond the payment helps drive a better payment experience for both the consumer and the retailer. The *Pay at Table* solution, launched initially in partnership with the United Kingdom (UK) restaurant chain wagamama, is one such example. wagamama came to MasterCard with specific issues that, if resolved, would improve the customer's experience. They wanted to improve the dining experience for every one of their customers by removing friction from the ordering and payment process. Speeding up that process would not only allow wagamama to make their customers happier, but would also allow them to boost revenue by turning over the tables faster, thus allowing for more customers. The *Pay at Table* application, now live across the UK, is an example of an approach to improving the customer's entire experience that also has the effect of simplifying the payment.

Delivering value for only the consumer or only the retailer will mean that the solution will not take off at scale—such a model is not going to resonate. The most successful innovations are of almost equal value to both parties. They create great experiences for consumers and merchants alike.

This approach highlights the importance of partnering to find insights that stimulate innovation. The more stakeholders who have a voice, the more relevant and 'real world' the innovations will be. Good ideas can come from everywhere and from anyone: business units, employees as individuals, customers, partners, universities, start-ups, developers, and more.

MasterCard's appetite for innovation is driven by the need to provide better service for its customers in ways that make their lives simpler or more convenient. In building for that future, the innovators at the company are not afraid to fail—but failing should be a quick process, before significant investment has been made in the failed innovation. Furthermore, that failure should provide a learning experience, so that the next innovative effort is stronger and will not repeat the mistakes made. That is truly failing smart.

Repeatable innovation

Innovation is not the result of luck. It rarely comes out of unfocused ideation. It requires structure and it needs to be continuous. It needs to be encouraged, developed, supported, and rewarded—and then the process needs to be repeated all over again.

Although structure and process might seem strange for innovation, MasterCard Labs views that discipline as critical to ensuring quick iteration and a clear path to scaling any ideas that show potential.

The Lab's innovation programmes are extensive and straightforward. They combine the best-in-class methodologies, efficient structures, and proven techniques—and they guide the innovation journey. They are also an effective way to leverage one of the company's greatest assets—its people—to generate new innovations.

Examples of these programmes include the Innovation Express, Involve, and IdeaBox; each is described below.

- **Innovation Express.** This is a two-day round-the-clock innovation competition designed to go from problem to solution in less than 48 hours. Cross-functional teams start with a very specific problem statement and compete to come up with a fresh, credible solution to the challenge. They then turn that solution into a prototype, business plan, video demonstration, and go-to-market plan. Each team pitches to a select group of skeptical judges—representing the voice of the customer—who pick the winning solution.

- **Involve.** Involve is a high-profile company-wide competition where teams of MasterCard employees identify truly unique solutions to win the chance to see their solutions brought to market as an actual MasterCard product. Teams work together outside of their day jobs to develop transformative product ideas with the potential for commercial success. Throughout the competition, teams are required to go through specific qualifiers where they present their prototypes, business cases, and go-to-market solutions. This serves to narrow the field, before the most innovative and commercially viable solutions are selected to pitch and demonstrate their products to the entire company. Products are then voted on by all MasterCard employees before determining the ultimate winner, which is then launched as a real MasterCard product.

- **IdeaBox.** One of the newest additions to MasterCard's innovation efforts, IdeaBox, was inspired by Adobe's Kickbox ideation and pilot-testing kit and adapted to fit MasterCard's culture. IdeaBox is focused on innovating at the individual level and cultivating new innovators within the company. It is also

designed to solicit the kind of employee ideas that could potentially grow into a start-up venture within the company. Individuals or teams (almost all participants partner up because the time commitment is so large) with promising ideas receive awards at increasing levels of difficulty to develop their idea further. The goal is to present the concept to the MasterCard Innovation Council. Finally, the projects that win the council's approval receive the ultimate prize: The idea is accepted for incubation, with MasterCard committing to adopt the idea and put appropriate resources and funding behind it to bring it to market.

These programmes are not just for show; they deliver tangible results. They have created many innovative products or enhancements to existing products that are now being marketed by MasterCard.

Any device is a commerce device

MasterCard is an example of an organization that embraces the opportunities around the Internet of Things and is working towards a future where any device could be enabled for commerce. In this future, consumers can engage and transact from any device that is part of their daily lives—including their phones, watches, televisions, cars, refrigerators, or even washing machines.

Through its Labs, MasterCard is collaborating with other companies to connect everyday appliances so consumers can use the Internet of Things to perform chores and free up time. Both MasterCard and its collaborators are parties to improving their customers' experience so both brands are seen in a more positive light. In other words, this collaboration is to their mutual benefit:

- **Connected Fridge.** MasterCard has partnered with Samsung to offer Groceries by MasterCard, allowing consumers to order weekly shopping directly from their kitchen. This is the first shopping application integrated directly into a fridge and will come preloaded in Samsung's Family Hub refrigerator. At launch, it supports buying groceries via FreshDirect and Shoprite. Consumers may never run out of milk again.

- **Connected Washing Machine.** MasterCard has partnered with Whirlpool to develop a digital solution to a real-world problem: how to displace the large amount of cash and coins used by consumers to pay to do their laundry in coin-operated machines. The mobile app Clothespin allows consumers to pay for their laundry cycles directly from their phones. This also solves Whirlpool's challenge of collecting a large number of coins across multiple locations.

- **Connected Vending Machine.** Over the course of a weekend, the Labs development team took a vending machine prototype and connected it to the digital payments platform MasterPass. The result is that consumers can securely order and pay for any vending machine item directly from a phone, tablet, or even smartwatch. This is not a small problem: There are almost 30 million vending machines operating worldwide today; the majority accept coins but not electronic payments, so the vending machine company must collect the coins and repair the machines when the coins jam.

The importance of partnerships

Innovations such as Clothespin and Groceries have one vital thing in common: They were created through partnerships.

There is no monopoly on innovation. Actively partnering with a number of external players, with the aim of exploring and developing future commerce solutions, is a fertile pursuit and can lead to innovative products and processes that benefit both partners.

For example, MasterCard's *Labs as a Service* group was launched to create innovation partnerships with key customers. Applying a consulting approach, this team works with partners to solve their own innovation challenges, collaborating with each client to design and build fully customized solutions that have been tailored to their specific needs. These partnerships extend from traditional financial institutions to leading players in sports and entertainment.

One method used to encourage innovation partnerships employed by the *Labs as a Service* team is the use of the LaunchPad programme, which is run in collaboration with MasterCard customers. Joint teams combining business, technical, and design skills with product goals use rapid prototyping and feedback to generate new solutions quickly.

Another asset used by MasterCard is seen in its *Start Path* group, which was established as a way to support start-ups that are building the next generation of commerce solutions today. By providing a blend of customized operational support and direct access across the company and to MasterCard's customers, MasterCard collaborates with these start-ups to help them scale

successfully. This approach has been used with over 90 start-ups that cover a diverse range of solutions, including logistics, authentication, data, wearables, and even artificial intelligence.

To augment its support of start-ups, the company has made a small number of strategic investments in some of these start-ups. The goal here is not merely to provide funding but, more importantly, to add strategic value to the start-up. One example that shows that security and convenience in commerce can be part of the same experience is seen in the investment made in the Canadian start-up Nymi. Nymi has developed proprietary technology that uses an individual's unique cardiac signature as a method of authentication, delivered via a consumer wearable. MasterCard committed to helping Nymi bring its technology to the real world by embedding an NFC chip within their wearable and completing the world's first biometrically authenticated wearable contactless payment.

Partnering from within

Working with external partners is only half of the innovation equation. Engaging across the entire MasterCard organization is equally critical. Building a culture of innovation is a central part of the MasterCard Labs mandate. The question is how to enable employees to help shape the future of their business.

In one example of innovative thinking that is encouraged in a particular company and has spillover effects, MasterCard has seen a 10-fold increase in the number of patents that have been filed by its own employees since 2010.

Doing well by doing good

It is important to recognize that diversity is also essential to achieving radical innovation. To be truly diverse, a company's partners must reflect diversity at all levels, including different cultures, ages, genders, skill sets, experiences, backgrounds, and geographies. To ensure fresh thinking, MasterCard regularly changes the composition of its project teams; it also relies on virtual teams, so that innovators are not restricted to regions that happen to be the location of the company headquarters. This diversity avoids the situation where everybody thinks along broadly similar lines, coming up with the same ideas and making the same mistakes.

With support from the Bill & Melinda Gates Foundation, the Lab for Financial Inclusion—launched by MasterCard in 2015 in Nairobi, Kenya—makes good use of diverse resources. The goal was to find a way to solve for the needs of a region populated by millions of individuals who are missing out on the technological revolution in financial services and who have no way to access everyday financial services.

The Lab is generating financial inclusion solutions and fast-tracking the best ideas from concept through prototype, pilot, and eventually commercialization. Ultimately, individuals trapped in a cash economy will have practical, cost-effective financial tools to open up a world of inclusion and help them build better, brighter futures.

Another solution to problems confronted in places without financial services is called MasterCard Aid. The Labs team was tasked with evaluating the existing aid distribution process of non-governmental organizations, and identified an opportunity and a need for eliminating paper vouchers. These vouchers are used like cash and can easily be stolen or lost; moreover, it is often difficult to accurately track the flow of goods from merchants who receive them. Over the course of a week, the Labs team, along with a number of MasterCard experts, developed the *MasterCard Aid* prototype, a points-based mobile as point-of-sale solution accompanied by a physical MasterCard.

Both of these examples demonstrate the importance of solving the everyday needs of those who have to get by on just $2 to $3 per day. This is not just about helping displace cash with digital payments, this is also about making people's lives better and safer.

Cool doesn't cut it

Innovation must be tangible and evident in the real world. Real, sustainable innovation cannot reside merely in ideas of the next great thing but instead must be anchored in real-world business value that solves real-world problems. Another saying in Labs is 'cool doesn't cut it'. It is not just about thinking about the next great thing, but about anchoring that thinking on the true business value they bring by solving our own problems or needs. Real and sustainable innovation is happening—everyday, everywhere.

Suggestions for effective innovation

MasterCard's journey has allowed the company to develop a set of suggestions for ways an organization can innovate effectively. These suggestions are relevant not only to MasterCard but to any entity that wants to stay relevant in the innovation sphere.

First, it is vital to innovate from within the organization and to include a talent pool to bring in fresh perspectives and new skills unencumbered by traditional approaches. Second, it is essential to encourage experimentation instead of shying away from it. This includes enabling

employees to not fear failure but accept it, learn from it, and work to find a better solution. Third, to ensure that innovation is not limited to thinking alone, it is important to reward the execution of novel ideas. Taking a concept and bringing it to life in the real world is what makes innovation more than fancy thinking. And finally, an organization must be willing to actively seek out external players that can provide resources that complement and accelerate its innovation path.

Notes

1 Evans, 2011.

2 PwC, 2012.

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The Management of Global Innovation: Business Expectations for 2020

Kai Engel, Nigel P. Andrade, Erik R. Peterson, and **Mauricio Zuazua,** A.T. Kearney

Martin Ruppert, IMP³rove – European Innovation Management Academy

In order to assess the current perspective of executives on global innovation management, in 2016 A.T. Kearney and its subsidiary IMP³rove – European Innovation Management Academy surveyed more than 100 executives of large international organizations from the Americas, Europe, Asia, and Australia. The sample comprises executives representing manufacturing (19%); energy and process industries (17%); consumer goods and retail (15%); communications, media, and high tech (14%); financial institutions (10%); automotive (10%); and other industries (14%).

The survey focused on five key themes:

- the future role of innovation for their company,
- changes in the footprint of their innovation activities,
- changes in the structure of their innovation partner network,
- key challenges and benefits for global innovation management, and
- the role of public actors.

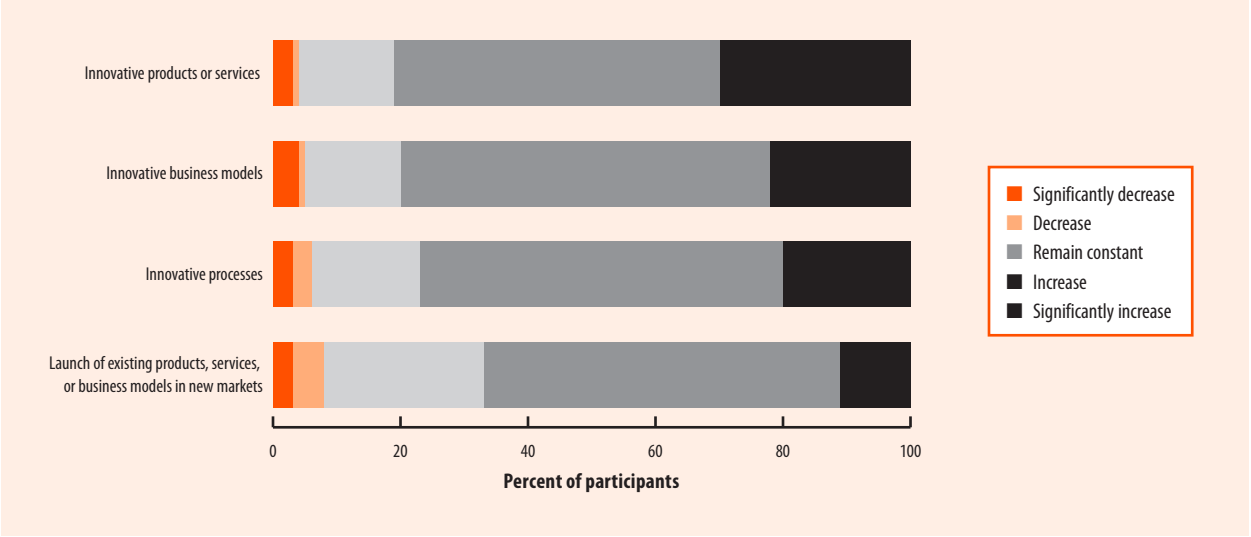
Key findings from the survey are summarized in the adjacent box.

The survey results reveal a strong call for action. More than half of the respondents expect to lose more than a fifth of their revenues within five years as a result of disruptive innovation if they do not change the way they operate. Digitization, the Internet of Things, and artificial

Key Findings

- **Innovation is expected to transform revenue generation:**
  - › Sixty percent of respondents would expect to lose more than 20% of their company's revenues within five years as a result of disruptive innovation if they do not change the way they currently operate.
  - › Eighty percent of executives expect the revenue contribution from innovation to increase or increase significantly between today and 2020.
- **Innovation will be increasingly global and collaborative:**
  - › Most companies work with external partners on their innovation agenda. Important innovation partners for survey participants today include customers (60% of respondents see customers as having a high or very high impact), large suppliers (40%), and research institutes or academic institutions (34%).
  - › The trend of leveraging innovation partners is expected to increase with a boost in the role of customers (78% expect an increase or a significant increase in impact), in the role of start-ups and small suppliers (67%), and in the role of research institutes or academic institutions (45%).
  - › More than seven out of ten participants agree or strongly agree that their innovation activities are becoming more global.
  - › More than 80% of participants consider five factors to be important for choosing a country to incubate an innovative, new business: proximity to innovation partners, access to markets, access to talent, supportive local regulations, and sufficiently high quality infrastructure (information and communication technologies, transport).
- **Most companies feel their innovation platforms are not ready to fully navigate this new landscape:**
  - › The increasing size of innovation networks drives the need for excellence in governance structure and processes.
  - › The majority of respondents rate their capabilities to identify, select, build and operate, and exit innovation partnerships as (very) poor or fair.
- **From a policy maker's perspective, the specific capability gap and its implications will need to be addressed**
  - › To date, four out of ten executives are not aware of non-financial support and incentive programmes. Moreover, close to 50% report that unexpected changes in national government regulations have had a negative impact on their innovation successes in the past.

Figure 1: Expected revenue contribution through innovation vs. market expansion with existing products between now and 2020



Source: A.T. Kearney and IMP³rove – European Innovation Management Academy.
Note: The figure depicts responses to the query 'How much will the revenue contribution from innovation increase or decrease between now and 2020?' 'Innovation' is defined as products, services, and business models that have been introduced within the past three years.

intelligence are seen as challenges, but also as sources of innovation.

Although survey participants represent a broad range of companies—including those that are centralized and those that are decentralized—the findings demonstrate a surprisingly broad agreement that innovation activities are becoming increasingly global. The vision of global innovation activities, where the best-suited partner for any specific innovation need—regardless of his or her location—can be included in an innovation process is promising, yet extremely challenging. Corporations will need to determine how to find a partner for a specific innovation topic if the appropriate specialist may be located far from global innovation hot spots, and how to keep an overview of the changing needs of global customers or of potential start-up and small business partners, the two groups whose importance as innovation partners is expected to grow most. These challenges seemed impossible to overcome before digitization enabled companies to interact with global customers on an individual basis, and before small business partners located in remote parts of the world.

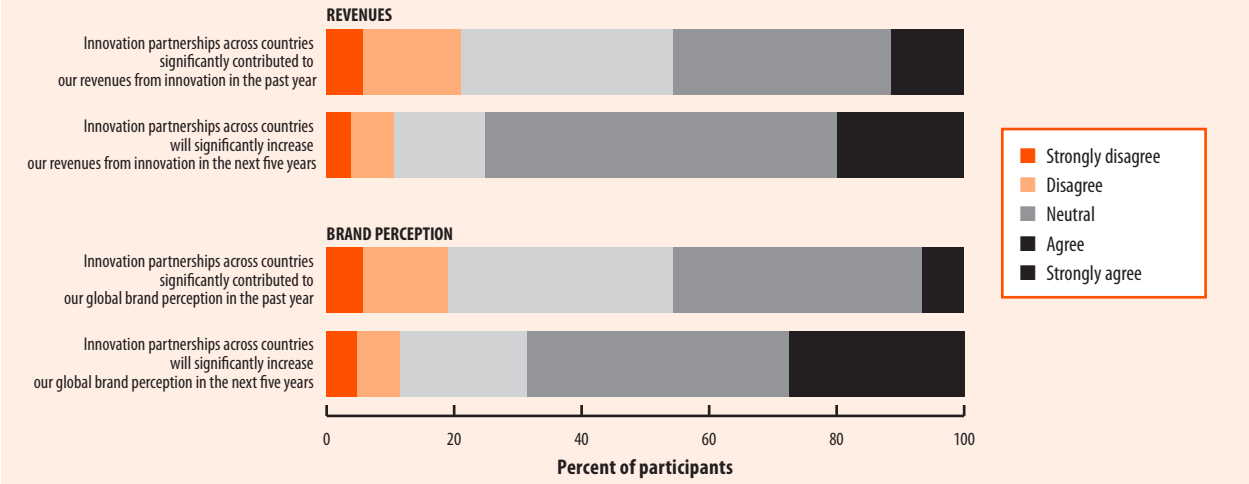
Public actors should take note: An important share of participants state that unexpected changes in national regulations had a negative impact on their innovation success. This can be explained partly by the fact that policy development cycles are usually linked to election periods, while product lifecycles or investment lifecycles may require much longer time periods—for example, utilities investing in innovative power plants or pharmaceutical companies investing in new medicines require a longer planning time frame for their innovation activities than governments need to formulate and implement policies about these investments or products. Almost half of the participants of our survey state that unexpected changes in national regulation had a negative impact on their innovation success. This raises the question of how policy makers can systematically boost innovation success by making their regulation plans more transparent.

The increasingly central role of innovation

Eighty percent of survey respondents expect the revenue contribution from innovation to increase or significantly increase between today and 2020 (Figure 1).[1] And three sources of innovation—products or services innovation, process innovation, and business model innovation—are rated as equally important.

This expectation is almost on par with the expected revenue growth that will be achieved by launching existing products, services, or business models in new markets. Nearly 70% of participants expect that these activities will make an almost equal contribution to a rise in revenues as innovation. Herein lies the overarching challenge: Executives will

Figure 2: The current and future impact of innovation partnerships



Source: A.T. Kearney and IMP³rove – European Innovation Management Academy.
Note: The figure depicts responses to the query 'How much do you agree or disagree with the following statements?'

need to speed up or increase their innovation activities and foster their impact in global markets.

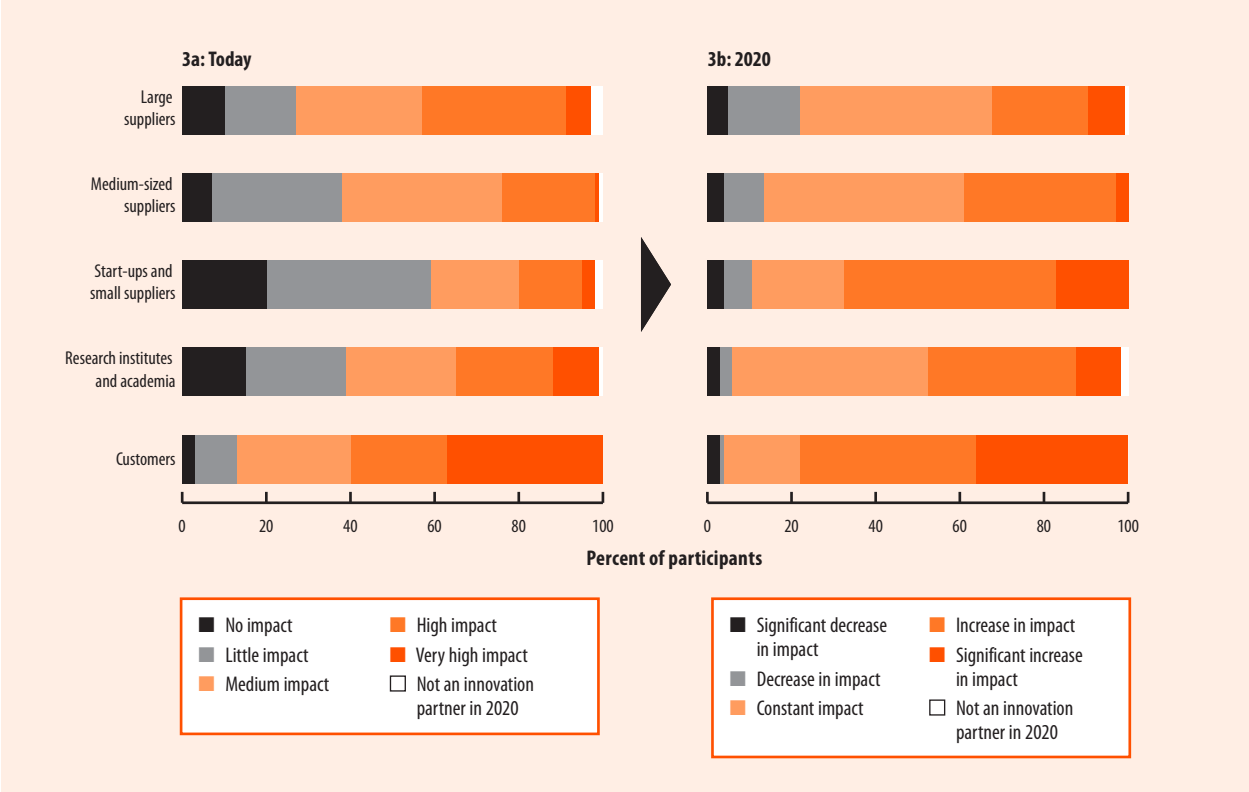
Unless they change the way they operate, 60% of respondents expect to lose more than 20% of revenues within five years as a result of disruptive innovation. The top three industries with the highest expected impact from disruptive innovation are financial institutions; communications, media, and high tech; and automotive. Major disruptions driving these estimates include digitization and the Internet of Things (which was highlighted by survey respondents across all industries), FinTechs (which innovate in financial services enabled by technology), artificial intelligence (which was mentioned particularly by respondents in the high-tech industries), and electric driving (which was highlighted by respondents from the automotive industry). The speed of disruption can be illustrated by considering FinTechs, as one example in this group of game changers: the five globally leading FinTechs PayPal, Lufax, Zhong An, Square, and Wirecard now readily have twice the valuation of five leading German banks (Deutsche Bank, Commerzbank, Aareal Bank, pbb, and Comdirect).[2]

Changes in the reach and complexity of innovation platforms

More than seven out of ten participants agree or strongly agree that their innovation activities are becoming more global. In this context, a more global innovation activity can, for example, relate to idea sourcing with a global community or collaboration on innovation projects with a geographically widespread team. This expectation is shared by organizations regardless of whether their business is centralized (with more than 75% of employees based in the company's headquarter country), decentralized (fewer than 25% of employees are based in the headquarter country), or set up as a hybrid where 25% to 75% of employees are based in the headquarter country.

The survey also reveals that a majority of respondents agrees that innovation partnerships across countries will significantly impact revenues and global brand perception (Figure 2). Although fewer than half of respondents agree that innovation partnerships across countries contributed significantly to revenues from innovation in the past year, three out of four expect that these partnerships would contribute significantly in the next five years. Similarly, although fewer than half of respondents observed that innovation partnerships across countries contributed to global brand perception, close to 70% agree when the issue is considered in the five-year context. The increasing role of digitization and the Internet of Things is an important factor in this regard. For example, partnerships can contribute to a major change towards a more innovative brand perception, higher differentiation, and higher

Figure 3: Impact of various groups of innovation partners



Source: A.T. Kearney and IMP³rove – European Innovation Management Academy.
Note: The figure depicts responses to the query 'How would you rate the impact of each of the following innovation partners?'

revenues of the product—as in the case of a manufacturer of white goods who collaborates with start-ups to develop Internet-of-Things applications such as the self-refilling fridge.

Proximity to innovation partners is one of the top five criteria in choosing a country in which to incubate an innovative new business for more than 80% of participants. Moreover, executives highlighted access to markets, access to talent, local regulations, and infrastructure (both information and communication technologies and transport) as key criteria. This is good news for governments, because to attract innovation, they can influence three out of these five factors directly: local regulations can be developed in the short to medium term, and both education and infrastructure can be fostered in the medium to long term. Moreover, as noted in the report *Fostering Innovation-Driven Entrepreneurship,* two among nine leading European policy makers readily highlighted efforts to connect their innovation ecosystems with globally leading hubs such as Silicon Valley to unlock benefits of proximity to globally leading innovation partners.[3]

Changes in the structure of innovation platforms

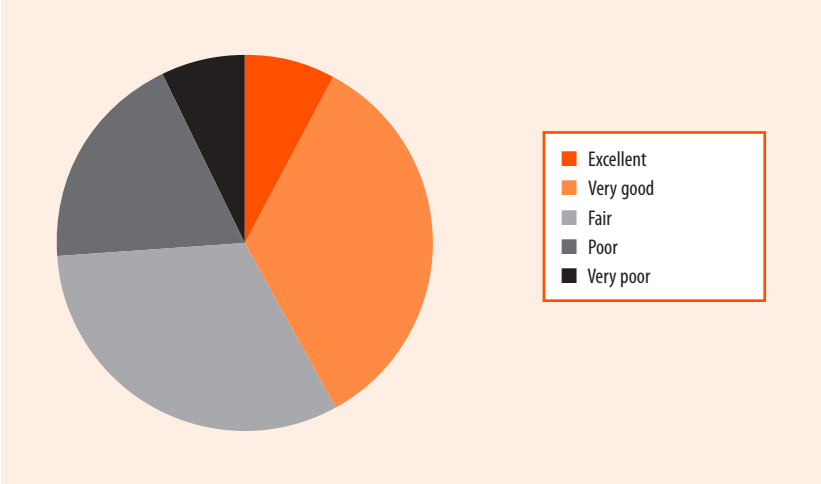
The extent to which partners are being integrated into company innovation activities is on the rise. According to survey participants, the most important innovation partners today are customers (60% of respondents see customers as having a high impact or very high impact), large suppliers (40%), and research and academic institutions (34%) (Figure 3a). Key expected trends include a further increase in the role of customers (78% of those surveyed expect an increase or significant increase in the impact of customers as innovation partners), in the role of start-ups and small suppliers (67%), and in the role of research and academic institutions (45%) (Figure 3b).

The survey respondents not only expect their innovation network to change in structure over the next several years, but they also expect it to grow geographically: seven out of ten participants expect to see an increase of their innovation network on the headquarter continent, and

four out of ten expect to see an increase across all continents.

This expectation seems achievable when considering the effect of digitization on innovation management: 20 years ago, a network of some hundred innovation partners would have been exceptional. In recent years, however, new scales have been reached. For instance, GE runs the Ecomagination Challenge to identify and select outstanding ideas and business models to solve the world's most challenging problems. Within just six months, GE built an online community of about 60,000 participants located in 90 countries and crowdsourced more than 5,000 ideas.[4]

Figure 4: Governance structures and processes to oversee innovation activities across geographies and business units: Respondents' assessment



Source: A.T. Kearney and IMP³rove – European Innovation Management Academy.
Note: The figure depicts responses to the query 'How would you rate your governance structures and processes set up to oversee innovation activities holistically (across geographies and business units)?'

The central challenge: Immature platforms and missed opportunities

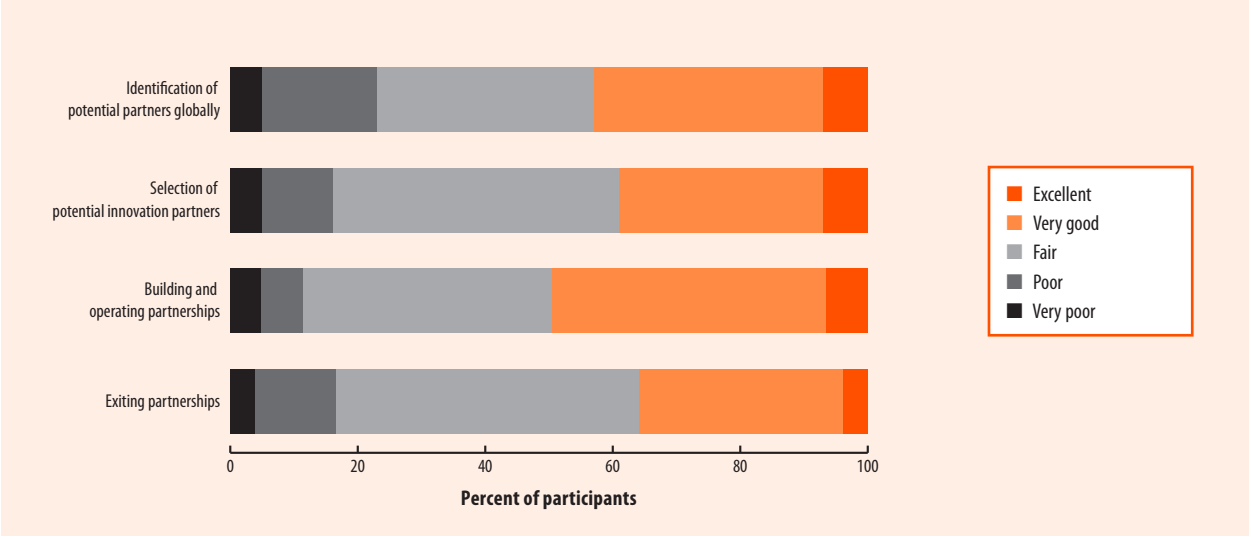
Growing innovation networks demand excellence in governance structures and processes. Anchoring global innovation as a topic that chief executive officers endorse and actively support throughout the corporate hierarchy, along with implementing processes that institutionalize collaboration—for example, by creating separate units for investing into innovative ventures or engaging in collaborative innovation—are becoming prerequisites for successfully managing global innovation networks.[5] However, 57% of participants rate their governance structures and the processes they have in place to manage and drive innovation activities across geographies and business units as fair, poor, or very poor (Figure 4).

Consider IBM: In 1999, the company realized that it had failed to commercialize a number of promising technologies such as the commercial router, which was developed by IBM but became a commercial success for Cisco. Analyzing reasons for the failure helped IBM to identify major roadblocks. Incentives rewarding execution were directed at short-term impact; IBM was focused on existing markets and existing offerings; and there was a perceived lack of established disciplines for selecting, experimenting, funding, and terminating new growth businesses, as well as a lack of entrepreneurial leadership skills to excel in execution. Realizing that a specific governance and process would be required to succeed, IBM launched the Emerging Business Organization (EBO). Since 2000, EBO has generated more than $25 million in new revenues for IBM.[6]

Over half of respondents are critical of their existing formal processes intended to identify, select, build and operate, and exit innovation partnerships, and rate them as very poor, poor, or fair. Time-consuming, cumbersome, and costly processes can become a hurdle before a potential innovation partnership even begins. Respondents also cite a lack of flexibility when it comes to working with smaller companies or start-ups. Only five out of ten participants adapt their processes for small or start-up partners (Figure 5).

In our work as Knowledge Partners of the World Economic Forum on the report *Collaborative Innovation,* we found that challenges and suggested response strategies for firms can be grouped into three layers—Prepare, Partner, and Pioneer.[7] The report summarizes the idea that often the most significant challenge and the greatest positive impact springs from how well firms prepare to collaborate: This implies having well-defined objectives, a carefully designed business case, and suitable organizational processes. A supportive culture and links to relevant networks are important predictors of success. Moreover, the report stresses the importance of tailored processes for collaborations between large and small partners. In one example of this approach, to ease the procurement process with smaller partners, Royal Dutch Shell has simplified its governance of collaborations. The company has decentralized decision

Figure 5: Formal phases of innovation partnerships: Respondents' assessment of capabilities



Source: A.T. Kearney and IMP³rove – European Innovation Management Academy.
Note: The figure depicts responses to the query 'How would you rate your formal processes for the following phases of innovation partnerships?'

making and changed procedural requirements.[8]

The role of public actors

In terms of the role of public actors, eight out of each ten respondents are aware of public innovation support programmes providing financial resources for innovation. However, more than 40% of respondents are not aware of programmes providing non-financial support (including co-creation support services) or demand-oriented programmes such as preferential purchasing programmes or regulatory measures in building codes, automobile emissions, or energy generation. There seem to be untapped opportunities in light of the finding that companies consider an increasingly global and collaborative management of innovation as a challenge for their current governance structures and processes. Governments can make a difference with specific programmes for capability-building and ecosystem development.[9]

Forty-six percent of participants report that unexpected changes in national government regulations have had a negative impact on innovation. This is particularly evident in industries with long planning horizons, such as the utilities industry. The German utilities industry, for example, invested heavily in modern gas and nuclear power plants, leveraging what were then the newest power plant technologies. However, changing government regulation favouring renewable and distributed energy generation had a severe impact on the business cases for these power plants and made the return on this investment unfavourable.

Recommendations by innovation leaders for how to excel in global innovation management

The following quotes are recommendations from innovation leaders about how to successfully master a corporation's global innovation agenda:

- **Strategy: 'A clear focus on search fields for innovation is imperative'.** To get their innovation strategies right, leading innovators invest upfront in understanding market dynamics, technology dynamics, and service dynamics. They are investing time more than money. Once they have their innovation strategy right—not just on paper but in the minds of all their influential internal decision makers—they begin collecting ideas with potential into a 'portfolio of *search fields',* which subsequently becomes the wellhead of the innovation flow.[10]
- **Clear measures that have buy-in from the leadership: 'Insulate key performance indicators for innovation from the existing business'.** In order to measure progress in the search fields of the innovation strategy,

innovation leaders set innovation-specific key performance indicators. These indicators are distinct from the company's other key performance indicators and measures. It is remarkable how easily many executives talk about key-performance indicators for their innovation strategy—for example, the 'new product vitality index' (the share of innovative products, services, or business models compared to overall revenues), or time to market and time to profit.

- **Worldwide consistent innovation processes: 'Consistent innovation processes across all our BUs and geographies make sure we can integrate and work with innovation partners from all over the world'.** Structured processes help to identify, select, operate, and, when necessary, withdraw from partnerships; independent from which business units or geographies are involved.
- **Culture that empowers employees: 'We nourish freedom of thought and freedom of action in order to spark creativity'.** The fairly consistent result is innovation and a sparking new business.
- **Digital infrastructure pulls down geographic barriers: 'Digital infrastructure helps to decrease transaction costs between partners'.** It provides transparency around needs and capabilities and enables a completely new scale of interaction.
- **Observe regulatory conditions and screen impending changes: 'Consistency in regulation is critical'.** In some countries disparities exist everywhere, making it hard to launch products and services on a national basis.

Conclusions

This study of more than 100 executives globally reveals a dichotomy: Although innovation is expected to drive revenue growth and brand perception across industries in the short term, challenges remain in building the capacity to harness it.

In order to benefit fully from this evolving central role of innovation, its management must become more and more global. Furthermore, customer-driven innovation and innovation in collaboration with start-ups, and with small and medium-sized enterprises as partners, represent the largest potential, but they also represent another important challenge: Many executives rate their own capacity to integrate potential innovation partners globally into their process as very poor, poor, or fair. Organizations that systematically harness partner ecosystems for innovation, building on disruptive procurement methods and sustainable partner relationships,[11] will be best prepared to capture the next wave of innovation: A recent study showed that better innovation management practices are linked to higher shares of EBIT driven by innovation.[12]

Notes

1 The definition of 'innovation' used here involves a dimension of time: for the purposes of the survey, 'innovation' is understood to mean products, services, or business models introduced in the past three years.

2 Klemm and Walter, 2016.

3 World Economic Forum, 2014.

4 King and Lakhani, 2013.

5 World Economic Forum, 2013.

6 O'Reilly et al., 2009.

7 World Economic Forum, 2014.

8 World Economic Forum, 2015.

9 See the analysis 'Empower, Educate and Enable: A Vision, Actions and Measurements for Policies to Address Collaborative Innovation Challenges' in the World Economic Forum 2015 report *Collaborative Innovation,* World Economic Forum, 2015.

10 Engel et al., 2015.

11 Schuh et al., 2016.

12 IMP³rove – European Innovation Management Academy, 2016.

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Global Corporate R&D to and from Emerging Economies

Max von Zedtwitz, GLORAD Center for Global R&D and Innovation, Kaunas University of Technology, Lithuania

Oliver Gassmann, University of St. Gallen, Switzerland

The re-emergence of China, India, and other formerly small economies as large markets and manufacturing powers has been one of the most significant events of the beginning of the 21st century. Well into the late 1990s, these countries played, at best, a peripheral role in global research and development (R&D) and innovation.

Expanding R&D into emerging economies

During the restructuring of industries in the wake of the rise and reshuffling of the new economy in the early 2000s, multinational corporations (MNCs) started to move R&D resources to countries with fast-developing markets or countries that at least promised future market growth, and to countries that offered low-cost access to exceptional talent and technology. China fit this bill perfectly, but also India, Brazil, the Russian Federation (Russia), and other countries—many along the Asia Pacific rim or in Latin America—attracted R&D investment from MNCs headquartered in the 'Triad' countries: those in Western Europe, North America (the United States of America and Canada), and Japan (Figure 1). Data from the R&D Locations database reveal that, between 2000 and 2015, the number of MNC R&D centres in emerging countries grew by a factor of five, while in the Triad countries this number merely doubled.[1]

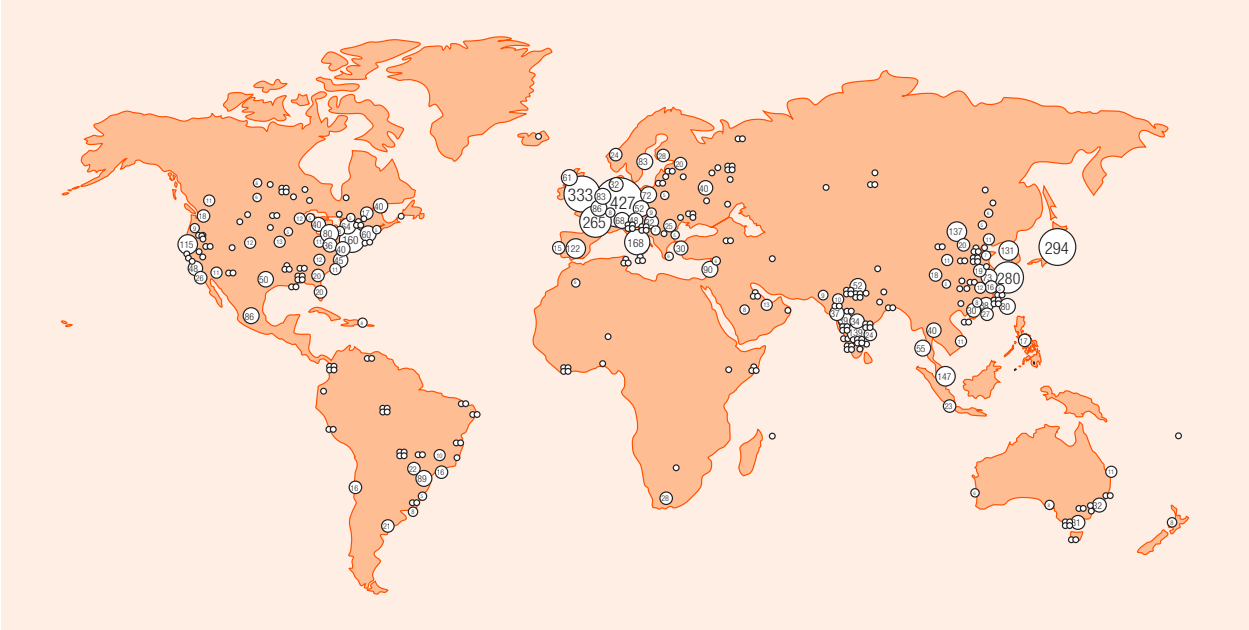
These new R&D centres were part of a strategy for MNCs to expand their global R&D footprint to connect to local markets and local talent. Their hosts provided easy-to-follow rationales for corporate executives to shift R&D investments abroad. For example, the BRIC countries (Brazil, Russia, India, and China) had a total of 18 universities in the ranking of the global 500 universities in 2003, but this grew to 40 universities in the 2015 ranking; of these, eight alone ranked among the top 200.[2] Chinese universities produced 7.5 million graduates in 2015, up from just 1 million in 2000.[3] Between 2000 and 2015 the number of domestic invention patent applications in China grew by a factor of 38—from about 25,300 to more than 968,000 applications per year.[4]

MNCs were not just moving to countries with low costs for doing R&D. They also used this opportunity to modernize their global R&D profile. The new R&D centres were housed in state-of-the-art facilities, employed the best and brightest of a young and ambitious generation, and focused on new technologies and applications that were possible only in markets with low or no switching costs. These centres developed unique sets of capabilities that gave their often larger, more established, and much more experienced cousins at home a run for their money.

Enter emerging market MNCs

The improvement of national science and technology systems was primarily targeted at making domestic companies more competitive, although foreign MNCs benefitted from better infrastructure and better-educated R&D employees. Local companies that initially benefitted from protected markets and preferential access to low-cost resources transformed themselves into innovative high-tech MNCs themselves: Examples are Huawei and TCL in China, Infosys and Tata in India, Embraer in Brazil, and Kaspersky Labs in Russia. As these companies have entered international markets themselves, they have established local R&D posts and R&D centres in target countries or—especially in the case of cash-rich Chinese firms—acquired competitors and integrated attractive technology resources. Huawei, for instance, set up its first international R&D office in Moscow as early as 1997. In 2015, Huawei had 16 global R&D centres outside China alone, and a total of 23 such centres worldwide. According to the R&D Locations database, Chinese companies had the 7th largest foreign footprint of all countries with 178 R&D centres set up or acquired outside China by the end of 2015.[5] Table 1 shows the origin ('Source countries') and targets ('Target countries') of all the

Figure 1: Global map of cross-border R&D centres



Source: R&D Locations database, accessed 5 March 2016; see http://www.glorad.org and von Zedtwitz and Gassmann, 2002.
Note: The figure shows a total of 5,877 cross-border R&D centres.

MNC centres in the R&D Locations database.[6]

Initially, these emerging market MNC (EMNC) R&D centres were focused on hiring overseas expatriates (e.g., Chinese graduates from US engineering programmes, a strategy that hurt local firms as much as it benefitted Chinese MNCs); they also emphasized ensuring a smooth transfer of technology from local competitors, universities, or acquisitions back home. In the meantime, many EMNCs established R&D centres to demonstrate innovation leadership, to attract the best people regardless of origin or ethnicity, and to steer global markets with products and technology from their home countries. The share of MNCs from countries outside the Triad rose from 29 in 2000 to 156 in 2015, with 98 alone coming from China.[7] And although the value of domestic patents in emerging countries is often debated, EMNCs have dramatically increased their share of global patent cooperation treaty (PCT) patents from 4.3% in 2000 to 21.5% in 2014. In 2005 only six EMNCs were among the top-100 PCT filers; there were 11 EMNCs in this group in 2015. It is mostly a China story, though, with seven of these top-100 PCT filers coming from China, two of them in the top 10: Huawei in the first spot and ZTE in the third, with 3,898 and 2,155 patent applications, respectively.[8] Armed with indigenously developed technology, these firms not only are equal partners in technology standardization decisions, they very often determine the direction of future technology standards in industries they now lead.

Patterns in global R&D evolution

The emergence of high-technology EMNCs from developing countries provides the opportunity to reassess the applicability, and value, of global strategy and innovation theory that was established on the basis of observing the behaviour and motivation of firms from developed countries only. For instance, does globalization help or hinder the internationalization of R&D and innovation? Given more transparent borders, more pervasive traveling, and more efficient information and communication technologies, is it easier to attract global R&D capability to a firm's home base than to expand an R&D network overseas? What exactly do EMNCs do?

The factor conditions of emerging markets still differ markedly from those experienced by the Triad countries during their foray into global R&D and innovation in the 1980s and 1990s, and national policy makers are applying the lessons that MNCs from those advanced markets have learned over the years. Many of their largest firms—EMNCs that

Table 1: Number of cross-border R&D centre establishments by source and target countries, 2016

Source countries	Target countries: Triad	BRIC	Rest of World
Triad	3,131	1,332	1,235
BRIC	192	23	66
Rest of World	146	86	44

Source: R&D Locations database, http://www.glorad.org, accessed 5 March 2016.
Note: The Triad includes Japan, Western Europe, the USA, and Canada.

are easily inside the global top 100 by revenue or market value—are still surprisingly domestic, not just in R&D. They are in good company: Many if not most companies in advanced markets have no global R&D either, and they run all of their product development and innovation activities from their corporate centre—which is usually in their home country. In fact, this is the de facto configuration for most companies when they start up, and most maintain this centralized R&D organization as a small and medium-sized enterprise even as they start distributing products internationally. A dominant market or technology position (e.g., Microsoft in the 1980s) allows these firms to concentrate R&D and innovation in their home country, where it can be controlled better for effectiveness, costs, and ownership. This is called the 'ethnocentric centralized configuration of R&D', also known as the 'do-alone' setup (see Figure 2 for an illustration of the five configurations discussed in the text).

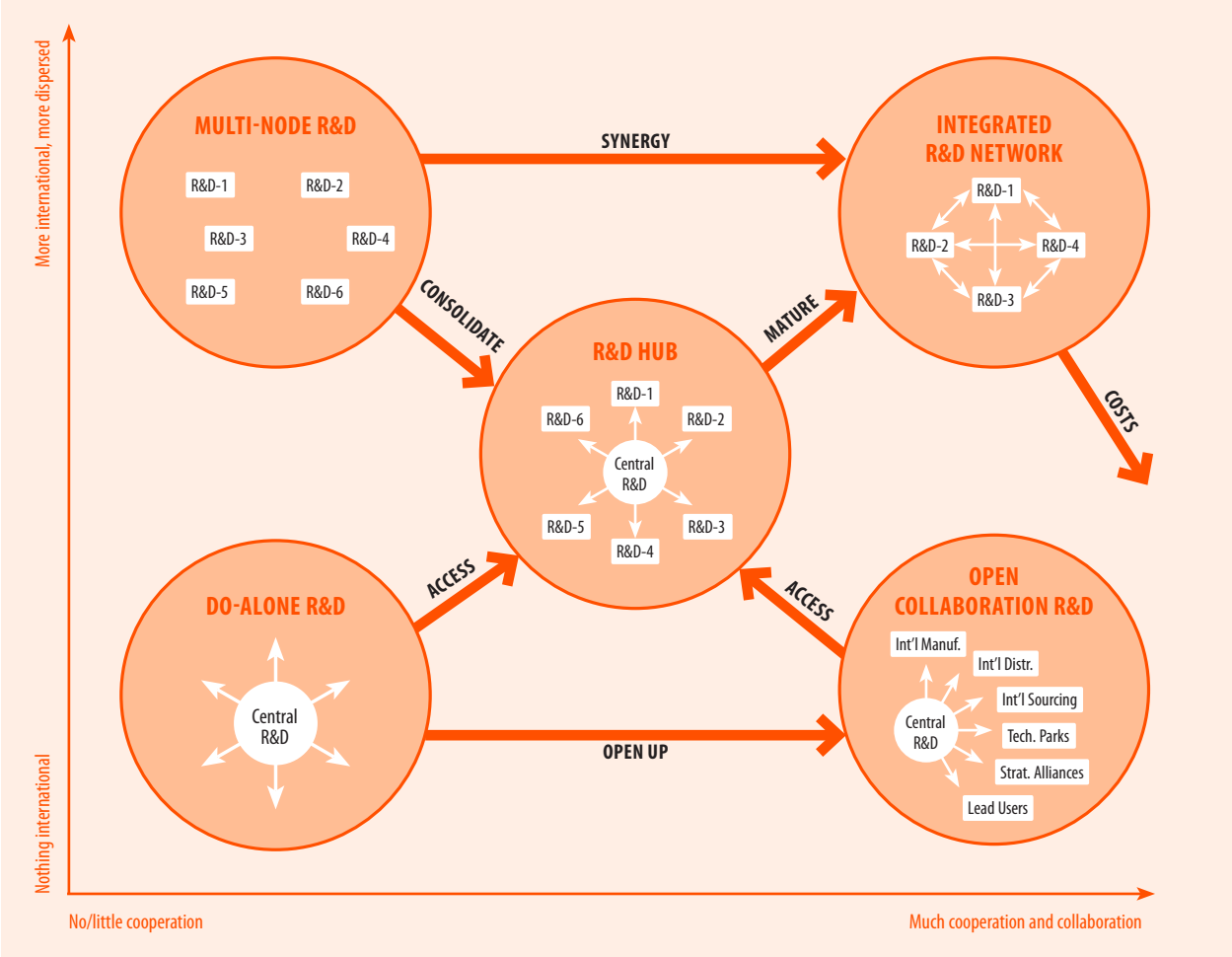
As companies further internationalize their horizons by expanding into new markets and new product offerings—that is, as they make strategic decisions about which technologies to pursue on their own and which ones to buy—they employ the support of specialized technology providers. They engage outwards, reaching out to universities and research laboratories for upstream R&D, and to lead-users and local joint venture partners for product development. Their R&D may still be very much centralized in just one location, but they cooperate across both geographical and industry borders to drive internal innovation. This is the geocentric centralized model, the 'open model' of innovation, a natural first step towards internationalized innovation for many companies. It is also the typical course of action for many local manufacturers in China and India that are trying to become product suppliers to global customers. Once they have established themselves as preferred original equipment manufacturing partners, they accumulate in-house R&D expertise, climb the value chain, and become original design manufacturing suppliers to overseas sellers, innovating at home, from an emerging economy, in cooperation with global brand leaders for the benefit of customers worldwide.

Once local markets become sizable for an MNC, its local market units start to support sales with local R&D tasked with product localization, product adaptation, and local product development. Corporate R&D sometimes confers local market scanning and technology intelligence roles onto such small R&D outposts. These local R&D units are specialized in focus and function, and they depend on the home-based R&D centre's technological guidance. Previously centralized R&D configurations, either of the do-alone or the open-collaboration type, thus expand their international reach. In sectors dominated by the efficient use of technology platforms (such as the automotive industry), this R&D hub model of global R&D is usually the optimal setup. Centrally coordinated R&D plans are executed with the support of local R&D units in different markets and countries. MNCs from countries with strong national cultures influencing global organization also tend to fall into this hub category.

In some MNCs the market orientation is so strong that all local activities and accountabilities are managed at the local level, with only financial functions reporting to the far-away parent holding company. Local R&D units develop products serving local customers, without much input from or coordination with R&D centres in the parent MNC's headquarters. These market-focused companies tend to compete on market proximity, service, and customer understanding rather than cutting-edge technology, which offers little room for differentiation. If technologies have matured globally, these local R&D centres develop their own R&D plans and product roadmaps. This form of running international R&D is the polycentric decentralized or 'multi-node' R&D organization. It is the perfect form for highly market-oriented companies in technologically mature environments with little need of global R&D coordination.

Some MNCs also arrive at a multi-node R&D configuration by virtue of mergers and acquisitions. This is especially the case for many Chinese firms searching for technology assets in industrialized

Figure 2: Global R&D organization of MNCs: Five typical configurations and how they evolve over time



Source: Based on Gassmann and von Zedtwitz, 1999.
Note: Each of the five configurations represents a typical way that MNCs organize global R&D around a headquarter R&D centre (solid white circles), subsidiary R&D units and foreign R&D partners (solid white boxes). The small white arrows denote the interaction within the R&D organization, and the large orange arrows represent the drivers and directions of the evolution of those configurations.

countries, but is certainly not limited to EMNCs. Once acquired, the future for the local R&D centre is uncertain and depends on the capabilities and competence of the R&D network of the acquiring company. Whether it is the external impetus of an acquisition and local mission redefinition or the internal realization of the potential for cost reduction and rationalization, MNCs are always tempted to rebalance a poorly coordinated multi-node R&D organization by either consolidating R&D resources into specific market or technology-facing units—that is, centralizing command and control back to a hub configuration—or by swapping R&D resources and plans such that the R&D units complement each other more harmoniously, with each R&D centre contributing a unique and significant value-added to the overall innovation effort, forming what is called an 'integrated R&D network'.

The integrated R&D network often appears as the holy grail of global R&D organization: Each centre is a centre-of-excellence in its own right, and innovation results from the global interaction of contributors in these centres under the leadership of a programme leader serving the global needs of the company in multiple markets simultaneously. Many pharmaceutical MNCs tend to fall in this category, as do many telecommunication companies: These are industries characterized by global products with high rates of innovation. But maintaining such a highly dispersed and coordinated network is not cheap, and MNCs with integrated R&D

networks will try to reduce management complexity by eliminating unnecessary R&D units when they can, selling or even closing them, to bring down the costs of the overall innovation effort. If they centralize into overseas R&D centres, their R&D internationalization may also go up rather than down, especially if domestic R&D is relatively expensive, as is the case for many advanced market MNCs.

Managing global R&D is more than just managing an international R&D footprint or coordinating foreign R&D teams—it is about managing the flow of innovation regardless of corporate allegiances and ownership, and appropriating the benefits irrespective of headquarter locations. No single form stands out as 'the best and only' way to do global R&D.[9] There is no 'one size fits all', and MNCs must choose carefully how to manage global innovation processes given their unique histories, provenance, and technological and competitive environments.

Global R&D and innovation: Recent trends and national policy

Two types of innovation have gained in popularity in the context of emerging markets: frugal innovation and reverse innovation. In frugal innovation, products are designed such that nonessential features are removed, product complexity is reduced, and manufacturing labour and material costs are minimized.[10] Although frugal innovation is by no means limited to specific geographies, it rose to prominence in India under the term 'Jugaad' or 'Gandhian' innovation; 'bottom-of-the-pyramid' and 'blow-back innovation' are also close synonyms. Of course, eliminating complexity and reducing cost in products are two major goals in R&D anywhere, and advanced market MNCs have long used the terms 'product defeaturing' or 'product localization' to characterize their product development approach to emerging markets. For innovators in developing countries, however, frugal innovation is often not a choice but a necessity. Unconstrained by global product plans or regulations, they bring their intimate market understanding to bear in developing perfectly suited 'good enough' solutions. Advanced market MNCs are trying to absorb these qualities in their own innovation efforts through local R&D centres in emerging countries, training R&D engineers in their more expensive bases elsewhere in the secrets of frugal innovation.

Whereas a frugal innovation may never leave its country of origin, a reverse innovation—by definition— must be introduced to an industrialized advanced country at some point.[11] Reverse innovations can be based on frugal innovation but do not have to be; some reverse innovations are actually very sophisticated and expensive offerings. Transferring an innovation from a developing country to an advanced one is not as trivial as one might expect, as customers in target markets may reject innovations from developing countries because they perceive them to be of lower quality, and even local management in advanced markets may fear that innovations from abroad cannibalize their own home-grown and often more expensive products. Crucial for the success of such a reverse innovation, especially if it originates from a local frugal innovation, is thus either the definition of a new product category—for example, one based on cost-effectiveness and different functionalities—or an entirely new business model. MNCs with global R&D centres have the opportunity to get involved in reverse innovation much earlier than MNCs that keep R&D at home. MNCs with globally integrated R&D networks do not wait for an innovation to be launched first in a developing country before it is transferred to an advanced one—they already conduct some if not all of the R&D, including design and discovery, in the developing country's R&D centre with a global launch in mind. This requires coordination between R&D centres and product management elsewhere.

Both of these recent types of innovation challenge the common assumption that who conducts the R&D is not as important as owning the result. Outsourcing R&D to third parties and purchasing technology 'as required' provides no competitive advantage over others. For global firms—from either advanced or emerging countries—it is important to be able to read local markets and to understand local innovations intimately and incorporate them as effectively as possible (as in the case of frugal innovation) and then leverage them globally as efficiently as possible (as in the case of reverse innovation). Managing that global flow of innovation is one of the key competencies of long-lasting multinationals that repeatedly and continuously balance the benefits of being global and local at the same time. This process does not come without glitches and mistakes, but successful MNCs are able to learn and respond quickly. They adapt their global R&D organization to run transnational innovation flows smoothly, finding 'the right form' in the context of their own corporate culture and in response to long-term changes in the business environment.

One understandable temptation for MNCs is to try to measure the impact of their global innovation activities for the purposes of better supervision and management; every meaningful effort to bring more clarity into this managerial and organizational conundrum should be supported. However, even academic circles concede that it is next to impossible to capture even local innovation fully, let alone innovation that is dispersed geographically (with all the various local legal challenges); furthermore, local innovation is also dispersed across different subsidiaries, often in collaboration with local research institutes or joint venture partners. This lack of transparency undermines the trust that is required for true win-win partnerships between local and global innovators, and forces them to focus on quick wins and tangible results. The data show that international R&D is much more short-term oriented than home-based R&D, which is where most of the strategic long-term research is still taking place.

National policy can reasonably influence only what happens at local subsidiaries of MNCs, within a nation's territorial borders. For the most part, national S&T policy has favoured and supported foreign MNCs to invest in local R&D, expecting positive spillovers such as inbound technology transfer, greater local patenting output, a more highly skilled labour force, and ultimately a better quality of life through better products and technology. But with MNCs increasing their skills in managing global innovation flows, products that are developed locally and supported financially through a nation's fiscal subsidies may now benefit customers in other countries as well. This is, of course, not a bad thing, and various transfer pricing schemes are in place to soften the effects. But ultimately the local presence of MNCs rests on their ability to exploit just that: to source innovation locally and to apply it globally.

Although national policy favours inbound innovation flows, they may be less supportive of such outbound reverse innovations.[12] China's Going Out policy (Zǒuchūqū Zhànlüè) has supported China's rise as a major source of foreign direct investment, and is in no small part responsible for China's global R&D footprint as well.[13] The primary idea is to improve the global competitiveness of Chinese MNCs and to advance technological capability in China. Policy makers have every incentive to support inbound innovation flows and to improve quality of life at home in the process. Dissipation of innovations to other countries is not the primary goal of governments seeking to enhance the standing of their domestic industry. The most experienced MNCs, however, have learned that they gain the most when innovation flows in both directions, when subsidiaries and headquarters complement each other, and when the creative effort of one team in one location—whether in a developing country or an advanced one—can support the development of a market opportunity somewhere else. Global R&D and innovation by private MNCs is thus a natural counterbalance to the more particular, locally optimizing ambitions of national policy.

To expand pervasive win-win scenarios for innovation, developing global innovation partnerships across countries must not be confined to only a few MNCs: Entire countries and their innovation ecosystems must collaborate and facilitate innovation flows not only within but also across national boundaries. The European Framework programmes are indicating the direction that such multilateral R&D collaborations could take (the same-spirited initiatives in China and the USA are also encouraging). After all, the most pressing global problems—such as environmental pollution, population migration, and economic imbalance—will be solved only if countries and companies find ways to cooperate and develop innovative solutions together.

Notes

1 As per the R&D Locations database hosted at the GLORAD Center for Global R&D and Innovation; see http://www.glorad.org.

2 ARWU, 2015.

3 National Bureau of Statistics of China, accessed 5 March 2016.

4 SIPO, 2015; accessed 5 March 2016. See also Haour and von Zedtwitz, 2016.

5 As per the R&D Locations database hosted at the GLORAD Center for Global R&D and Innovation; see http://www.glorad.org.

6 For an early study on cross-border R&D flows involving developing countries, see von Zedtwitz, 2006.

7 See the Fortune 500 Ranking, available at http://www.fortune.com/global500.

8 WIPO, 2015; accessed 5 March 2016.

9 See Boutellier et al., 2008, for a rich compendium of 22 case studies of both advanced and emerging market MNC R&D organizations.

10 Zeschky et al., 2014.

11 Examples of research on reverse innovation include Zeschky et al., 2014; von Zedtwitz et al., 2015; and Haour and von Zedtwitz, 2016.

12 National policy makers too often overestimate the attraction of tax advantages, but the main drivers for internationalization are markets and resources. Markets cannot be changed that easily—even the most conservative Keynesian has to admit this—but supplying resources in the right quality and quantity is the biggest playing ground for policy makers. This means investing in cutting-edge education, developing a strong research university, and supporting an intellectual property regime that encourages win-win technology spillover to industry. This allows innovation ecosystems to arise, which in turn attract the best R&D labs from abroad.

13 China's Going Out policy has recently been updated by its Belt and Road Initiative, which also calls for greater international R&D collaboration with countries in Central Asia, Africa, and Europe; see http://english.gov.cn/archive/publications/2015/03/30/content_281475080249035.htm.

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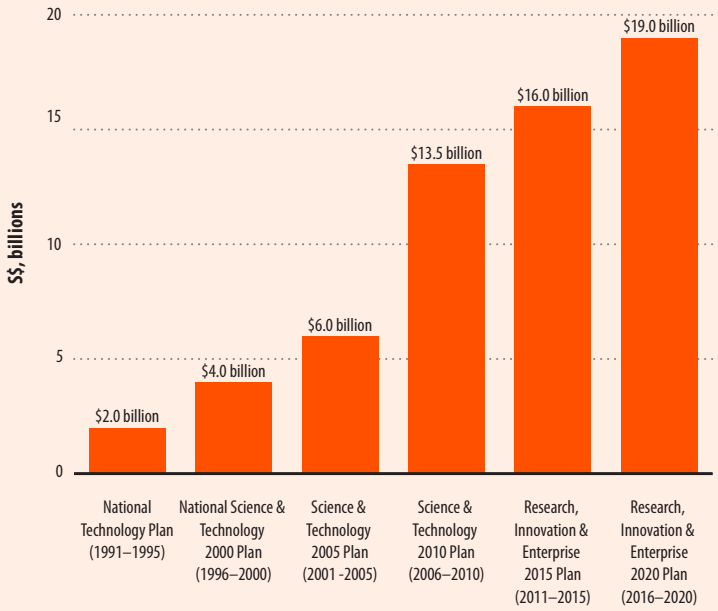
From Research to Innovation to Enterprise: The Case of Singapore

Lim Chuan Poh, Agency for Science, Technology and Research (A*STAR), Singapore

In just 50 years, Singapore has transformed itself from a developing economy with few natural resources to a thriving global metropolis. Its gross domestic product (GDP) per capita has risen from US$516 in 1965 to US$52,888 in 2015.[1] In 2015, Singapore celebrated its Golden Jubilee and the nation came together to reflect on how far the country had come and to envision the future. This chapter aims to shed light on a critical element of Singapore's success story: the country's investments in research and innovation.

Figure 1: Singapore's public R&D budget, 1991 to 2020



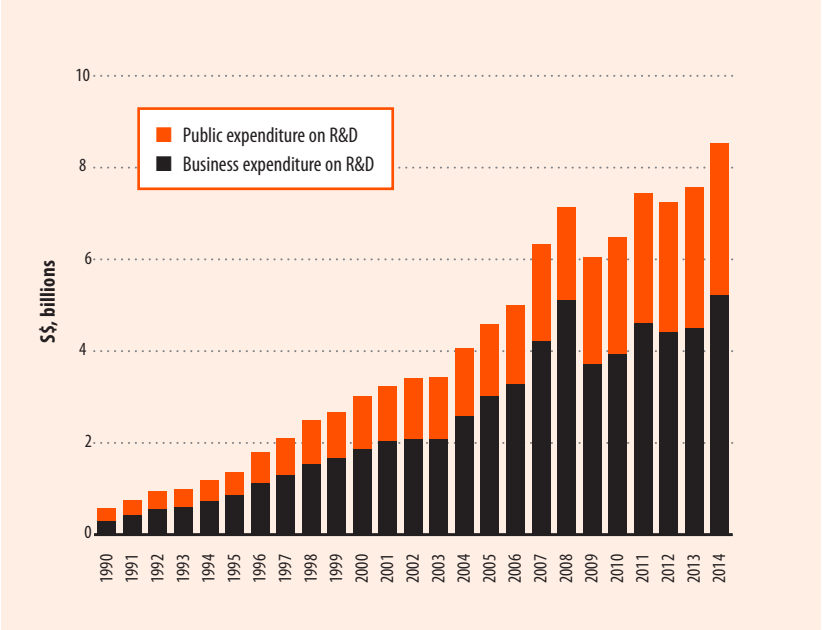
Source: National Research Foundation, RIE2020 Plan, available at http://www.nrf.gov.sg/research/rie2020.

Singapore's research and development journey

Since Singapore's independence in 1965, the government understood that it had to develop science and technology (S&T) capabilities to overcome the constraints of the country's limited size and lack of natural resources in order to ensure its economic survival. In 1966, the late founding Prime Minister Lee Kuan Yew said at the opening of the Science Tower in the University of Singapore, 'our population ... is the one thing we have which makes up for our lack of size and numbers, and it is of the utmost importance that, in the field of science and technology, we should lead the field in this part of the world.'[2] Singapore made early efforts to build research and development (R&D) capabilities, such as those under the Singapore Institute of Standards and Industrial Research (SISIR) formed in 1969. However, the economy was still predominantly capital- and skills-intensive before the 1990s.

It was with the establishment of the National Science and Technology Board (NSTB) in 1990 and the launch of the first five-year National Technology Plan in 1991 that the government began to invest in R&D in a significant and structured way (Figure 1). These developments followed the 1986 report by a national Economic Review Committee, set up after Singapore's first major recession in 1985. That report recommended that Singapore move up the economic value chain, away from low-cost competition in traditional manufacturing and services to develop new high-technology clusters and activities. Over the next 25 years, four more national S&T plans were implemented to position Singapore as an innovation-driven, knowledge-based economy. The S$19 billion *Research, Innovation*

Figure 2: Gross expenditure on R&D, 1990 to 2014



Source: National R&D Survey of Singapore 2014.

and Enterprise 2020 Plan (RIE2020) is the country's sixth five-year plan; announced by Singapore's Prime Minister Lee Hsien Loong in January 2016, it represents a nearly 10-fold increase in the public R&D budget over the S$2 billion National Technology Plan of 1991.

With strong government commitment to R&D and a steady stream of public funding, a rich and diverse research ecosystem has been built up in Singapore over the past two and a half decades. This ecosystem includes the research institutes of the Agency for Science, Technology and Research (A*STAR), which focus on mission-oriented research for economic impact; research-intensive universities that concentrate on academic research to develop a base of fundamental knowledge; and academic medical centres and hospitals that focus on translational and clinical research, as well as corporate labs.

Singapore has also launched major infrastructural initiatives to strengthen its research and innovation system. The one-north masterplan was conceived in 2001 to catalyse the growth of research-intensive hubs in the biomedical sciences and the physical sciences and engineering (in Biopolis and Fusionopolis, respectively),[3] where researchers from the public and private sectors could co-locate. In October 2015, with the completion of the state-of-the-art facilities at Fusionopolis Two, the one-north vision reached a meaningful milestone as a vibrant and dynamic hub: home to over 250 companies, 600 start-ups, 16 public research institutes, five corporate universities and institutes of higher learning comprising an internationally diverse community of 16,000 scientists, researchers, and innovators coming from both the public and private sectors. It is therefore heartening to note that Thomson Reuters has ranked A*STAR as one of the world's Top 25 Global Innovators (Government) at the 9th position.[4]

An outcomes-driven and phased approach

Singapore has taken a steady and sustained approach to funding R&D as a critical pillar of Singapore's economic development strategy (Figure 2). The public R&D budget has increased from S$2 billion under the 1991 five-year National Technology Plan to S$19 billion under the recently announced RIE2020 Plan. Annual public expenditure on R&D (PUBERD) reached S$3.3 billion in 2014, a compound annual growth rate (CAGR) of 11.1% over the past nearly two and a half decades (1990 to 2014). Correspondingly, annual business expenditure on R&D has grown at a CAGR of 12.5% over the same period, from $0.3 billion in 1990 to $5.2 billion in 2014, the highest level yet.

The development of Singapore's research and innovation system has been different from that of many other successful research-intensive countries around the world. Unlike the research and innovation systems of countries such as Switzerland and Germany, which grew organically out of centuries-old research-intensive universities or industries, Singapore's R&D push was predominantly a directed, government-led effort to upgrade and strengthen the competitiveness of the domestic economy. In other words, Singapore's R&D journey was rooted in a need for economic competitiveness and growth. Today its research and innovation policies continue to heavily emphasize economic outcomes and impact. Given the many competing needs for resources, Singapore also had to adopt a pragmatic, phased approach to its R&D initiative.

The launch of its National Technology Plan in 1991 provided the framework for establishing Singapore's science and engineering research institutes over the following 10 years. A key feature of these institutes was their purpose: they were set up to serve Singapore's manufacturing sectors, mainly electronics, engineering, and chemicals. By 2001 Singapore saw that the biomedical sciences presented tremendous growth potential. It started the Biomedical Sciences (BMS) Initiative to establish biomedical sciences as the fourth pillar of the manufacturing economy, alongside electronics, engineering, and chemicals. Between 2001 and 2005, Singapore put into place the key building blocks that would establish core scientific biomedical capabilities and attract the talent needed for the endeavour. In its second phase (2006–10), the BMS Initiative focused on strengthening biomedical science capabilities to bring scientific discoveries from the laboratory bench to the bedside, to improve human health and healthcare delivery, and to bring benefits to the economy and society.

From 2004 to 2006, concurrent with the launch of the second phase of the BMS Initiative, two successive reviews were conducted with the aim of transforming Singapore's public universities into autonomous and research-intensive institutions to enable them to respond to the increasingly competitive global academic landscape and become world-class research universities. This review led to a significant increase in funding for academic research, the setting up of an Academic Research Council, and the establishment of the Research Centres of Excellence (RCEs). Five RCEs were established within Singapore's two largest universities[5]—the National University of Singapore (NUS) and the Nanyang Technological University (NTU)—to attract world-class academic investigators, train high-quality research talent, and create new knowledge in the specific areas of each centre. In the process, the international standing of Singapore's universities rose significantly. In the 2016 *Times Higher Education* global university rankings, NUS was ranked 26th and NTU 55th, up from their respective positions 34th and 174th only five years before.[6]

In 2006, with a rapidly growing and diversifying research landscape, Singapore recognized the need for high-level coordination and strategizing of the research efforts. This led to the establishment of the Research, Innovation and Enterprise Council, chaired by the Prime Minister and comprising international and local members, to steer the overall direction of the strategy. The National Research Foundation was established at the same time to plan, coordinate, and monitor the execution of the strategy.

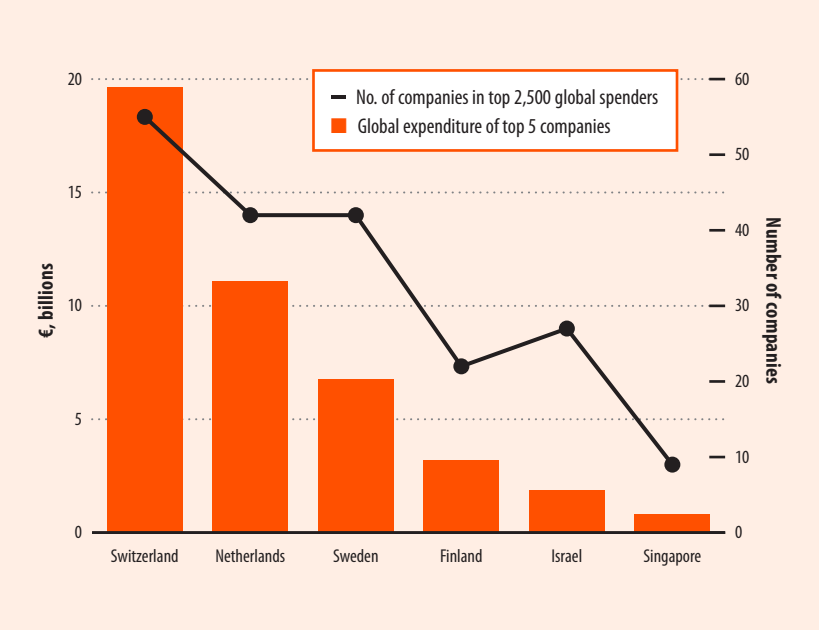
From research to innovation to enterprise (R-I-E)

In 2010, in the aftermath of the global financial crisis, Singapore undertook another review of its economic strategies to position itself for the new post-crisis environment and to achieve sustained and inclusive growth. Among other things, that review recommended strengthening its emphasis on business innovation and the commercialization of R&D, including creating customized platforms to facilitate the integration of the capabilities of research institutions, companies, and public-sector agencies to deliver innovative solutions. This approach gave rise to the pivotal articulation of Singapore's R&D framework—one that is based on open innovation—from research to innovation to enterprise.

The fifth national R&D plan—the Research, Innovation and Enterprise 2015 Plan (RIE2015) (2011–15)—espoused, for the first time, differentiated open innovation strategies targeted at the different enterprise segments that make up Singapore's economy. Singapore recognized then that its research ecosystem had progressed to another level of maturity, and a pipeline of promising research outputs had the potential to yield benefits. By recognizing that multinational corporations (MNCs), large local companies, small and medium-sized enterprises (SMEs), and start-ups each have different needs and capacities for conducting R&D and absorbing research outputs, Singapore embarked on customizing partnership models and open innovation platforms suited to their specific needs and circumstances. For example, the differentiated value proposition that Singapore was able to offer MNCs was the spectrum of science and engineering capabilities available within a small, compact location; seamless access to these capabilities across different research institutions; and the rich diversity of world-class talent present in those institutions.

In contrast, SMEs typically had limited resources available for R&D and were interested in new products or services that could bring additional revenue streams, or in productivity measures that could help them remain competitive. Public-sector efforts were then focused on either bringing technologies further down the value chain so they could be readily licensed by the companies or creating ready-to-go technologies that could be easily adopted. Consortia that brought these SMEs into the supply chains of larger MNCs

Figure 3: Comparison of corporate R&D expenditure across small research-intensive countries, 2014



Source: EU Industrial R&D Investment Scoreboard.

Table 1: Global expenditure of the top five corporate spenders as a percentage of national BERD, latest available year

Switzerland (2012)	Netherlands (2014)	Sweden (2014)	Finland (2014)	Israel (2014)	Singapore (2014)
164%	149%	74%	72%	23%	26%

Source: Estimates based on data from the EU Industrial R&D Investment Scoreboard; OECD Main Science and Technology Indicators; 2014 National R&D Survey of Singapore; and the European Central Bank.

Note: Percentage figures were estimated by dividing data from the EU Industrial R&D Investment Scoreboard (the numerator) by the national BERD (the denominator, which was estimated by multiplying BERD in the national currency, taken from the OECD and the 2014 National R&D Survey of Singapore, by appropriate exchange rates, taken from the European Central Bank).

were also a particularly useful model for ensuring that these smaller firms could raise their capabilities so they could continue to serve the MNCs.

The economic agenda has always been a fundamental tenet of Singapore's R&D strategy: all of Singapore's national S&T plans have consistently articulated the goal of catalysing private-sector investment and growth. Singapore has therefore adopted a holistic and integrated approach to developing research, innovation, and enterprise capabilities that allow it to translate research discoveries to impactful outcomes.

Singapore's strategy: Open innovation and open talent

Singapore's innovation system has been characterized by a strong openness to foreign investments, ideas, and talent. As a small, resource-constrained economy since its independence, Singapore recognized that it needed to tap into globalization to survive. Since the 1960s, the Singapore Economic Development Board (EDB) pioneered a strategy of welcoming and attracting MNCs and foreign direct investments into Singapore—at a time when many other countries were, at best, still largely ambivalent about foreign investment and corporations.

This attitude of openness has similarly been adopted in the R&D sector. When Singapore was building up its R&D capabilities in the early years, it relied on an open talent strategy to recruit international scientific leaders to seed capabilities and mentor young scientists. As a result, today Singapore has a robust core of local research talent complemented by a rich diversity of international talent. Of Singapore's research community, 30% are foreign,[7] allowing it to tap into the diversity of research ideas, expertise, and networks around the world. This puts Singapore among the most internationally diverse R&D ecosystems globally, on par with Sweden and the United Kingdom.

Another trend that Singapore has leveraged on in its R&D strategy is that of open innovation. As defined by Henry Chesbrough in 2006, 'Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.'[8] Globalization, technological advances, increased connectivity, and intensifying competition have led many companies to turn away from the traditional Bell Labs approach of internal R&D.[9] Instead, companies embrace the open innovation model and partner more aggressively with public-research performers across the globe. For example, Procter & Gamble is an early adopter of open innovation models through their Connect+Develop programme. From 2000 to 2006, the programme

helped increase their R&D productivity by almost 60%, more than doubled their innovation success rate, and doubled their share price while lowering their cost of innovation: their R&D investment as a percentage of sales decreased from 4.8% in 2000 to 3.4% in 2006.[10]

Very early on, Singapore recognized and harnessed the benefits of open innovation by collaborating with and anchoring strategic MNC partners, thereby transferring their capabilities and expertise to the local ecosystem while creating good jobs in the local economy. Singapore's economic agencies, such as A*STAR and EDB, make coordinated efforts to leverage open innovation to strengthen Singapore's key industry clusters. For example, A*STAR and EDB successfully partnered with Applied Materials, the largest semiconductor equipment manufacturer in the world, to anchor the firm's R&D operations in Singapore. Today all wafer-level packaging research across the firm is conducted in Singapore, adding to Singapore's position as a key global node for semiconductor R&D.

Another example of Singapore's open innovation strategy that has led to industry growth is seen in the aerospace cluster. Under the A*STAR Aerospace Research Consortium, major aerospace MNCs (such as Airbus, Boeing, Pratt & Whitney, and Rolls-Royce), local leading companies, and A*STAR research institutes collaborate in pre-competitive research. The consortium has played a critical role in building the R&D expertise needed for Singapore's aerospace industry, allowing it to gain a competitive edge over other emerging hubs in the region.

In recent years, Singapore's research-intensive universities have also deepened their industry engagement with major collaborations including the Rolls-Royce@NTU Corporate Lab and Keppel-NUS Corporate Lab. In the health and biomedical sciences space, A*STAR, the universities, hospitals, and academic medical centres also collaborate closely in major translational and clinical research programmes that aim to bring R&D from bench to bedside. Many of these collaborations, which link research to innovation and enterprise, are also both inter- and transdisciplinary in nature. Singapore recognizes that the greatest impact of innovation is often found at the convergence of different research fields and professions. In particular, A*STAR has played a leading role in convening large-scale, multi-disciplinary programmes that integrate the diverse capabilities of various performers in the ecosystem.

Besides open innovation partnerships with companies, Singapore has attracted top research performers from across the world. For example, the Campus for Research Excellence and Technological Enterprise (CREATE) under the National Research Foundation houses research centres from top universities such as the Massachusetts Institute of Technology (MIT), ETH Zurich, Cambridge University, and Peking University. These international partnerships have created a strong pipeline of ideas, talent, and research capabilities to increase the vibrancy and diversity of Singapore's R&D ecosystem. Another example is the Asian Network for Translational Research and Cardiovascular Trials programme, in which A*STAR and the major public healthcare institutions collaborate with regional partners across 10 countries to study cardiovascular disease progression in heart failure.

Singapore's challenges: Private-sector innovation capacity

Singapore's R&D and innovation journey is not without its challenges. Although it has consistently ranked 1st in the Innovation Input Sub-Index of the Global Innovation Index, Singapore ranked 20th in the Innovation Output Sub-Index in 2015, leading to an overall Innovation Efficiency ratio ranking of 100th in that year. In particular, Creative outputs is an area of weakness in Singapore that needs to be improved on, hovering at 33rd place in both 2014 and 2015; Knowledge and technology outputs fared better, at 12th place in 2015.

This situation is partly a result of the relatively nascent and government-led development of Singapore's innovation system. The Singapore government invested significantly in developing the country's universities and public research institutions in order to catalyse private-sector investments. As a result, although public-sector research has grown in intensity and excellence, that of enterprises, especially local enterprises, has yet to grow at a corresponding rate. The MNCs, by and large, dominate in many R&D-intensive industry clusters, such as electronics, pharmaceuticals, and biomedical sciences. In comparison, local enterprises are still relatively modest in their research investments and capabilities, although their growth rate appears to have picked up in the last five years or so.

Another pertinent observation is that many of the most research-intensive and innovative small economies in the world (such as Switzerland, Sweden, and Finland) have large home-grown companies that are also multinationals in their own right—these domestic MNCs account for a major proportion of the business expenditure on R&D

(BERD), and are the engines of innovation as well as technology receptacles of the R&D outputs in their home countries (Figure 3, Table 1).[11] For example, in Sweden, about 80% of business R&D is performed by a few large multinational companies, and 49% of BERD spent by Swedish-owned MNCs.[12] In Finland, Nokia alone used to contribute almost half of BERD in its heyday.[13] In comparison, it takes more than 100 companies in Singapore to contribute 80% of BERD and the large local enterprises collectively contribute only 17%.[14] The stark difference illustrates plainly that Singapore's domestic enterprises are nowhere near as large or as research-intensive as those in other small research-intensive countries.

Singapore is well aware of this challenge and of the importance of local enterprises, both small and large, to a strong and sustainable economy. Indeed, Singapore's SMEs employ 70% of workers and contribute 50% of total GDP.[15] Therefore, in recent years, government policy makers have placed greater emphasis on the technological upgrading of SMEs. SPRING, an economic agency dedicated to helping Singapore's SMEs grow, offers a broad slew of incentives and credit schemes to encourage SMEs to conduct R&D. A*STAR also carries out programmes that support the transfer of technologies and expertise from its research institutes to SMEs. Examples include the Growing Enterprises through Technology Upgrade (GET-Up) programme, which helps companies with their technology roadmapping and attaches research scientists to companies to increase their absorptive capacity; and the Technology Adoption Programme, which encourages companies to adopt ready technologies that may help them improve productivity.

Singapore is also increasing its efforts to collaborate with large local companies. For example, in the marine and offshore sector, Singapore is building a deepwater ocean basin and will partner with the industry, including local shipyards, to grow prototyping and testing capabilities for offshore platform development. More recently, companies outside the manufacturing sector—such as the DBS Bank and Singtel—have stepped up to collaborate with public-sector performers to enhance the digitization and data analytics capabilities within the banking and telecommunication sectors, respectively.

In addition, Singapore is stepping up its efforts to develop its entrepreneurial ecosystem. Assistance schemes such as the Technology Incubation Scheme, Early Stage Venture Funds, and the Technology Enterprise Commercialisation Scheme provide funding support for companies in their early stages. Within the one-north area, the government has built dedicated infrastructure for start-ups at the JTC Launchpad, which houses a growing number of successful local information technology and biomedical start-ups. Indeed, start-ups in Singapore have more than doubled in the last decade, growing from 24,400 in 2005 to 55,000 in 2014. The Global Entrepreneurship and Development Institute's annual Global Entrepreneurship Index now ranks Singapore as the 11th most entrepreneurial country.[16] However, Singapore's start-up scene is still far from the likes of Silicon Valley or Israel, and there is much room to inculcate more entrepreneurial mindsets in young Singaporeans and catalyse more start-up activities.

There is a silver lining in all these endeavours: Many local companies are now aware of the benefits that R&D and innovation can bring to their businesses, especially as they seek to differentiate their products and services from the competition. The aspiration is that, with continued persistence and more success stories of local enterprise growth, Singapore's private-sector innovative capacity will close the gap with the top research-intensive countries in the world. Singapore has some way to go in terms of cultivating a vibrant, R&D-intensive private sector, but it is on the right trajectory.

Conclusion: The way forward for Singapore

Singapore's R&D efforts have led it to be consistently ranked in the top 10 in the Global Innovation Index. It came in 7th in the 2015 GII, the top-ranked country in the South East Asia and Oceania region. Singapore ranked 1st in the Innovation Input Sub-Index and is seen to be strong in the Infrastructure and Business sophistication sub-pillars, in which it ranked 1st for each pillar. Its strong performance in the GII rankings is undergirded by strong growth in gross expenditure on R&D (GERD) and BERD, as shown earlier. The impact of these R&D investments is evident in the creation of many high-value jobs for the Singapore economy, with 32,835 research scientist and engineer (RSE) jobs in 2014, a growth of 6% CAGR over the last 10 years.[17]

Interestingly, because of the way Singapore's R&D sector has developed—through a government-led effort aimed at catalysing private-sector activities and investment—the Business sophistication pillar is viewed in Singapore as an output of its public R&D endeavours rather

than as an input. Many of the indicators in this pillar, such as knowledge-intensive employment and the state of cluster development, are in fact key performance indicators for the government agencies undertaking research activities.

Under the RIE2020 Plan announced earlier this year, Singapore has shifted to a governance framework that would allow for even more integrated national strategies, as well as strengthened links between the country's research capabilities and industry structure. Under RIE2020, Singapore is organizing its R&D investments into four thematic domains that reflect major national challenges and economic opportunities: Advanced Manufacturing & Engineering; Health & Biomedical Sciences; Urban Solutions & Sustainability; and Services & Digital Economy. This structure provides coherence to the research endeavours of the various research performers, the public-sector agencies, and the private sector. At the same time, three cross-cutting programmes—academic research, manpower, and innovation and enterprise—will support the four domains. The intent naturally is to avoid unnecessary duplication of effort, to support the most meritorious ideas and proposals, and to achieve even greater outcomes for the steady and sustained investments of the government in RIE2020.

Notes

1 Department of Statistics, Singapore, SingStat Table Builder, available at http://www.tablebuilder.singstat.gov.sg/publicfacing/createDataTable.action?refId=3252.

2 Josey, 2012, p. 325.

3 Information about one-north can be found at http://www.jtc.gov.sg/industrial-land-and-space/pages/one-north.aspx.

4 Thomson Reuters, 2016.

5 The three RCEs hosted in NUS are the Cancer Science Institute of Singapore, the Centre for Quantum Technologies, and the Mechanobiology Institute. The two RCEs hosted in the NTU are the Earth Observatory of Singapore and the Singapore Centre on Environmental Life Sciences Engineering.

6 See the Times Higher Education World University Rankings, available at https://www.timeshighereducation.com/world-university-rankings/2016/world-ranking.

7 This refers to the percentage of foreigners among PhD, Masters, Bachelors, and non-degree researchers. National R&D Survey of Singapore 2014.

8 Chesbrough, 2006, p.1.

9 Information about the Bell Labs approach can be seen in Hilger, 2014.

10 Huston and Sakkab, 2006.

11 OECD, 2013, p.165

12 Jacob et al., 2015. The *RIO Country Report 2015: Sweden*, released 23 June 2016, uses data from 2013.

13 OECD, 2008, p. 116.

14 National R&D Survey of Singapore 2014.

15 Say, 2015.

16 The Global Entrepreneurship Index can be found at https://thegedi.org/global-entrepreneurship-and-development-index/.

17 National R&D Survey of Singapore 2014.

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National Innovation Systems Contributing to Global Innovation: The Case of Australia

Alan Finkel, Department of Industry, Innovation and Science, Australia

John Bell, ACIL Allen Consulting, Australia

In the context of the increasing globalization of innovation, this chapter explores ways in which Australia is drawing on global experience in the design of national innovation systems, while at the same time recognizing that many of the benefits from national innovation systems spill across national borders. The chapter provides examples of Australian engagement in worldwide innovation through the globalization of 'big science', with outcomes in fields such as aerospace and pharmaceuticals. It also provides examples of ways in which Australia is drawing on the experiences of other countries in developing new policies and programmes. And just as Australia is learning from other countries, others can also learn from the Australian experience. In both policy development and big science projects, advances made in Australia build on and will contribute to global innovation benefits.

Global science cooperation and national innovation

Well-designed national innovation systems recognize the value of international linkages and collaboration. Global collaboration harnesses the best talent and resources to address world challenges, with participating countries sharing the costs, through:

- international research collaboration to address issues such as the Ebola virus;
- big science collaborations such as the Square Kilometre Array (SKA; see below) and the Laser Interferometer Gravitational-Wave Object (LIGO);[1] and
- shared access to major facilities such as synchrotrons.

The Global Science Forum (GSF) of the Organisation for Economic Co-operation and Development (OECD) was established in 1992.[2] Originally known as the 'Mega-Science Forum', it is a forum in which OECD members and other countries can discuss scientific issues. Through this forum, the GSF has also been providing analysis and advice to governments on international science collaborations; the name was changed to the Global Science Forum in 1999 to more accurately reflect this broader role. The GSF includes 33 member countries that are either OECD members or other countries (as Key Partners).

In the area of international scientific cooperation, the GSF provides a venue for consultation among the senior science policy officials. It produces findings and action recommendations on high-priority science policy issues that require international cooperation, and identifies opportunities for collaboration on major scientific undertakings.[3]

Challenges to which the GSF seeks to respond include:

- the tension between the fiscally constrained environment on science, technology, and innovation (STI) in most jurisdictions, along with a need to demonstrate the impact and benefits of public investment in science;
- the growing complexity of science and technology, which requires greater international and inter-disciplinary cooperation;
- the rapid development of information and communication technologies and associated 'open science' and 'big data' developments;
- the growing societal engagement with science and the need to ensure public trust; and
- the increasing importance of emerging economies in global STI, which is expanding the global competition for talent and requiring new approaches to international cooperation and its governance.

The GSF serves its members in the formulation and implementation of their science policies by exploring opportunities for new or enhanced international cooperation in selected scientific areas, defining international frameworks for vital national or regional science policy decisions, and addressing the scientific dimensions of issues of global concern.[4] The GSF's current activities include a scoping exercise to help determine upcoming priorities for research infrastructure.

The globalization of science and innovation: Examples

This section provides an example of an international project based, in part, in Australia, and an example of a policy programme that underpins the big science environment in the country. They can both be seen as efforts bringing together scientists and engineers from around the world in a way that can serve as a roadmap for other international efforts.

The Square Kilometre Array

The SKA project is an international attempt to construct a radio telescope capability many times more powerful than any currently in existence. The project involves international collaboration and funding. The SKA project plans to locate a facility in both Australia and South Africa and to build it in two phases. The indicative capital budget for Phase 1 is about $A1 billion. The purpose of the SKA is to probe key questions about the nature and origins of the universe and the laws of physics.

Australia has long been a leading player in radio astronomy. It has been a strong proponent of this project and offers an exceptionally good site for locating some of its most exciting elements. The country has taken a leadership role and brings world-class radio astronomy capabilities to the project. Australia and other SKA partners will gain benefits from the exchange of top scientists and engineers and the SKA will inspire young people to develop an interest in science.

Construction and operation of the low-frequency SKA in Australia offers the potential for substantial tangible economic benefits through demands for local supply of goods and services that will feed into employment, wage rates, and an overall boost to real incomes and economic welfare.

Investment in the SKA project creates options for Australia to secure a competitive position in supercomputing and the management of massive datasets. Successful implementation of the SKA will require major progress in this area. The data-handling demands of the SKA will be well ahead of current commercial drivers of progress, working with huge data streams needing to be managed. The largest data volumes will originate in Western Australia, and it will be necessary to have major, highly innovative data processing performed within that region.

A key feature of the data-handling requirements of the SKA lies in the ability to identify rare, weak signals in a background of massive noise. This type of problem arises in a number of other settings as well. It was the stimulus for the Australian development in the 1980s of fast Wi-Fi capabilities, which subsequently proved highly successful commercially. Such data handling also underpins the emerging use of computer modelling of geological structures as an input to resource exploration. Locating this type of data-processing capability in Western Australia supports strong synergies with resource exploration and development.

Australia's National Collaborative Research Infrastructure Strategy

In Australia, the drivers for big science projects such as the SKA are also reflected in national decisions about investment in shared research infrastructure. These facilities provide the tools for Australian researchers to contribute to global science and innovation, and highlight:

- the increasing importance of major research infrastructure to research and innovation;
- the changing nature of research—which now places more emphasis on collaboration and the importance of systemic infrastructure (broadband, high-performance computing, data repositories, etc.);
- the limited capacity of a 'small' nation to meet major infrastructure needs; and
- the increasing cost and complexity of research infrastructure.

Some expensive research equipment needs to be used around the clock in order to get value from it before it is no longer leading-edge equipment (for example, the life expectancy of state-of-the-art sequencing machines is about five years). Experience shows that sharing access to leading-edge research equipment and facilities can result in new beneficial collaborations between users both within and between public and private sectors.

Since Australia's National Collaborative Research Infrastructure Strategy (NCRIS) programme began in 2004, it has resulted in the investment of around $A3.7 billion to develop and fund national research infrastructure projects. NCRIS involves a strategic and collaborative approach to investment in world-class research facilities, networks, and infrastructure that are accessible to researchers and meet long-term needs. Many high-priority, medium-scale research facilities are too large or complex to be supported by any single research institution, but are nevertheless necessary to leading-edge research. NCRIS provides funds in the range of $A5 to $A60 million, supporting facilities that are too large to be funded through other Australian programmes but are less than 'landmark' investments such as the SKA, which require separate case-by-case

consideration. NCRIS also seeks to avoid wasting limited resources that would result from competitive or uncoordinated duplication of key research facilities.

The key requirements of NCRIS include:

- Major infrastructure should be developed on a collaborative, national, non-exclusive basis. Funding and eligibility rules should encourage collaboration and co-investment.
- Access is a critical issue in the drive to optimize Australia's research infrastructure. In terms of NCRIS funding, there should be as few barriers as possible to accessing major infrastructure for those undertaking meritorious research.
- Due regard must be given to the whole-of-life costs of major infrastructure, with funding available for operational costs where appropriate.
- NCRIS should seek to enable the fuller participation of Australian researchers in the international research system.

Participants in NCRIS facilities include institutions of higher education, the Australian federal government as well as state and territory research agencies and institutions, independent research institutions, private-sector research organizations, and industry. Researchers from other countries access these facilities through collaborations with Australian researchers. NCRIS funds have supported access for Australian research to international infrastructure such as the European Molecular Biology Labs and the Giant Magellan Telescope.

Australia is currently planning the next stage of national-scale research infrastructure. The evolving roadmap will be shared with the international community through the country's participation in the Group of Senior Officials on Global Research Infrastructures, whose most recent meeting was hosted in Sydney in February 2016.[5] Countries such as New Zealand and Singapore have been invited to follow Australia's progress and participate where they wish.

The global search of big corporations for research from public-sector inputs

Corporations that previously employed large numbers of researchers in their own laboratories are increasingly building alliances with leading-edge public-sector research groups around the world to access skills, expertise, and equipment. These alliances provide corporations with low-cost access to new ideas emerging from public-sector research facilities—yet another example of how the global innovation system integrates and builds on national systems.

This trend provides opportunities for different groups:

- for countries such as Australia to get 'on the radar' of multinational corporations and attract research investment;
- for public-sector researchers to develop entirely new approaches to addressing major challenges and solving industry problems; and
- for research students involved in these activities to enjoy greater employment prospects.

Global corporations seek to locate those public-sector researchers who can best meet their needs. Of these alliances, of which there are many in Australia, two—Boeing with Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Monash University with GlaxoSmithKline (GSK)—illustrate this trend.

Boeing Australia has worked with its parent company in Seattle to be the sole Australian supplier of flight control surfaces such as ailerons, spoilers, and rudders for a number of Boeing commercial aircraft, including the new 787 Dreamliner. These are manufactured in Melbourne and exported to the United States of America (USA) for assembly. Boeing has collaborated with the Australian government research agency called CSIRO for over 23 years; in recognition of this collaboration, in 2011 Boeing named CSIRO the 'Supplier of the Year' out of 17,500 suppliers worldwide. The joint collaboration has worked on projects including research into sustainable aviation fuels, aircraft painting processes, and aircraft maintenance management software. In 2012 CSIRO and Boeing commenced a five-year, $A25 million research programme in space sciences, advanced materials, energy, and direct manufacturing. In the past decade, Boeing has transferred an estimated $A100 million in technological knowledge (including the cost of licences, know-how transfer, and so on) to Australia and has invested more than $A500 million in plant, equipment, training, and research laboratories.[6]

Monash University's Institute of Pharmaceutical Sciences (MIPS) collaboration with GSK was established in 2009 with $A3.3 million in initial funding from the Government of the State of Victoria and GSK. It leverages the unique skills of MIPS in drug delivery and formulation with the industrial know-how and world-class medicine development capabilities of GSK Australia. This project funded the creation of a centre to support the development

of next-generation formulations and platform technologies for new medicines.

GSK has continued to make significant investments in Australia, creating new high-skilled jobs while continuing to support the successful MIPS-GSK collaboration. GSK's advanced manufacturing facility in Victoria is its largest sterile facility in the southern hemisphere, where it manufactures medicines and vaccines that utilize blow-fill seal technology, developed in partnership with MIPS. This technology, which is an advanced antiseptic process, produces a range of container sizes suitable for the delivery of unpreserved, sterile products. GSK and MIPS have collaborated on more than 20 other projects since 2010. The partners have a strategy to underpin an ongoing 10-year sustainability and growth target for enhanced pharmaceutical manufacturing in Australia that embraces a range of partners and communicates knowledge to a broader audience.[7]

Melbourne's world-class concentration of bioscience and medical research includes MIPS, BIO21,[8] CSL Ltd,[9] the Walter and Eliza Hall Institute of Medical Research, and NCRIS platforms such as the Australian Genome Research Facility. Australian Prime Minister Malcom Turnbull recently announced a major expansion of BIO21 to house CSL's Global Research and Translational Medicine Hub. Melbourne's research institutes are well connected to other global centres of bioscience and their innovations have an impact around the world.

Enhancing national contributions to global innovation

National innovation systems are increasingly making greater use of demand-side policy and programme measures (see also Edler in Chapter 5).[10] In doing so, they are drawing on the experiences of other countries and adapting them where necessary. This sharing of policy ideas and experience raises the performance of the global innovation system. One example is the US Small Business Innovation Research (SBIR) Program, established in 1982. It currently distributes around US$2.5 billion in contracts and grants. US agencies with external R&D budgets of more than US$100 million per annum are required to spend 3.0% of their budget on grants and contracts to small businesses. Firms are selected to develop products and technologies that are of interest to the government agencies or that support innovation aimed at public good outcomes (which are generally diffused globally, contributing to global innovation). Individual agencies are responsible for selecting awardees. One project, led by Alan Finkel, received SBIR funding in 1986 in support of a transformational technology development that underpinned company sales and reputation growth for the next two decades.

Evaluations of the US SBIR Program have found strong economic and employment outcomes. For example, Lerner compared firms that had been awarded grants in 1985 with a matching set of firms over a 10-year period.[11] He found that the awardee firms had a five times greater increase in employment and a 2.5 times increase in sales than the control firms. In recent years, other countries—including Finland, the Netherlands, Sweden, and the United Kingdom (UK)—have copied or adapted the SBIR Program to accelerate the growth of new technology-based businesses. Australia is planning to start a pilot SBIR-type programme at the federal level this year.

Several pioneering features of SBIR, maintained since its inception 34 years ago, have contributed to its success. First, there is no federal government budget impact because the funding is set aside from existing expenditure. This approach has helped to secure bipartisan support. Second, SBIR is generous in its encouragement of innovative firms and projects—the government takes no equity position, requires no matching funds, and expects no payback. Risk mitigation is managed through the two-phase awards process, and societal benefit comes from its contribution to the economy through jobs and taxes. Third, because each agency administers its own programme within the guidelines established by Congress, agencies are empowered and motivated. Fourth, SBIR provides funding for early-stage innovation ideas that are too high risk for private investors, including venture capital firms, so that these ideas have a chance to come to fruition.[12]

SBIR-type programmes are seen as addressing needs that are not being met by market mechanisms alone. The success of demand-side innovation measures such as SBIR contracts depends on a number of factors. The SBIR contracts approach, where an invitation is issued to develop a solution to an identified problem, requires programme administrators who are lateral thinkers able to identify issues that are amenable to this type of approach. These administrators also need a solid, working knowledge of related research activities. SBIR-type programmes differ from conventional public-sector procurement and require a different mindset. For example, some health ministries may not see investment in innovation as part of their

responsibility, even though such investments may reduce hospital costs or improve patient well-being. SBIR-type schemes also require a capability on the part of research suppliers, who must have the necessary agility and business skills.

Creating pathways to employment for research graduates

Research graduates have global employment opportunities and are important contributors to global innovation. In Australia only about one-third of PhD-trained researchers are employed in the business sector, compared with two-thirds in the USA. This makes it harder to establish research collaboration projects between business and the public sector in Australia, which in turn has an impact on the innovation capacity of this sector. Increasing the numbers of researchers in business is therefore of some importance. Again, Australia is seeking to learn from the experience of other countries such as France, where companies that employ new PhD graduates receive a quadruple tax deduction on their salaries for two years.[13]

In the UK, Knowledge Transfer Partnerships (KTPs) create demand for recent graduates while also encouraging their supervisors to become involved in knowledge transfer. KTPs aim to help businesses improve their productivity and competitiveness through the better use of technology, knowledge, and skills. Each KTP is a three-way partnership between a business, an academic institution, and a graduate. The academic institution receives a grant to partially subsidize the cost of employing a recently qualified graduate to work at the company; the average company contribution to KTP projects is around £20,000. Typical KTPs last between six months and two years, depending on the project and the needs of the business. KTP opportunities are advertised online.[14]

KTPs are delivered through Innovate UK. A wide range of knowledge-exchange activities—spanning management; marketing, business administration and policy; engineering technology; and information technology, computer science, and computation—are undertaken. Associates are jointly supervised by staff in the company and in the faculty at the university concerned.

The costs of the partnerships are partly funded by government and partly by the participating business. A review in 2010 reported that 62% of company partners subsequently offered the associate a permanent position, and 82% of associates accepted those offers.[15] A recent independent study evaluating the economic impacts of the KTP Associates and participating universities found that, in the period 2001–08, the return on public investment was £7.5-7.9 per £1 of KTP grant funding, with £1.6-1.8 billion gross value-added and between 5,530 and 6,090 jobs created.[16]

Australia has a small programme called Innovation Connections that provides financial support to place a publicly funded researcher in a business or a business researcher in a publicly funded research organization to work collaboratively on a specified project.[17] An EU-wide KTP Program, currently understood to be under consideration, would have impact beyond national innovation systems.

Increasing the contribution of public-sector research to innovation

Measuring engagement between public-sector researchers and external parties is an important step towards providing incentives to increase the translation of public-sector research for economic and social benefit.[18] The Australian Academy of Technology and Engineering (ATSE) has taken the initiative of exploring options for metrics to measure Australian universities' research engagement with external partners. These partners may be Australian or based overseas. This work is intended to ensure that research engagement is appropriately recognized and rewarded alongside research excellence.[19]

The proposed metrics are derived from existing data collections of Australian university research. These metrics are based on external dollars attracted to support research from industry and other users of university research, as a direct measure of research engagement. Research engagement with industry is seen as a forward-looking proxy for impact. Building on the ATSE's initiative, in December 2015 the Australian government announced its intention of introducing, for the first time, clear and transparent measures of non-academic impact and industry engagement when assessing university research performance. Built on the work of the ATSE, the new metrics will be piloted through the Australian Research Council in 2017 and fully implemented by 2018.

A database of international scope developed in Australia is in the process of integrating patents from most countries alongside academic publications and business data. Known as 'The Lens', among other capabilities it will enable the measurement of impact by tracking the number of times academic publications have been cited in the patent literature. It is conceivable—and probably desirable—that such impact data will become a component of national and

international rankings of research institution performance.

Managing intellectual property to provide global opportunities for innovation

Government agencies responsible for the administration of intellectual property (IP) rights systems are becoming more pro-active in making their information available to potential users. In December 2014, a discussion paper announced that the government would put in place arrangements to provide industry and other end-users with better access to research.[20] To achieve this outcome the government would seek to:

- establish an online point of access to commercially relevant research for business, and
- develop a whole-of-government policy to open up access for business and the community to publicly funded research.

The Australian IP rights agency, IP Australia, has implemented the first of these objectives. IP Australia recognizes that knowledge created by research organizations is rarely in a form that can be immediately applied commercially. Potential small- and medium-sized company research users often lack the resources and experience to find such knowledge. This is a particular problem in Australia, where the percentage of Australian researchers employed in business is relatively low. Add to this a researcher 'reward system' that is not set up to encourage research commercialization, and the challenge of helping potential users of IP becomes that much harder.

IP Australia operates an Australian patent database. In addition, it has established an in-house analytics group of experts, the Patent Analytics Hub, to help Australian innovators make the most of their IP. The Hub provides analysis, visualization, and interpretation of data included in patent documents.

IP Australia has also developed:

- an IP Toolkit to facilitate, simplify, and improve collaboration between researchers and industry; and
- Source IP—a digital marketplace for sharing information, indicating licensing preferences, and facilitating contact for IP generated by the public research sector in Australia. This is similar to other globally available databases, including those of the Danish Patent and Trademark Office and the Malaysian Patent Office.

Source IP's focus is on connecting rather than buying or selling IP. It provides a single point for information and making contact, and because it is a primary database it can be trusted. It provides 'translated' patent listings with usage suggestions. It also provides some information on provisional patent applications, as well as those in Patent Cooperation Treaty (PCT) and national phases (a PCT application, which establishes a filing date in all contracting states, must be followed up with the step of entering into national or regional phases to proceed towards the granting of one or more patents). IP Australia's work is connecting Australian researchers and IP owners with potential users around the world.

In addition, WIPO's PATENTSCOPE allows more than 60 million patent documents to be searched, including patent applications filed under the PCT.[21] Through the Access to Specialized Patent Information programme, patent offices and academic institutions in developing countries can receive free or low-cost access to sophisticated tools and services for retrieving and analysing patent data.

Conclusions

This chapter has shown that Australia's science base is strong and contributes to innovation both nationally and internationally through its engagement in worldwide innovative programs. Although by population Australia is a small country, it takes advantage of the globalization of big science, finding a place on the international stage in cooperative ventures with other countries and opening itself up to interaction with scientists from around the world. In doing so, it draws on the experiences of other countries in developing new policies and programmes.

Australia, through its national innovation policies, recognizes the value of international linkages and global collaboration. It aims to harness the best talent and resources to address global challenges and to share costs of providing and maintaining leading-edge facilities and equipment, which would otherwise be prohibitive, with other participating countries.

Australia's innovation system is in transition. It is learning from international best practice, both in policy development and in big science projects. As these evolve, Australia's experiences with finding workplace connections for research graduates, with managing IP, and with fostering the engagement of the public sector in translational research can contribute to the societal benefits to be reaped from global innovation. And in this way, too, Australia can participate by providing lessons to other countries that want to be part of the global innovative effort.

Notes

1 See https://www.skatelescope.org/ for information about the SKA project; See https://www.ligo.caltech.edu/ for information about LIGO.

2 OECD, no date.

3 OECD, no date.

4 OECD, no date.

5 Department of Education and Training, Australia, 2016.

6 Bell et al., 2014.

7 Monash University, 2012.

8 BIO21 is one of Australia's largest biotechnology research institutes, with more than 500 researchers.

9 CSL Ltd is a Melbourne-based leading global biotherapeutics company that operates in more than 30 countries.

10 See Chapter 5 of this report.

11 Lerner, 1996.

12 Lerner, 1996.

13 BusinessFrance, no date.

14 Innovate UK, 2016.

15 Regeneris Consulting, 2010.

16 WECD, 2015.

17 Department of Industry, Innovation and Science, Australia, 2016.

18 Bell et al., 2015

19 ATSE, 2015, 206.

20 Department of Education and Department of Industry, Australia, 2014.

21 See http://www.wipo.int/patentscope/en/ for information about WIPO's PATENTSCOPE.

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Leveraging Talent Globally to Scale Indian Innovation

Gopichand Katragadda, TATA Sons

Aravind Bharadwaj, Mahindra & Mahindra Ltd.

India has all the ingredients needed to become a global driver of innovation: It has a strong market potential, an excellent talent pool, and an underlying culture of frugal innovation. Innovative countries have demonstrated the leverage of their cultural advantage to capture markets. Japan leveraged its cultural emphasis on 'efficiency and team work',[1] to revolutionize the manufacturing and engineering industries. The Republic of Korea (Korea) utilized its cultural emphasis on 'speed',[2] and it built world-class companies such as Samsung and LG. China has sustained a GDP growth in excess of 10% for more than two decades by virtue of its 'ability to scale.'[3] The United States of America (USA) and Israel have leveraged the diversity of their populations to lead innovation globally.

Similarly, India can build on its cultural bias of frugality and sustainability to capture markets not only within its shores but globally. For this to happen, however, India's industries need to have the hunger to be at the top of the value chain, its customers have to be more demanding, its policies have to be more transparent, and its talent pool has to get more hands-on experience while simultaneously growing to leverage the global talent pool.

Leveraging global talent

An often-cited example of a US company leveraging global talent is that of General Electric (GE). GE has been an early pioneer of globalizing research with its centres in India, China, Germany, and Brazil, in addition to the parent research centre in the USA. The centre in Bangalore, the John F. Welch Technology Center (JFWTC), was set up in September 2000 at its present 50 acre campus. Today the JFWTC is home to over 4,000 researchers and engineers contributing to product development and intellectual property filed and owned by the parent GE. Close to 2,000 of the 30,000 patents awarded between 2011 and 2016 to GE have Indian inventors from the JFWTC and Indian talent in other global centres.[4] Contributions from the JFWTC include low wind regime wind turbines, locomotive designs for emerging markets including India, low-cost ultrasound and ECG machines, and aircraft engine component designs.[5] Going by awarded patents, other global companies with strong contributions from Indian inventors include IBM, Intel, Qualcomm, and Google (see Table 1). An interesting aspect of these data is that US companies, especially GE and IBM, have leveraged Indian inventors more than non-US companies have. This could point to the fact that the Asian companies have only recently started leveraging talent outside their own geographies. Similarly, Indian corporations show an increasing trend in patent filing and a healthy leverage of global talent, as shown in Table 2.

Innovating for the immediate needs of the Indian market

As India embarks on its innovation journey, Indian corporations and the government should first focus on the significant internal market needs in the energy, water, transport, healthcare, food security, and digital products and services sectors to deliver tangible human and environmental benefits. India should build out its own capabilities while simultaneously leveraging global talent to speed up delivery in these critical sectors. Identified below are the opportunities and challenges in the six sectors:

- **Energy.** India would need to generate 0.5 kW of electricity per person to provide a reasonable level of opportunity to its population. Based on current population projections for 2025, India needs to increase its generation capacity by 2.5, from roughly 280 GW to 710 GW. The energy requirement of 0.5 kW per person is roughly half of the European average and a quarter of the US average. Transmission and distribution capacity should be upgraded accordingly.[6]

Table 1: Contributions of Indian inventors to patents granted to multinational corporations

Company	Patents granted (total, 1 January 2011 to 31 March 2016)	Patents with at least one Indian inventor (total)	Patents with at least one Indian inventor (%)
GE	29,001	1,966	6.8
IBM	45,527	1,894	4.1
Intel	16,542	284	1.7
Amazon	3,631	62	1.7
Google	12,116	192	1.5
Microsoft	24,696	365	1.4
Qualcomm	32,218	421	1.3
Samsung	95,298	441	0.46
Apple	14,007	31	0.22
LG	71,443	47	0.06
Sony	47,336	9	0.01
Toshiba	51,703	8	0.01
Toyota	53,122	6	0.01
Canon KK	56,987	3	0.005
BMW	75	0	0

Data source: Patent Inspiration, http://www.patentinspiration.com/.

- **Water.** India needs to double its available usable water from 1,000 to 2,000 cubic metres per person per year; less than 1,700 cubic metres of water per person per year is considered by the United Nations to be water-stressed.[7] To put this into perspective, currently the USA provides 8,000 cubic meters of water per person per year to its citizens. Furthermore, India needs to double the sewage treatment facilities in its urban areas to even meet its current needs.[8]
- **Transportation.** It is estimated that India will add 1,000 passenger and freight locomotives over the next 10 years, and the passenger and freight aircraft market will grow to US$100 billion or more by 2025. A detailed analysis of India's transportation sector is available in the report submitted to the Prime Minister of India by the National Transport Development Policy Committee in 2013–14 entitled *India Transport Report: Moving India to 2030*.[9] In regard to road transportation, the Government of India aims to make automobile manufacturing the main driver of its Make in India initiative, as it expects the passenger vehicles market to triple, reaching 9.4 million units by 2026, as highlighted in the Auto Mission Plan (AMP) 2016–26.[10] Efficiency, emission control, and light weighting will continue to drive the next generation of transportation in India.
- **Healthcare.** In order to provide sufficient healthcare for its citizens, India will need to boost its healthcare spend from its current 4% of GDP to 5.5% of GDP, as noted by the McKinsey report prepared for the Confederation of Indian Industry (CII) *India Healthcare: Inspiring Possibilities, Challenging Journey*. The report presents a vision for India's healthcare with clear goals and the steps that will need to be taken to achieve those goals by 2022.[11]
- **Food Security.** India will have to develop innovative, accessible, diversified food plans and supply chains to enable a diet that supplies at least around 2,100 kilocalories per capita per day for the urban population and 2,400 kilocalories per capita per day for the rural population.[12]
- **Products and Services for the Digital Consumer.** It is expected that by 2030 more than a billion Indians will be online.[13] Digital consumers today are connected individuals who leverage their interconnectivity as much as their Internet connectivity for purchasing products and services. From mobile wallets to digital lockers, digital consumers will redefine commerce as we know it.

Building innovation competence: Indian IT and automotive industries

The Indian information technology (IT) industry is discussed in the following paragraphs to outline the historical context of global leverage of Indian talent and the subsequent leverage of global talent by Indian industry. The chapter then focuses on the automotive industry as an example of a sector where global talent has played a role in the maturing of the Indian industry.

The Indian IT industry: Moving up the value chain

During the era of protected markets, companies in emerging markets predominantly focused on products based on dated technology and adapted them to local needs with local manpower. However, with emerging markets opening up to global players, traditional companies

have focused on processes to improve product quality and operational efficiencies to remain competitive. Simultaneously, several start-ups seized this opportunity in sunrise sectors, specifically in the Indian IT sector, to leverage the low-cost talent available in India to initially execute manpower intensive projects for mature markets. Companies such as Tata Consultancy Services (TCS), Infosys, and Tech Mahindra have progressively expanded their scale and scope to move up the value chain with a global centre and workforce and have transformed themselves into major international players.

Table 2: Indian companies filing globally and leveraging global talent, 1 January 2011 to 31 March 2016

Company	Patents granted (total, five years)	USA	China	Australia	European Patent Office	Canada	Patents with one or more non-Indian inventors (total)
Infosys	281	275	2	1	0	0	81
TCS	244	170	22	25	4	2	21
Ranbaxy	196	58	10	23	26	8	35
Wockhardt	160	54	9	13	16	19	45
Sun Pharma	84	21	8	6	10	2	24

Source: Patent Inspiration, http://www.patentinspiration.com/.

Tata Consultancy Services: An example of leveraging talent globally

TCS established its first research centre, the Tata Research Development and Design Centre (TRDDC), in Pune, India, in 1981. The TRDDC undertakes research in software engineering, process engineering, and systems research. It is also the largest research and development (R&D) facility among the network of innovation labs at TCS.

In the USA, TCS opened centres in Cincinnati and Santa Clara with the goal of fostering research by leveraging specific talent and ecosystems available in these cities. TCS Innovation Labs in Cincinnati, established in 2008, employs more than 900 workers. This centre was created to nurture research in the areas of supply chain management and manufacturing technologies. The empowered team of researchers, located in both Cincinnati and Bangalore, is extensively engaged in co-innovation partnerships with their global partners including Purdue University, the Indian Institute of Science, and Oklahoma University. This team is piloting innovative platforms such as the supplier social network and is excited about shaping the TCS research agenda in the emerging area of cybersecurity across applications in the automotive, supply chain, and Internet of Things sectors.

The TCS Silicon Valley Customer Collaboration Center in Santa Clara, California, which was officially opened on 31 January 2012, is designed to provide an open, innovative, and collaborative workspace that adopts the entrepreneurial spirit and best practices employed by the world's leading start-up companies in Silicon Valley. With a state-of the-art Usability Test Lab, the centre serves as the worldwide headquarters of TCS's Mobility Solutions platform, incorporating the benefits of emerging technologies such as big data, analytics, and mobility into TCS's technology palette.

Furthermore, as one of the early adopters of collaborative innovation, TCS has actively pursued the development of new models for research and innovation. TCS's Co-Innovation Network (COIN™) includes companies with thriving, customized innovation ecosystems that enable the development of breakthrough solutions. The COIN™ network comprises leading university and research communities, tech start-ups, venture capital firms, industry analysts, and senior industry executives. Anchored at the TCS Innovation Labs across multiple cities, COIN™ provides an environment for sophisticated IT research in leading-edge technologies across various domains with the aim of delivering innovative solutions that can be globally sourced and customized to requirements.

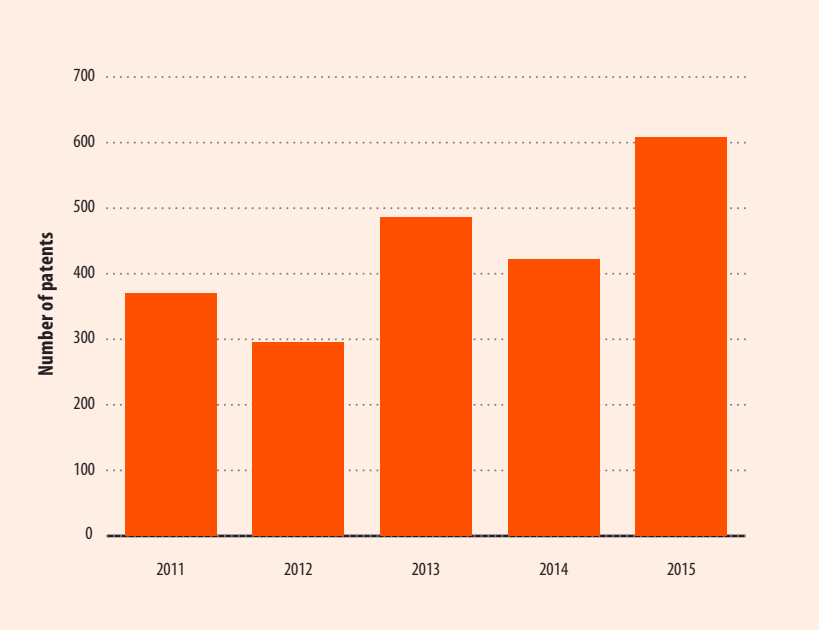
The strategic approach of TCS in building a strong Indian research base and combining it with talent at its global centres is reflected in the steady accumulation of intellectual property, as shown in Figure 1. Some of the granted patents are also well cited, indicating the relevance of the patents in the industry.

The evolution of the Indian automotive industry

The Indian automotive industry is another good case study that illustrates a transition for both Indian and global players over the past two decades.

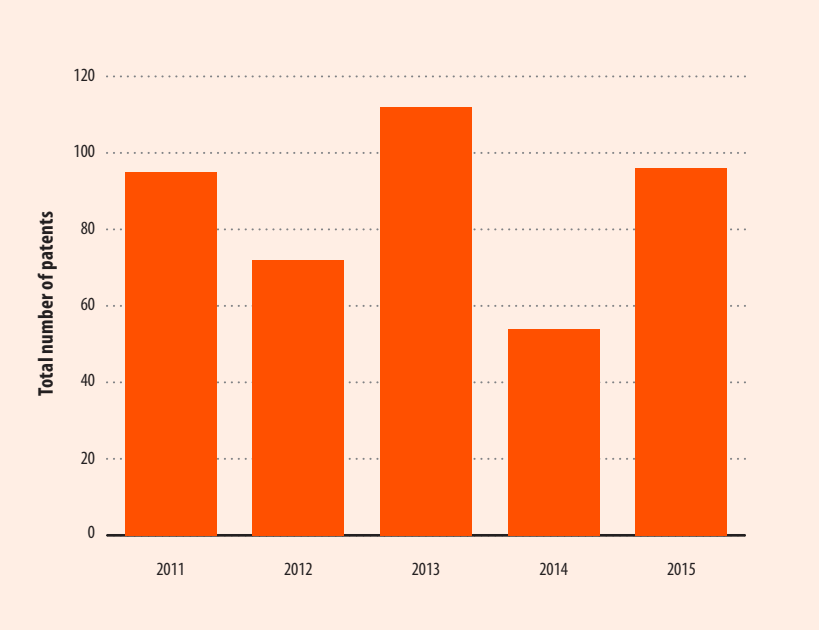
During its initial phase, the market needs drove the formation of several joint ventures between major international original equipment manufacturers (OEMs) and big Indian conglomerates. Examples include TVS Suzuki, Mahindra Ford,

Figure 1: TCS's globally published patents, by year of publication



Data source: Patent Inspiration, augmented with data from InPAAS for India patents.

Figure 2: Mahindra patents: Published patents including granted patents



Data source: Patent Inspiration, augmented with data from InPAAS for India patents.

Daewoo Shriram, and Hero Honda. The major objective was to launch global products and technology in India with a focus on localization for Indian conditions and consumer requirements. Although many of these partnerships were short lived, they created a strong pool of local engineering talent with exposure to global manufacturing systems, processes, and quality standards. During this period, the quality of products manufactured in India improved considerably. Subsequently, when statutory regulations synchronized with global standards were ushered in by the government, updated technology features needed to be introduced at a cost affordable to Indian customers.

Given the advantage of local market knowledge, Indian companies such as Tata Motors, Mahindra, Ashok Leyland, and TVS shifted their focus to product development. Although these companies significantly increased their investment in their own product development centres in India, they also collaborated extensively with global consultants and suppliers to accelerate their learning process. These companies reached out to mature automotive markets such as the one in the USA to recruit talented and experienced professionals to lead their product development initiatives. One outcome of this incorporation of global talent was that several products were successfully designed, developed, and launched in India for India, with a frugal engineering approach.

One such success story is that of the Scorpio vehicle, launched by Mahindra in 2002 and developed under the leadership of Pawan Goenka, who joined the company after spending more than two decades at the GM Research Labs in Detroit. Indian customers quickly embraced the Mahindra Scorpio

vehicle despite the fact that it did not reach global standards because of its extremely attractive value proposition. This vehicle has maintained its place in the Indian market for more than a decade with a strong brand loyalty. This loyalty is mainly the result of periodic upgrades and quality improvement, which bridge the gap with global products, and yet it continues to provide an affordable price that meets customer expectations.

During the same period, some of the global automotive players, such as Hyundai and Ford, continued investing in manufacturing and sales operations in India. This strategy enabled them to access the local supplier ecosystem, leading to product cost reduction through increased local content in their products. In addition, their direct presence in the Indian market accelerated their understanding of emerging market customer expectations. The result was several product designs that cater to India and similar markets globally.

Late entrants such as Renault Nissan formed several joint ventures with Indian companies to access the local ecosystem and talent pool. Although most of these partnerships did not last long, their continued focus in India has helped them establish a strong presence in the Indian market within a very short time. The large-scale manufacturing operations set up by the global OEMs have been transformed into major export hubs for vehicles manufactured in India to global markets. The two major ports in the southern city of Chennai—the manufacturing base of major global OEMs such as Hyundai, Ford, and Nissan Renault—handle about 400,000 vehicles per annum. Last year, Hyundai alone accounted for more than 100,000 vehicles exported from the Chennai Port.

Table 3: Automobile export trends, aggregated for local and international OEMs

Category	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Passenger vehicles	4,46,145	4,44,326	5,08,783	5,59,414	5,96,142	6,22,470
Commercial vehicles	45,009	74,043	92,258	80,027	77,050	85,782
Three wheelers	1,73,214	2,69,968	3,61,753	3,03,088	3,53,392	4,07,957
Two wheelers	11,40,058	15,31,619	19,75,111	19,56,378	20,84,000	24,57,597
Total	18,04,426	23,19,956	29,37,905	28,98,907	31,10,584	35,73,806

Source: Society of Indian Automobile Manufacturers.

Sustained investment by Indian companies for more than a decade with the goal of establishing indigenous product development capabilities has created an ecosystem of skilled professionals across the country. While public investment by the government over the last two decades led to the creation of state-of-the-art infrastructure for vehicle testing and homologation, several technical centres that match global standards have been created by Indian companies to ensure that they are able to sustain competitiveness in the market with a slew of new product launches.

A good example of such a product development centre is the Mahindra Research Valley (MRV), which was established in the outskirts of Chennai with an investment of more than 700 crores Indian rupees (₹). Infrastructure at MRV rivals that of most global automotive R&D centres. The uniqueness of this campus, which has more than 2,500 engineers, is that it is arguably the only integrated R&D centre in the world that is involved in product development activities for both automobiles and tractors. This unique synergy has enabled the company to successfully launch several new products on the market, such as the XUV5OO, TUV3OO, and KUV1OO sport utility vehicles and the Nuovosport by leveraging the shared talented workforce for both sectors. Similar to the products of multinational operations in India, these products not only cater to the Indian market but are also exported globally. Vehicle exports from both local and international OEMs have registered an impressive growth during the last decade, as illustrated in Table 3.

The XUV5OO vehicle, which was the first product developed at MRV, is a classic example of frugal engineering that incorporates state-of-the-art technology without the frills to make a product accessible to cost-conscious customers in emerging markets. Such product development initiatives have been made possible by engineers at MRV, both local workers and expatriates, collaborating extensively with global consultants and international suppliers to bring sophisticated features to the vehicle in a simplified form. Since its launch, this product has outsold all global and local competitors in the Indian market by offering a very attractive customer value proposition. It is a testament to the collaborative efforts of engineers working across the world with a focus on developing a product to meet the unique customer requirements in emerging markets. Moreover, focus on new product development has created substantial intellectual property for Mahindra, as depicted in Figure 2.

Global automotive players such as Bosch, Cummins, Fiat Chrysler, GM, and Renault Nissan also tapped into the availability of qualified engineering professionals by establishing their captive development centres in India. Most of the engineers at these centres worked closely with experienced professionals across the globe, thus reducing product development costs for global companies while at the same time accelerating the transfer of skills across borders within a short time.

With increasing software and electronic content in the vehicles, such collaborations extended beyond Indian development centres. Several partnerships were established outside the traditional automotive domain, specifically with the already-mature Indian IT industry. Several other models of collaboration are also being attempted to leverage the highly skilled software professionals available in India, although these are finding limited success.

One such unconventional partnership was the joint venture between an Indian OEM (Ashok Leyland) and a global Tier 1 supplier (Continental AG, then Siemens VDO) called Automotive Infotronics. Its main objective was to leverage the market knowledge of the Indian player and the knowledge repository of the global partner to design and develop technology products that would meet local customer requirements at a new price performance point. Through this partnership, quite a few products were created for the commercial vehicle market segment that challenged the conventional wisdom on product cost and performance. In addition, the cross-pollination of ideas between German and Indian engineers also accelerated the development of solutions for customers in other markets. Although Automotive Infotronics did not survive because of an expectations mismatch between the Indian and German partners, the products they developed are still manufactured by Continental in India. Automotive Infotronics remains a good example of building talent in emerging markets using global partnerships.

Through its journey over the past two decades, the Indian automotive industry has fully integrated itself into the global market while maintaining its uniqueness, both in terms of market potential and in terms of the availability of skilled talent. Over the past few years the difference between the strategies of the local and global players has been significantly reduced since both have gone through the learning curve, albeit for different competencies, and are now competing in the market place as equals.

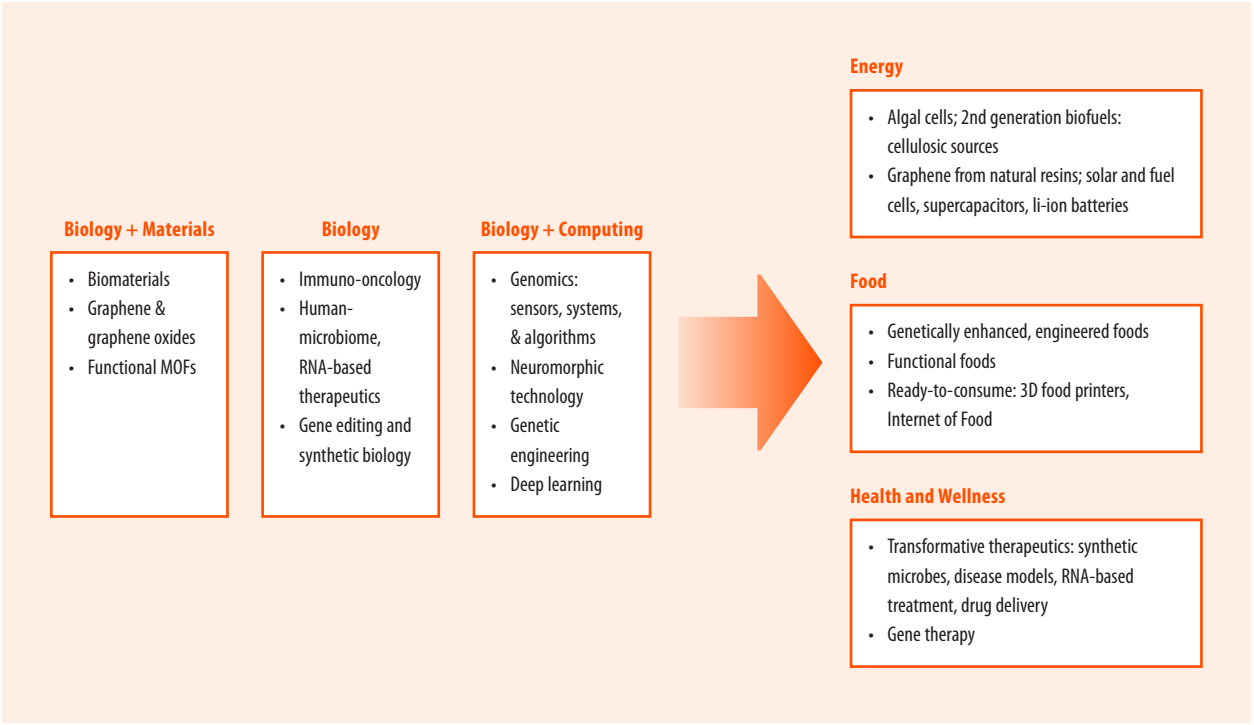
Both the multinational corporations and the Indian conglomerates have benefitted from the partnering of engineering talent across borders. Some multinationals, such as Suzuki, acquired Maruti operations in India to leverage the talent available in their Indian R&D centre to develop global products. The Indian conglomerates, on the other hand, have successfully taken over ailing operations of global companies to gain access to their global technical resources. Examples include the successful turnaround of Jaguar Land Rover after it was acquired by Tata Motors and Ssangyong after it was acquired by Mahindra. This inorganic growth has also enabled Indian companies to tap into global product development talent.

Global players such as Renault Nissan and Hyundai now have India-specific product strategies and leverage these strategies for other emerging markets. Similarly, Indian companies have established technical centres in Europe and the USA not only to develop products for emerging markets but also to enable their entry into mature markets. Examples include Tata Motors and Ashok Leyland, which established R&D centres in the United Kingdom (UK).

Tata Motors, in addition to their R&D centre in India, has design and R&D presence in the UK, Italy, and Korea. The centre of excellence in the West Midlands, UK, Tata Motors European Technical Center (TMETC)—a wholly owned subsidiary of Tata Motors—was established in 2005. One of the main reasons for having an R&D centre based in the UK was to provide a gateway to European technology, processes, personnel, and R&D. In addition to the core team of 250 members at TMETC today, a design studio in Coventry and a prototype workshop located in Gaydon have also been set up. One area that grew out of the advanced engineering at TMETC was a focus on electric and hybrid vehicles. TMETC has played a major role in helping the parent company augment capabilities in aspects such as craftsmanship, electrical system design, and platform strategy. TMETC has also provided a strong and active link to collaboration with UK and European research programmes and funding.

Recently, Mahindra has been aggressively adopting this same approach by establishing the Mahindra North American Technical Center (MNATC) in Detroit in the USA, taking controlling stakes in PSA Peugeot Citroën's motorcycles unit and also acquiring Pininfarina, the legendary Italian car designer responsible for the design of the iconic cars of Ferrari, Maserati, Rolls-Royce, and Cadillac. MNATC is currently bidding on the US Postal Service's next-generation delivery trucks.

Figure 3: Examples of opportunities at the intersection of biology, computing, and materials



Note: MOF = Metal organic framework.

This centre, which was formed just two years ago, has grown significantly and employs more than 100 engineers with decades of product development experience. Such initiatives by Indian and multinational OEMs result in the creation of a global network of product development engineers and transnational companies. Through this network they can maximize the talent available in each region to develop products to not only cater to emerging market requirements but also for the global markets.

Opportunities for leadership: Innovation in emerging sciences and materials

The previous section describes an India market-pull approach to innovation. In order to play a leadership role in innovation, India should also develop a technology-push strategy. Indian start-ups should accelerate innovating for the digital economy and large corporations, and universities should develop new opportunities at the confluence of emerging scientific knowledge and materials. One such opportunity is the intersection of biology, computing, and materials. New developments in areas such as genomics, connectomics, deep learning, graphene, and metal organic frameworks provide the palette to create global first products and services. Applications include developing sustainable fuels for transportation, predicting and preventing disease, determining ways to improve wellness, and delivering better nutrition.

This section explores some specific areas of opportunity presented by these emerging scientific knowledge and materials (see Figure 3).

The human genome project, which was officially declared complete in 2003, was a major milestone in human technological history. In 2009, the human connectome project was launched and is providing further fuel to modify the technological landscape. The connectome will provide a map of the human nervous system, just as the genome provided the map of the human DNA. A further development is the human microbiome, which is the genetic understanding of the trillions of microbes that are symbiotically part of the human system. The microbes in the gut, as examples, are now considered an important aspect of human health and the immune system. In addition, with a better understanding of our genes,[14] RNA,[15] and the proteins associated with health and disease, RNA-based therapeutics is now viable.

Precision genetic engineering using CRISPR (clustered regularly interspaced short palindromic repeats) has been heralded by *MIT Technology*

Table 4: Patents published in the last 20 years, based on inventor country

	Inventor location					
Patent topic	USA	China	Israel	UK	India	Others
Deep learning	328	135	4	15	3	Canada: 24 Japan: 18
CRISPR	893	255	15	42	2	France: 126 Germany: 48 Japan: 38
MOFs	912	381	75	71	33	Germany: 373 Korea, Rep.: 155 France: 99
Graphene	15,570	9,997	195	1,131	333	Korea, Rep: 4,712 Japan: 4,042 Germany: 1,426
Connectome and microbiome	2,192	163	32	179	28	Switzerland: 448 France: 313 Netherlands: 297

Source: Patent Inspiration, http://www.patentinspiration.com/.
Note: CRISPR = clustered regularly interspaced short palindromic repeats; MOFs = metal organic frameworks.

Review as the 'biggest biotech discovery of the century'.[16] CRISPR is a natural part of microbial (bacterial) DNA. CRISPR, interestingly, is a snipped copy of a virus DNA extracted from previous attacks on the microbe. CRISPR is used by the microbe's immune system to identify and disable new virus attacks. Recent understanding of CRISPR has led to CRISPR-based technology that allows scientists to snip any target DNA at precise location(s) and potentially replace the segments with repair strands. This technology hence has the ability, as already demonstrated in mice, to cure genetic disorders. Moreover, the technology has a range of possible applications, from producing pest-resistant crop to increasing the energy yield of biomass. These advances clearly herald the overdue age of biology and the consequent 'biofication' of other technologies.

Over the past two years, deep learning algorithms that attempt to mimic the human brain have demonstrated the power of computational biofication, particularly in voice and image recognition. In March 2016, Lee Sedol—one of the world's best players of the game of Go—lost 5 to 1 to AlphaGo, a deep learning software. Go is considered to be far more difficult for a computer algorithm to master than games such as Chess. The recent advances in deep learning are attributable to new training algorithms and increased computational power. The new training algorithms incorporate different levels of abstractions in multiple layers of learning networks, thereby enabling better utilization of layered networks. Improved hardware and the ability to handle large volumes of data now enable combining supervised and unsupervised networks to solve complex cognition problems.

While deep learning is an example of leveraging biology into computation, personal genomics is an example of the leverage of computation into biology. Personal genomics is now a reality, with an individual genome being sequenced in 2016 for US$1,000—down from US$10,000 in 2011. This accomplishment is a combination of biological, computational, and optical sensing innovations. Personal genomics will eventually enable the evolution of healthcare from a diagnose-and-cure model to a predict-and-prevent one.

Biomimetic structures ranging from roofs to hydrophobic surfaces have successfully incorporated evolutionary biological advantages into human creations. Simultaneously, advances in material sciences have offered progress in biological fields such as medicine. Recent material advances include metal organic frameworks (MOFs). MOFs are metallic ions joined together by organic ligands into structures that have a high porosity and active area. MOFs have demonstrated substantial potential for applications such as gas storage and separation. In medical applications, MOFs have shown promise in the delivery of drugs, imaging agents, and nitrogen oxide.

Graphene has been described as a 'wonder material' because of its high strength, high electric conductivity, high thermal conductivity, high flexibility, and high transparency. In medicine, the applications of graphene derive from its biocompatibility and high strength as leveraged in implants. Graphene oxide is also used for detecting specific toxins and in the targeted delivery of drugs and imaging agents.

It is interesting to note that the hotbed of innovation as measured by patent activity continues to be the USA, as shown in Table 4. Other regions, such as China and Korea, emerge as innovation hubs based solely on patent numbers. However, based on the citations of the patents, US universities and companies continue to lead in these emerging R&D areas. Furthermore, the importance of university research in creating a national innovation advantage is emphasized by the fact that many of the highly cited patents

in the areas shown in Table 4 belong to universities.

Conclusions

India has the ability to create a unique spot in innovation history to meet its own market requirements by using its cultural advantages of frugality and sustainability. India's first priority for innovation should be its immediate internal needs in the areas of energy, water, transport, healthcare, food security, and digital consumption. In these market-pull areas, India should strengthen its own talent pool while also leveraging global talent. The examples from the IT and automotive sectors presented in this chapter demonstrate the role of global talent in meeting both local and export needs. In emerging research areas—such as at the intersection of biology, computing, and materials—industry R&D should double its investment and the government should provide direct R&D grants to industry. Industry and government should team up with universities to create meaningful graduate research programmes utilizing global collaboration models where appropriate. The government should adequately resource its intellectual property offices to grant intellectual property rights in a timely manner and to ensure proper enforcement of the law. With its positive demographic, political, and market outlook today, India has its best opportunity in many decades to position itself for a century of innovation.

Notes

1 Lean manufacturing and the Toyota Production System are process examples of Japan's focus on efficiency and team work.

2 'Palli Palli,' the often-used phrase meaning 'quickly quickly' in Korean, reflects the cultural emphasis on speed. Korea has the fastest Internet speeds in the world, an example of its emphasis on speed.

3 According to Forbes (2014), 'there are more than 40 Chinese phrases (*Chengyu*), to encourage children and adults to have big dream for their future'. See Forbes, 2014.

4 The patent numbers referenced in this chapter are obtained using Patent Inspiration: http://www.patentinspiration.com/. The patent inspiration database has data for all major global jurisdictions. The India-specific data is populated from CY 2015.

5 See the GE Global Research website at http://www.geglobalresearch.com/locations/bangalore-india/technology-and-discovery.

6 Gupta et al., no date.

7 For information about the UN's work on water scarcity, see http://www.un.org/waterforlifedecade/scarcity.shtml.

8 Luthra and Kundu, 2013.

9 National Transport Development Policy Committee, 2014.

10 Information about the Automotive Mission Plan is available at http://www.siamindia.com/uploads/filemanager/47AUTOMOTIVEMISSIONPLAN.pdf and http://www.siamindia.com/cpage.aspx?mpgid=16&pgid1=17&pgidtrail=83.

11 Gudwani et al., 2012.

12 Tandon and Landes, 2012.

13 The Economist, 2016.

14 Genes are portions of deoxyribonucleic acid, or DNA, that encode proteins.

15 Ribonucleic acid, or RNA, is the macromolecule that translates genes to proteins.

16 Regalado, 2014.

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How to Design a National Innovation System in a Time of Global Innovation Networks: A Russian Perspective

Leonid Gokhberg and **Vitaliy Roud,** National Research University – Higher School of Economics

The quest for growth models based on science, technology, and innovation (STI) has been central to the Russian Federation (Russia)'s policy-making agenda for more than a decade.

Relying too much on the exports of primary resources (particularly oil and natural gas) as a major driver of development was recognized as unsustainable during the global financial crisis of 2008. The acknowledged importance of the reforms transformed into the urgent need for a new economy after the second half of 2014, when global oil prices dropped radically. According to a number of estimates, the resulting economic downturn, marked by inflation and depreciation of Russia's currency, has had an even greater impact on the performance of the national economy than the previous recession. Facing the compromise of the existing growth models, decision makers, as well as the broader expert community, designate STI as an alternative driver of sustainable growth.

The imperative for innovation-driven growth

At a glance, Russia maintains solid positions in the composite Global Innovation Index (GII) rankings (56th place overall in 2011, 51st in 2012, 62nd in 2013, 49th in 2014, and 48th in 2015). Mainly constrained by low rankings in pillars concerned with resource and energy efficiency of production as well as inadequate infrastructure, the GII captures Russia's high level of human capital and the accumulated capabilities for scientific research, inherited from the Soviet Union; along with functional high-technology sectors, these set the scene for the country's excellence in STI. However, the exploitation of this potential is hindered as a result of the following persistent systemic failures:

- unfavourable framework conditions (especially the quality of institutions, the quality of public administration and administrative barriers, and inadequate law enforcement);[1]
- limited access to finance and investment opportunities induced by a poor investment climate and even further deteriorated because of political, economic, and financial sanctions imposed by a number of states as a consequence of the Ukrainian crisis in 2014;
- a low share of enterprises aimed at global competitiveness; these are mostly monopolistic local markets with high entry barriers that are dominated by large (often state-owned) enterprises and create a bias towards rent-extracting behaviour that benefits from non-innovation-based competitive advantages promised by tighter connections with the state authorities;[2]
- obsolete institutional structure and the overall hampered performance of the research and development (R&D) sector, which is still dominated by public research organizations with a marginal (though gradually increasing) role for universities; and
- fragmentation and lack of contingency between the components of the innovation system—including sectoral and regional polarization, underdeveloped networking, and limited connections between industry and science,[3] reducing possible spillover effects of policy measures, considerably decreasing the efficiency of the regulation, and magnifying the costs and risks of establishing advanced value and knowledge chains.

These factors drastically hampered the positive dynamics exhibited by innovation during the decade of solid economic growth (average annual growth was 6.9% in 2000–08; 1.0% in 2009–13, and even lower in 2014–16).[4] As a result, the national innovation system demonstrated a high level of inertia and path dependency, reflecting stagnation or even the gradual loss of the competitive

Table 1: May 2012 Presidential Decrees: Quantitative targets to 2018

Target	Year
Raise labour productivity by 150%	2018
Increase the share of high-tech industries in GDP by 130% compared to the level of 2011	2018
Raise export revenue from nanotech products to 300 billion roubles	2020
Raise GERD to 1.77% of GDP (from 1.12% of GDP in 2012)	2018
Raise the average salary of researchers to 200% of the average salary in the region	2018
Raise the share of GERD performed by universities from 9.0% in 2013 to 11.4% by 2015 and 13.5% by 2018	2015, 2018
Increase total funding of public science foundations to 25 billion roubles	2018
Increase Russia's world share of publications indexed in the Web of Science from 1.92% (2013) to 2.44%	2015

Source: Presidential decrees: On long-term economic policy (No. 596); on measures to implement state social policy (No. 597); on measures to implement state policy in the field of education and science (No. 599).
Note: GERD = gross domestic expenditure on R&D.

positions it had held among a range of developed and rapidly developing countries. In times of crisis, overcoming the systemic flaws becomes crucial even in the face of the complications of tightening budget constraints.

Even if properly attributed, the ultimate goal of overcoming systemic flaws is not so straightforward to implement. The global nature of contemporary STI processes alters the priorities and principles of efficient policy design. Conventional objectives, such as compensating for internal systemic failures, fostering economic diversification and structural change, and massive technological upgrading of the industries have to be reconceptualized in order to provide new ways to balance risks and benefits of acting in the global environment. In order to be efficient, the scope of new policy models should include smart positioning in the global value and knowledge chains; should be fully cognizant of the international competition for the knowledge capital and human resources; and should account for global tendencies and technological trends—such as the next production revolution—that are going to drastically change the configuration of the global productivity frontier.[5]

Achieving the highest level of consideration from the Russian authorities, STI has been subject to intensive regulation. Since 2010 more than 50 policy documents have been adopted by Russian governmental bodies, including the framework-shaping Strategy for Innovative Development to 2020 (2012, subject to renewal in 2016); the State Programme for Development of Science and Technology, 2013–2020; and the Federal Goal-Oriented Programme on Research and Development in Priority Areas of Russia's S&T Complex (2012) among others. In May 2012, directives for Russia's development were set in the presidential decrees that introduced quantitative targets for the Russian Federation (see Table 1). The implementation of these targets is associated with an extensive governance scheme that puts a number of top-level governmental bodies in charge of boosting STI performance. These include the Presidential Administration of Russia, the Ministry of Economic Development, the Ministry of Science and Education, and the Ministry of Industry and Trade, as well as specialized interdepartmental commissions and other communication platforms that will facilitate the coordination among a broad range of initiatives.

Science and technology

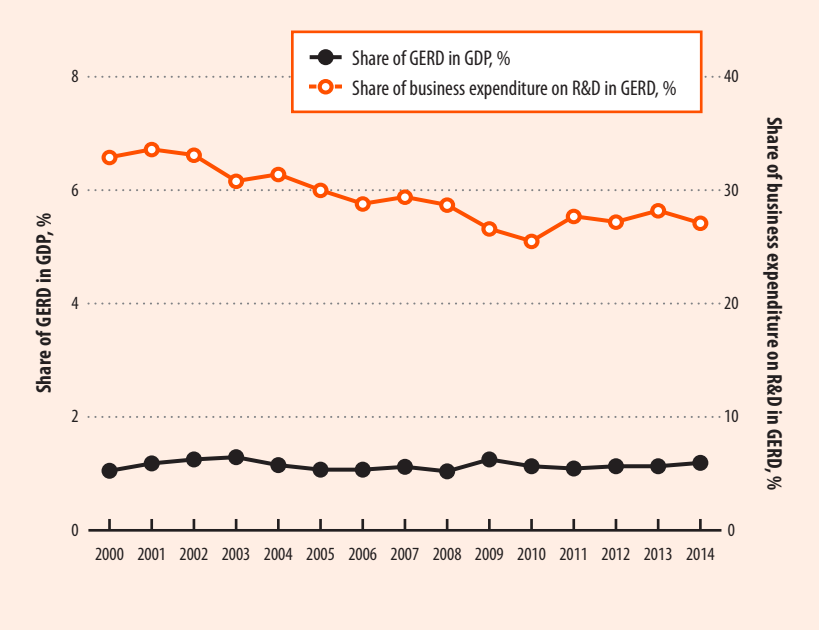
A comprehensive upgrade of the R&D sector represents a key area of ongoing reform in Russia. The observed aggregate trends indicate the exhausted capacity of the existing institutional structure and administrative models: These can no longer provide reasonable productivity gains even with an extensive increase of financing. Gross domestic expenditure on R&D (GERD) increased twofold in constant prices from 2000 to 2014 and now accounts for 847.5 billion roubles in current prices (roughly US$39.9 million PPP). That brings Russia into the group of top 10 leaders in total expenditure on R&D, a group in which the United States of America (USA) is 1st (US$456.9 million), China is 2nd (US$368.7 million PPP), the United Kingdom (UK) is 6th (US$44.1 million PPP), and Brazil is 8th (US$35.5 million PPP).[6] However, GERD today still accounts only for the 60% of GERD spent before the collapse of the Soviet Union and also lags behind most of the OECD economies for its proportion to GDP (see Figure 1). At the same time, scientific productivity has started to recover only recently (Figure 2); facing the most rapidly developing competitors, this inadequacy brings Russia from rank 9 in the share in total number of publications indexed by the Web of Science in 2001 down to rank 15 in 2015. Moreover, detailed examination of the areas of Russia's scientific specialization (Figure 3) reveals particularly low engagement in most areas

of international research effort:[7] The country places 29th in 2015 with the participation of domestic scholars in 3.28% of more than 10,000 global research fronts (clusters of highly cited papers) identified by the Web of Science. The group of leaders for this indicator includes the USA (74.3% of all research fronts), the UK (32.3%), Germany (30.7%), and China (23.4%). Existing comparative advantages of Russian science appear to belong to the areas of traditional Soviet expertise—including physics, aerospace and astronomy, geosciences, mathematics, chemistry, and materials science—while poorly representing topics, such as life sciences, associated with the next industrial revolution.

In this regard, the comparative advantages and global visibility of Russian science is quite limited. Policy officials have recently begun to aim at increasing this global visibility through a range of mechanisms, from high-level ones such as presidential decrees to smaller ones such as the evaluation of programmes. Recognizing that there can be no 'national' science apart from the best available globally competitive scientific research appears to be a major achievement for Russian policy frameworks. A widely disputed declaration of the overarching set of quantitative objectives in terms of international benchmarking and impact assessment (specifically with the aim of increasing Russia's exposure in the international citation indexes) influenced the structure of ground-level regulatory initiatives. In particular:

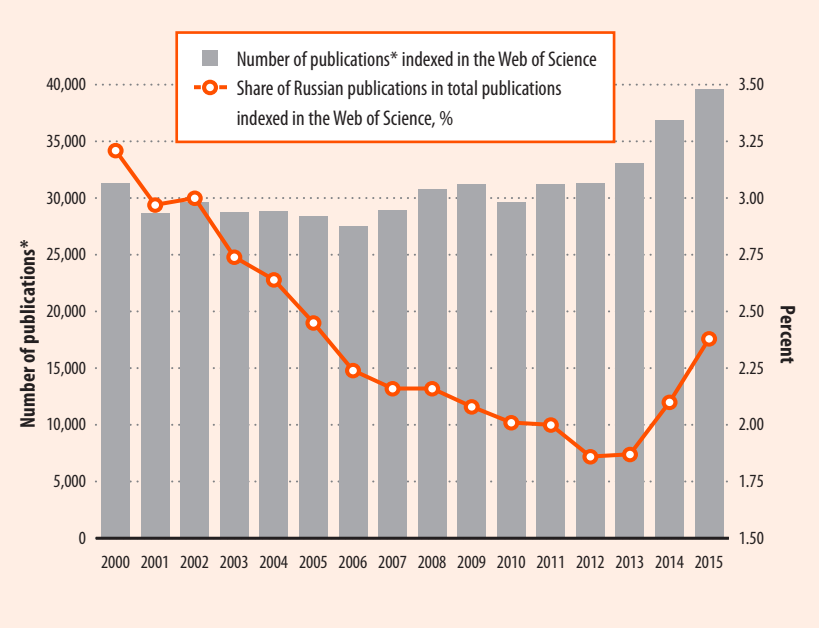
- A large-scale reform of the Russian Academies of Science was launched in 2013, resulting in the transformation of the extensive network of public research

Figure 1: Dynamics of expenditure on R&D



Source: HSE, 2016a.
Note: GERD = gross domestic expenditure on R&D.

Figure 2: Publication activity of Russian scientists



Source: HSE calculations based on Web of Science data, accessed 12 April 2016..
* Publications means articles, proceedings papers, and reviews.

Figure 3: Specialization of Russian science, 2015

Source: Authors' estimates, based on Web of Science data.
Note: Revealed comparative advantage index equals the proportion of the country's publications in the specific field of science under consideration divided by the proportion of world publications that in the same field.

organizations (more than 800 of these organizations account for nearly 50% of all Russian publications).[8] Key principles behind the reform that can currently be observed from outside imply preserving the research coordination and evaluation as well as expert functions with the Russian Academy of Science (which was merged with the two smaller academies of medical and agricultural sciences). Decisions on financing, property management, and infrastructure were relegated to a newly established Federal Agency for Research Organizations.

- Further optimization of the network of public R&D institutes, especially those that belong to the Academy of Sciences, is intended to foster the national research infrastructure and elaborate the regular efficiency monitoring procedures to ensure greater performance of public research in the civil sector. Such an optimization process involves merging field-specific smaller-sized research institutes into the so-called federal research centres, namely those specializing in computer science, biotech, agriculture, and so on.

- The 5/100 Programme for raising the global competitiveness of Russian universities (promoting at least the five top performing Russian universities into the top 100 and adding 10 more leaders to the top 200 of global university rankings). Participation in the programme has been granted on a competitive basis, conditional on an annual performance evaluation, and has provided access to the total budget of 10 billion roubles for 2013–14 and 40 billion roubles for 2015–16.

- Megagrants—a special governmental programme launched in 2010 to invite world-class researchers (of the 144 current researchers, half are of Russian origin) to establish highly productive laboratories in existing Russian universities and research centres aiming to develop new scientific schools with notable international publications (roughly 800 published papers were indexed in the Web of Science by 2016). A total budget of 27 billion roubles was allocated for 2010–16 with the

requirement of joint financing (around 20%) from the host universities.

- A transition to performance-based reward schemes for researchers was launched. The scheme is to provide an 'efficient contract' with a base salary and a regular evaluation-based premium, thus increasing the researchers' salaries to 200% of the average wage in the region.[9]

Boosting the efficiency of applied science appears not to be so straightforward. Facing low business demand for domestic R&D and heavy dependence on the import of technologies (mainly in the form of machinery and equipment rather than licensing, for example) as the dominant strategy for acquiring technology, development of the capabilities in this direction should rely on multifaceted supporting schemes that combine favourable technology localization mechanisms, customs regulation, tax incentives, and complex risk-balancing supporting measures in the form of public-private partnerships. In 2015 two mechanisms of this type were launched: (1) a horizontal initiative aimed at competitive support for national projects with a highly innovative component (focusing on smart energy systems, agriculture, transportation, and health services) and (2) the National Technology Initiative (NTI), which targets the incubation of national technological leaders for emerging markets. The NTI can be thought of as a collection of special tools for the complex facilitation of prospective global market niches, starting from identification and foresight and ending with the fine-tuning of regulatory frameworks. Current thematic areas of the NTI include EnergyNet (concerned with distributed and portable smart power systems); FoodNet (advanced technologies in food and agriculture); SafeNet (personal security systems); HealthNet (personalized medicine); AeroNet, MariNet, and AutoNet (distributed systems of unmanned aerial, marine, and road vehicles); FinNet (decentralized financial systems and currencies); and NeuroNet (neurotechnologies).

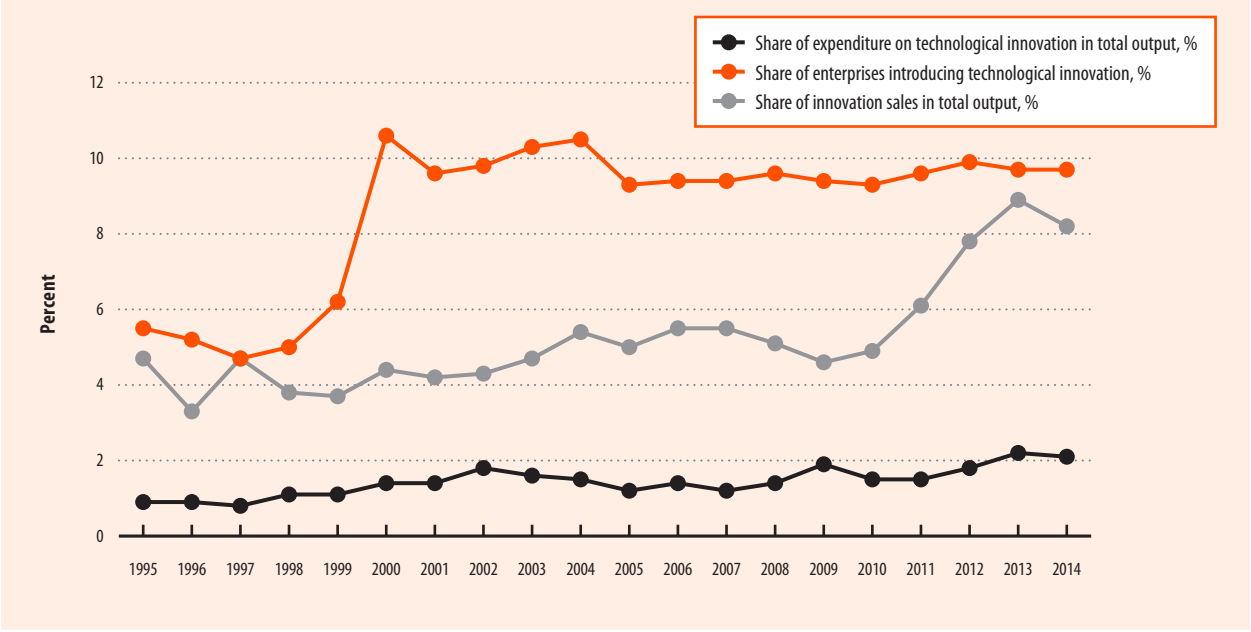
Efficient governance of the S&T complex relies heavily on priority identification mechanisms. Russia has established a systematic and multilevel foresight practice that produces inputs for strategic decision making processes in both public and private sectors. In 2011 the latest list of critical technologies was approved by the president, emphasizing eight major areas (information and communication technologies, transport systems and space, safe and efficient energy systems, environmental management, life sciences, nanotechnology, defence, and national security) with 27 total critical technologies on the second level of classification. Two key principles underpinning this list of critical technologies are that they must have potential effective impact for addressing grand challenges as well as perspectives for promoting national competitiveness. These lists were used as inputs for structuring a number of policy initiatives aimed at promoting R&D and innovation. S&T foresight-2030 is another regular long-term future-oriented activity comprising a part in the long-term strategic governance of Russian S&T.[10]

Industry and innovation

Unlike the public R&D sector, the innovation activity of business enterprises generally cannot be considered subject to directive intensification because—although budget spending on basic science can be ordered to increase within the network of state R&D labs, doing better innovation cannot be ordered—the ability to do better innovation depends to a great extent on framework conditions and the performance of other functional dimensions of the national innovation system.[11] The stability of innovation indicators (see Figure 4)—including the total share of innovation companies, shares of innovation expenditure, and innovation sales of total sales—reflects rather modest progress in promoting innovation as the best competitive strategy; this is the case as long as it is possible to successfully compete with some rent-seeking behaviour, such as corruption or monopoly. At the same time, certain positive dynamics can be traced. Although less than 10% of the country's industrial enterprises engage in technological innovation, the share of innovation expenditure in their total output as well as the share of innovation sales in their total output has been increased by roughly 30% since 2010. Still, these indicators show that innovation accounts for a very limited proportion of a firm's economic activity.

The observed dynamics can be related to the mix of measures aimed at promoting innovation and business R&D. The existing portfolio is quite diverse, ranging from *thematic state programmes* to support specific industries (e.g., pharmaceuticals, electronics, aircraft, and shipbuilding) and technological areas (e.g., composite materials, photonics, and biotechnology) to the *horizontal demand-side mechanisms*—a Federal Law on Public Procurement has a special way to foster the purchase of innovative as well as high-technology products; it also especially favours small and medium-sized enterprises (SMEs). A notable example of direct support

Figure 4: Key indicators of the innovation performance of industrial enterprises



Source: HSE, 2016b.

Note: Data refer to the statistical classification of economic activities in the European Community, NACE, rev 1.1, sectors C (Mining), D (Manufacturing), and E (Utilities). See http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_%28NACE%29.

for the functional activities within the national innovation system is the targeted support for engineering and industrial design, including the promotion of engineering service providers and prototyping centres. The Foundation for the Assistance to Innovative SMEs and a newly established Federal Corporation for the Development of Small and Medium Enterprises (reorganized in 2015 from the Programme for SME Development, which had been active since 2013) introduced subsidies to promote innovation in SMEs.

The range of the available tax incentives for R&D and innovation, including special benefits for high-tech exports,[12] has been expanded since 2011 to provide relief for the taxation of intellectual property–related profits and benefits for patent duty payments for SMEs and inventors. These activities fit into the overall trend of developing the intellectual property protection regulatory framework.

Another set of mechanisms, launched in 2009, was specifically designed in the spirit of promoting cross-sectoral interaction and compensating risks directly associated with advanced innovation strategies. As presented in several reports,[13] some of the highlighted measures provided competitive-based support for cooperation between companies, research organizations, and universities; others facilitate the development of the pilot innovative territorial clusters (25 active clusters presently receive support for infrastructure, commercialization, and technological transfer),[14] as well as the development of the technology platforms (34 active platforms engaging more than 3,000 organizations).[15] The coordination of these platforms employs the Foundation for Industrial Development (formerly the Technology Development Fund), which provides special loans for innovation projects. The platforms are also synchronized with other governmental thematic programmes. The Skolkovo Innovation Centre provides special taxation regimes and promotes global visibility of high-tech start-ups in the areas of nuclear technologies, energy efficiency and energy saving, space technologies, biomedicine, and strategic computer technologies. This centre now hosts more than 1,000 companies on an exterritorial basis and has an annual budget that accounts for more than 17.3 billion roubles.

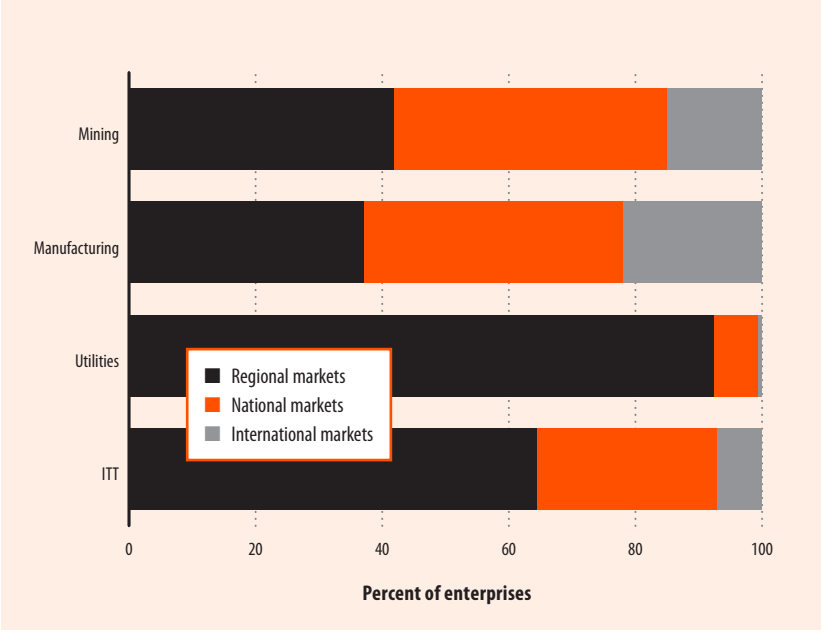
The high-profile initiative imposed state-owned corporations to architect and implement innovation development strategies with the

mandatory requirements of cooperating with SMEs, research organizations, and universities. Launched in 2010, this instrument has undergone several iterations of assessment. It is clear that this type of intervention should be introduced with a complex and regular evaluation system that promotes the efficient and effective implementation of the planned activities.[16]

The abovementioned range of supporting instruments forms a policy mix aimed at promoting innovation by combining horizontal and vertical measures that compensate for various functional flaws of the existing national innovation system. At the same time, it is important to be realistic when assessing the expected outcomes of sophisticated policies and pay attention to the actual presence and incentives of the potential benefactors within the economy.

The Russian experience shows that, for nearly 90% of enterprises, engagement in innovation activity, even at the national level, is not the most popular business strategy, which often limits the experience of domestic actors in networking and cooperation. Surveys on the strategic orientation of companies can estimate the availability of potential candidates for integration into the international value chains (Figure 5).[17] Of the observed Russian companies, only 22% of manufacturing enterprises, 15% of mining enterprises, and 7% of companies engaged in information and communication technologies consider international markets to be potentially important. Such strategic orientation leads to particular business models that result in a certain level of competitiveness and skill. This 'equilibrium' of business models and strategies is subject to change only through a very inertial and path-dependent trajectory.

Figure 5: Prospective markets for innovative enterprises by sector



Source: HSE, 2016b. Estimates by the authors based on data provided by Rosstat, the Federal Statistical Service of the Russian Federation.
Notes: The figure shows the percent of enterprises that consider particular markets (regional, national, or international) to be especially important for the future commercial success. ITT = Information and telecommunication technologies.

Conclusions

Over the last years Russia has developed an extensive STI policy framework and an elaborate portfolio of supportive instruments. The resulting policy mix appears to be sophisticated enough to address the challenge of effective governance of the STI complex. Time will show if the existing mechanisms are robust in the face of tightening budget constraints and unfavourable geopolitical conditions. At the same time, the potential outcomes of the expensive policies are entirely conditional on the ability to synchronize initiatives and thus maintain the holistic approach to the designed system of incentives that the actors of the NIS are facing. This will be impossible without integrating the systemic methods for policy evaluation and impact assessment. Providing the framework conditions is a necessity as soon as strategic objectives concern promoting massive innovation activity and large-scale integration into the global value and knowledge chains rather than merely supporting a selected narrow circle of national champions. The intensity of the country's integration into the global innovation space is, finally, an aggregate of the engagement of individual actors (firms, research organizations and universities, researchers, and inventors, etc.) into cooperative projects, aligning their expertise, interests, and needs with the emerging networks of partners. The promotion of a special competence of cooperative networking as a part of the general sophistication of the country's innovation and research strategies appears to be the first step towards fostering the openness of an innovation system. Mastering these skills helps to focus

on mutually beneficial projects to overcome economic and political crises. In the case of Russia, this is demonstrated by the strong bilateral ties established with the European Union (e.g., access to the Horizon 2020 research and innovation programme that provides funding for 2014 to 2020 and participation in megascience activities such as CERN);[18] growing collaboration with Asia (e.g., within the Shanghai Cooperation Organisation, the Eurasian Economic Union, and the Association of Southeast Asian Nations) aimed at the joint development of high-tech, commercial space technologies, materials engineering, medicine, computing, and telecommunications; and special opportunities to cooperate within the BRICS countries. In order to succeed in the STI domain, policy makers are expected to broaden the time horizons of strategic planning and investment, thus ensuring economic and political stability, consistent administration, and a long-term intelligence elaborated via the systematic practice of foresight.

Notes

1 Polischuk, 2013.

2 Yakovlev and Zhuravskaya, 2013; Yakovlev, 2014; Kuznetsova and Roud, 2013.

3 Zaichenko et al., 2014.

4 IMF, 2016.

5 OECD, 2015.

6 HSE, 2016a; OECD, 2016.

7 This is an index of revealed comparative advantage, normalized from 0 to 1. See, for example, Todeschini and Baccini, 2016, pp. 4–7.

8 HSE, 2016a.

9 Gershman and Kuznetsova, 2014.

10 Gokhberg, 2016.

11 Edquist, 2011.

12 Gokhberg and Roud, 2012.

13 Gokhberg and Kuznetsova, 2015; Gokhberg and Roud, 2012; OECD, 2011.

14 Kutsenko and Meissner, 2013.

15 Proskuryakova et al., 2015.

16 Gokhberg et al., 2015.

17 See also Zaichenko et al., 2014.

18 Information about the European Union's Horizon 2020 programme is available at https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020. For further information on the directions of Russia's S&T cooperation, see Gokhberg and Kuznetsova, 2015; Kotsemir et al., 2015.

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Appendices

Appendix I

Country/Economy Profiles

Country/Economy Profiles

The following tables provide detailed profiles for each of the 128 economies in the Global Innovation Index 2016. They are constructed around three sections.

1 Five key indicators at the beginning of each profile are intended to put the economy into context. They present the population in millions,[1] GDP in US$ billions, and GDP per capita in PPP current international dollars.[2] The fourth indicator categorizes the economy into income group and the fifth indicates its geographical region.[3]

2 The next section provides the economy's scores and rankings on the Global Innovation Index (GII), the Innovation Output Sub-Index, the Innovation Input Sub-Index, and the Innovation Efficiency Ratio.

The GII ranking for the 2015 edition comes next. Because 13 economies dropped out in 2016, and because of adjustments made to the GII framework every year and other technical factors not directly related to actual performance (missing data, updates of data, etc.), the GII rankings are not directly comparable from one year to the next. Please refer to Annex 2 of Chapter 1 for details.

Scores are normalized in the 0–100 range except for the Innovation Efficiency Ratio, for which scores revolve around the number 1 (this index is calculated as the ratio between the Output and Input Sub-Indices).

The Innovation Input Sub-Index score is calculated as the simple average of the scores in the first five pillars, while the Innovation Output Sub-Index is calculated as the simple average of the scores in the last two pillars.

Albania

Key indicators

Population (millions)	2.9
GDP (US$ billions)	11.5
GDP per capita, PPP$	11,300.8
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
	Global Innovation Index (out of 128)	**28.4**	**92**	
	Innovation Output Sub-Index	16.2	115	
	Innovation Input Sub-Index	40.5	71	
	Innovation Efficiency Ratio	0.4	121	
	Global Innovation Index 2015 (out of 141)	30.7	87	
1	**Institutions**	**62.3**	**64**	
1.1	Political environment	55.9	53	
1.1.1	Political stability & safety*	74.6	44	
1.1.2	Government effectiveness*	37.1	73	
1.2	Regulatory environment	59.4	83	
1.2.1	Regulatory quality*	50.3	61	
1.2.2	Rule of law*	37.9	84	
1.2.3	Cost of redundancy dismissal, salary weeks	20.8	89	
1.3	Business environment	71.8	58	
1.3.1	Ease of starting a business*	90.1	48	
1.3.2	Ease of resolving insolvency*	63.4	39	●
1.3.3	Ease of paying taxes*	62.0	98	
2	**Human capital & research**	**23.6**	**90**	
2.1	Education	37.5	93	
2.1.1	Expenditure on education, % GDP	3.5	92	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	5.8	107	○
2.1.3	School life expectancy, years	15.8	33	●
2.1.4	PISA scales in reading, maths, & science	395.2	57	
2.1.5	Pupil-teacher ratio, secondary	14.3	58	
2.2	Tertiary education	32.2	76	
2.2.1	Tertiary enrolment, % gross	62.7	37	●
2.2.2	Graduates in science & engineering, %	16.8	73	
2.2.3	Tertiary inbound mobility, %	2.1	64	
2.3	Research & development (R&D)	1.1	104	
2.3.1	Researchers, FTE/mn pop. ⌚	157.3	76	
2.3.2	Gross expenditure on R&D, % GDP ⌚	0.2	95	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**43.6**	**64**	
3.1	Information & communication technologies (ICTs)	44.2	79	
3.1.1	ICT access*	45.0	87	
3.1.2	ICT use*	34.0	70	
3.1.3	Government's online service*	44.9	72	
3.1.4	E-participation*	52.9	59	
3.2	General infrastructure	38.4	56	
3.2.1	Electricity output, kWh/cap	2,399.7	72	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	29.9	20	●
3.3	Ecological sustainability	48.2	45	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.2	19	●
3.3.2	Environmental performance*	74.4	58	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.2	59	
4	**Market sophistication**	**51.2**	**30**	●
4.1	Credit	27.8	82	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	37.6	80	
4.1.3	Microfinance gross loans, % GDP	0.4	40	
4.2	Investment	73.3	[6]	
4.2.1	Ease of protecting minority investors*	73.3	8	●
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	52.6	94	
4.3.1	Applied tariff rate, weighted mean, %	1.2	38	●
4.3.2	Intensity of local competition†	50.6	120	○
4.3.3	Domestic market scale, bn PPP$	31.6	104	
5	**Business sophistication**	**21.9**	**114**	
5.1	Knowledge workers	22.4	104	
5.1.1	Knowledge-intensive employment, % ⌚	16.1	84	
5.1.2	Firms offering formal training, % firms	23.8	74	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, % ⌚	3.3	82	
5.1.5	Females employed w/advanced degrees, % total	9.0	68	
5.2	Innovation linkages	17.3	119	
5.2.1	University/industry research collaboration†	22.3	121	○
5.2.2	State of cluster development†	30.9	119	○
5.2.3	GERD financed by abroad, % ⌚	7.4	53	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP ⌚	0.0	86	
5.3	Knowledge absorption	25.9	78	
5.3.1	Intellectual property payments, % total trade	0.4	61	
5.3.2	High-tech imports less re-imports, % total trade	1.2	121	○
5.3.3	ICT services imports, % total trade	1.3	42	●
5.3.4	FDI net inflows, % GDP	8.7	14	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.2**	**106**	
6.1	Knowledge creation	2.0	122	
6.1.1	Patents by origin/bn PPP$ GDP	0.4	79	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	70	
6.1.3	Utility models by origin/bn PPP$ GDP	0.0	60	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.8	97	
6.1.5	Citable documents H index	43.0	120	
6.2	Knowledge impact	26.3	107	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.0	66	
6.2.2	New businesses/th pop. 15–64 ⌚	1.1	65	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.4	60	
6.2.5	High- & medium-high-tech manufactures, %	0.9	98	○
6.3	Knowledge diffusion	23.2	72	
6.3.1	Intellectual property receipts, % total trade	0.0	82	
6.3.2	High-tech exports less re-exports, % total trade	0.0	115	
6.3.3	ICT services exports, % total trade	3.2	21	●
6.3.4	FDI net outflows, % GDP	0.8	53	
7	**Creative outputs**	**15.3**	**119**	
7.1	Intangible assets	24.9	121	
7.1.1	Trademarks by origin/bn PPP$ GDP	18.4	84	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.4	82	
7.1.3	ICTs & business model creation†	45.0	111	
7.1.4	ICTs & organizational model creation†	31.5	121	○
7.2	Creative goods & services	2.1	117	
7.2.1	Cultural & creative services exports, % of total trade	0.1	54	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	101	
7.3	Online creativity	9.3	64	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.1	48	
7.3.2	Country-code TLDs/th pop. 15–69	1.6	72	
7.3.3	Wikipedia edits/mn pop. 15–69	2,576.7	47	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
⌚ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

3 Pillars are identified by single-digit numbers, sub-pillars by two-digit numbers, and indicators by three-digit numbers. For example, *indicator 1.3.1, ease of starting a business,* appears under *sub-pillar 1.3, Business environment,* which in turn appears under *pillar 1, Institutions.*

The 2016 GII includes 82 indicators and three types of data. Composite indicators are identified with an asterisk (*), survey questions from the World Economic Forum's Executive Opinion Survey are identified with a dagger (†), and the remaining indicators are all hard data series.

For hard data, the original value is provided (except for indicators 7.3.1, 7.3.2, and 7.3.4, for which the raw data were provided under the condition that only the normalized scores be published). Normalized scores in the 0–100 range are provided for everything else (index and survey data, sub-pillars, pillars, and indices).

When data are either not available or out of date (the cutoff year is 2006), 'n/a' is used. The year of each data point is indicated in the Data Tables shown in Appendix II. To the right of the indicator title, a clock symbol indicates that the country's data for that indicator are older than the base year. More details, including the year of the data in question, are available in Appendix II.

For further details, see Appendix III, Sources and Definitions, and Appendix IV, Technical Notes.

4 To the far right of each column, a solid circle indicates that an indicator is one of the strengths of the country/economy in question,

and a hollow circle indicates that it is a weakness.

All ranks of 1, 2, and 3 are highlighted as strengths, except in particular instances at the sub-pillar level where strengths and weaknesses are not signaled when the desired minimum indicator coverage (DMC) is not met for that sub-pillar.[4] For the remaining indicators, strengths and weaknesses of a particular economy are based on the percentage of economies with scores that fall below its score (i.e., percent ranks).

- For a given economy, strengths (●) are those scores with percent ranks greater than the 10th largest percent rank among the 82 indicators in that economy.
- Similarly, for that economy, weaknesses (○) are those scores with percent ranks lower than the 10th smallest percent rank among the 82 indicators in that economy.

Percent ranks embed more information than ranks and allow for comparisons of ranks of series with missing data and ties in ranks. Examples from Ireland illustrate this point:

1. Strengths for Ireland are all indicators with percent ranks equal to or above 0.95 (10th largest percent rank for Ireland); weaknesses are all indicators with percent ranks equal to or below 0.56 (Ireland's 10th smallest percent rank).
2. Ireland ranks 7th out of 119 economies in 3.3.1, GDP/unit of energy use, 2005 PPP$/kg oil eq. with a percent rank of 0.95; this indicator is a strength for Ireland.
3. Ireland also ranks 7th in 5.3.5, research talent, % in business enterprise, but with a percent rank of 0.93 (because only 81 countries are covered by that indicator), this indicator is not a strength for Ireland.
4. The rank of 58 (percent rank of 0.55) in 1.2.3, *cost of redundancy dismissal, salary weeks*, is a weakness for Ireland. By contrast, the rank of 31 for Namibia for that same indicator is a strength for Namibia (with a percent rank of 0.76, this is above the cutoff for strengths for Namibia, which is 0.57).

Percent ranks are not reported in the Country/Economy Profiles but they are presented in the Data Tables (Appendix II).

Notes

1 Data are from the United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision*.

2 Data for GDP and GDP per capita are from the International Monetary Fund *World Economic Outlook 2015* database.

3 Income group is according to the World Bank Income Group Classification (July 2015): LI = low income; LM = lower-middle income; UM = upper-middle income; and HI = high income. Geographical regions are based on the United Nations Classification: EUR = Europe; NAC = Northern America; LCN = Latin America and the Caribbean; CSA = Central and Southern Asia; SEAO = South East Asia, East Asia, and Oceania; NAWA = Northern Africa and Western Asia; and SSF = Sub-Saharan Africa.

4 This year a new data stringency requirement is used in the attribution of strengths and weaknesses at the sub-pillar level. When countries do not meet a data minimum coverage (DMC) requirement at the sub-pillar level (for sub-pillars with two indicators, the DMC is 1; for three it is 2; for four it is 2; and for five it is 3), they are not attributed a strength or weakness at the sub-pillar level. Furthermore, if the country in question does not meet the DMC requirements at the sub-pillar level but still obtains a ranking higher than or equal to 10 or a ranking equal to or lower than 100, this rank is put into square brackets. This new procedure is to ensure that incomplete data coverage does not lead to erroneous conclusions about strengths or weaknesses or to particularly strong or weak sub-pillar rankings.

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United States of America	297
Uruguay	298
Venezuela, Bolivarian Rep.	299
Viet Nam	300
Yemen	301
Zambia	302

Albania

Key indicators

Population (millions)	2.9
GDP (US$ billions)	11.5
GDP per capita, PPP$	11,300.8
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**28.4**	**92**	
Innovation Output Sub-Index		16.2	115	
Innovation Input Sub-Index		40.5	71	
Innovation Efficiency Ratio		0.4	121	
Global Innovation Index 2015 (out of 141)		30.7	87	
1	**Institutions**	**62.3**	**64**	
1.1	Political environment	55.9	53	
1.1.1	Political stability & safety*	74.6	44	
1.1.2	Government effectiveness*	37.1	73	
1.2	Regulatory environment	59.4	83	
1.2.1	Regulatory quality*	50.3	61	
1.2.2	Rule of law*	37.9	84	
1.2.3	Cost of redundancy dismissal, salary weeks	20.8	89	
1.3	Business environment	71.8	58	
1.3.1	Ease of starting a business*	90.1	48	
1.3.2	Ease of resolving insolvency*	63.4	39	●
1.3.3	Ease of paying taxes*	62.0	98	
2	**Human capital & research**	**23.6**	**90**	
2.1	Education	37.5	93	
2.1.1	Expenditure on education, % GDP	3.5	92	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	5.8	107	○
2.1.3	School life expectancy, years	15.8	33	●
2.1.4	PISA scales in reading, maths, & science	395.2	57	
2.1.5	Pupil-teacher ratio, secondary	14.3	58	
2.2	Tertiary education	32.2	76	
2.2.1	Tertiary enrolment, % gross	62.7	37	●
2.2.2	Graduates in science & engineering, %	16.8	73	
2.2.3	Tertiary inbound mobility, %	2.1	64	
2.3	Research & development (R&D)	1.1	104	
2.3.1	Researchers, FTE/mn pop.◴	157.3	76	
2.3.2	Gross expenditure on R&D, % GDP◴	0.2	95	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**43.6**	**64**	
3.1	Information & communication technologies (ICTs)	44.2	79	
3.1.1	ICT access*	45.0	87	
3.1.2	ICT use*	34.0	70	
3.1.3	Government's online service*	44.9	72	
3.1.4	E-participation*	52.9	59	
3.2	General infrastructure	38.4	56	
3.2.1	Electricity output, kWh/cap	2,399.7	72	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	29.9	20	●
3.3	Ecological sustainability	48.2	45	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.2	19	●
3.3.2	Environmental performance*	74.4	58	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.2	59	
4	**Market sophistication**	**51.2**	**30**	●
4.1	Credit	27.8	82	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	37.6	80	
4.1.3	Microfinance gross loans, % GDP	0.4	40	
4.2	Investment	73.3	[6]	
4.2.1	Ease of protecting minority investors*	73.3	8	●
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	52.6	94	
4.3.1	Applied tariff rate, weighted mean, %	1.2	38	●
4.3.2	Intensity of local competition†	50.6	120	○
4.3.3	Domestic market scale, bn PPP$	31.6	104	
5	**Business sophistication**	**21.9**	**114**	
5.1	Knowledge workers	22.4	104	
5.1.1	Knowledge-intensive employment, %◴	16.1	84	
5.1.2	Firms offering formal training, % firms	23.8	74	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %◴	3.3	82	
5.1.5	Females employed w/advanced degrees, % total	9.0	68	
5.2	Innovation linkages	17.3	119	
5.2.1	University/industry research collaboration†	22.3	121	○
5.2.2	State of cluster development†	30.9	119	○
5.2.3	GERD financed by abroad, %◴	7.4	53	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP◴	0.0	86	
5.3	Knowledge absorption	25.9	78	
5.3.1	Intellectual property payments, % total trade	0.4	61	
5.3.2	High-tech imports less re-imports, % total trade	1.2	121	○
5.3.3	ICT services imports, % total trade	1.3	42	●
5.3.4	FDI net inflows, % GDP	8.7	14	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.2**	**106**	
6.1	Knowledge creation	2.0	122	
6.1.1	Patents by origin/bn PPP$ GDP	0.4	79	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	70	
6.1.3	Utility models by origin/bn PPP$ GDP	0.0	60	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.8	97	
6.1.5	Citable documents H index	43.0	120	
6.2	Knowledge impact	26.3	107	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.0	66	
6.2.2	New businesses/th pop. 15–64◴	1.1	65	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.4	60	
6.2.5	High- & medium-high-tech manufactures, %	0.9	98	○
6.3	Knowledge diffusion	23.2	72	
6.3.1	Intellectual property receipts, % total trade	0.0	82	
6.3.2	High-tech exports less re-exports, % total trade	0.0	115	
6.3.3	ICT services exports, % total trade	3.2	21	●
6.3.4	FDI net outflows, % GDP	0.8	53	
7	**Creative outputs**	**15.3**	**119**	
7.1	Intangible assets	24.9	121	
7.1.1	Trademarks by origin/bn PPP$ GDP	18.4	84	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.4	82	
7.1.3	ICTs & business model creation†	45.0	111	
7.1.4	ICTs & organizational model creation†	31.5	121	○
7.2	Creative goods & services	2.1	117	
7.2.1	Cultural & creative services exports, % of total trade	0.1	54	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	101	
7.3	Online creativity	9.3	64	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.1	48	
7.3.2	Country-code TLDs/th pop. 15–69	1.6	72	
7.3.3	Wikipedia edits/mn pop. 15–69	2,576.7	47	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Algeria

Key indicators

Population (millions)	39.7
GDP (US$ billions)	172.3
GDP per capita, PPP$	14,503.9
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**24.5**	**113**	
Innovation Output Sub-Index		16.1	116	
Innovation Input Sub-Index		32.8	104	
Innovation Efficiency Ratio		0.5	111	
Global Innovation Index 2015 (out of 141)		24.4	126	
1	**Institutions**	**45.7**	**113**	
1.1	Political environment	29.3	113	
1.1.1	Political stability & safety*	33.7	118	
1.1.2	Government effectiveness*	24.8	101	
1.2	Regulatory environment	51.7	104	
1.2.1	Regulatory quality*	14.8	126	○
1.2.2	Rule of law*	28.8	106	
1.2.3	Cost of redundancy dismissal, salary weeks	17.3	73	
1.3	Business environment	56.3	110	
1.3.1	Ease of starting a business*	76.1	108	
1.3.2	Ease of resolving insolvency*	47.7	66	●
1.3.3	Ease of paying taxes*	45.0	116	
2	**Human capital & research**	**28.2**	**79**	
2.1	Education	48.9	60	
2.1.1	Expenditure on education, % GDP[d]	4.3	73	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years[d]	14.4	56	●
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	35.6	64	●
2.2.1	Tertiary enrolment, % gross	34.6	73	
2.2.2	Graduates in science & engineering, %	27.6	15	●
2.2.3	Tertiary inbound mobility, %	0.6	86	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**37.2**	**86**	
3.1	Information & communication technologies (ICTs)	18.4	116	
3.1.1	ICT access*	42.7	92	
3.1.2	ICT use*	15.2	99	
3.1.3	Government's online service*	7.9	124	
3.1.4	E-participation*	7.8	125	○
3.2	General infrastructure	51.5	15	●
3.2.1	Electricity output, kWh/cap	1,527.4	83	
3.2.2	Logistics performance*	2.6	91	
3.2.3	Gross capital formation, % GDP	49.1	2	●
3.3	Ecological sustainability	41.8	68	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.4	40	●
3.3.2	Environmental performance*	70.3	76	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	106	
4	**Market sophistication**	**31.7**	**117**	
4.1	Credit	7.8	126	○
4.1.1	Ease of getting credit*	10.0	124	○
4.1.2	Domestic credit to private sector, % GDP	18.4	110	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	33.3	78	
4.2.1	Ease of protecting minority investors*	33.3	126	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	53.9	90	
4.3.1	Applied tariff rate, weighted mean, %[d]	9.4	112	
4.3.2	Intensity of local competition†	45.7	122	○
4.3.3	Domestic market scale, bn PPP$	548.6	32	●
5	**Business sophistication**	**21.2**	**118**	
5.1	Knowledge workers	20.9	112	
5.1.1	Knowledge-intensive employment, %[d]	17.6	79	
5.1.2	Firms offering formal training, % firms[d]	17.3	85	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[d]	4.4	79	
5.2	Innovation linkages	23.3	92	
5.2.1	University/industry research collaboration†	21.1	122	○
5.2.2	State of cluster development†	36.1	99	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	110	
5.3	Knowledge absorption	19.3	104	
5.3.1	Intellectual property payments, % total trade[d]	0.2	76	
5.3.2	High-tech imports less re-imports, % total trade	9.4	43	●
5.3.3	ICT services imports, % total trade[d]	0.4	108	
5.3.4	FDI net inflows, % GDP	0.7	108	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.7**	**100**	
6.1	Knowledge creation	3.6	104	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	94	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	91	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.5	101	
6.1.5	Citable documents H index	97.0	82	
6.2	Knowledge impact	34.9	71	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.1	37	●
6.2.2	New businesses/th pop. 15–64	0.6	84	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.8	109	
6.2.5	High- & medium-high-tech manufactures, %[d]	29.1	40	●
6.3	Knowledge diffusion	14.5	120	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	96	
6.3.2	High-tech exports less re-exports, % total trade	0.0	119	○
6.3.3	ICT services exports, % total trade[d]	0.3	106	
6.3.4	FDI net outflows, % GDP[d]	(0.1)	106	
7	**Creative outputs**	**14.6**	**122**	
7.1	Intangible assets	23.8	122	
7.1.1	Trademarks by origin/bn PPP$ GDP	9.0	100	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.5	57	●
7.1.3	ICTs & business model creation†	42.6	117	
7.1.4	ICTs & organizational model creation†	32.3	120	
7.2	Creative goods & services	8.8	98	
7.2.1	Cultural & creative services exports, % of total trade	0.0	74	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	1.8	50	
7.2.4	Printing & publishing manufactures, %[d]	1.2	51	
7.2.5	Creative goods exports, % total trade	0.0	123	○
7.3	Online creativity	2.0	97	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.5	109	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	112	
7.3.3	Wikipedia edits/mn pop. 15–69	399.7	91	
7.3.4	Video uploads on YouTube/pop. 15–69	4.5	66	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Argentina

Key indicators

Population (millions)	43.4
GDP (US$ billions)	585.6
GDP per capita, PPP$	22,553.6
Income group	High income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.2**	**81**	
Innovation Output Sub-Index		21.6	89	
Innovation Input Sub-Index		38.9	77	
Innovation Efficiency Ratio		0.6	98	
Global Innovation Index 2015 (out of 141)		34.3	72	
1	**Institutions**	**47.2**	**106**	
1.1	Political environment	49.4	67	
1.1.1	Political stability & safety*	64.7	62	
1.1.2	Government effectiveness*	34.0	81	
1.2	Regulatory environment	38.5	119	
1.2.1	Regulatory quality*	18.0	124	○
1.2.2	Rule of law*	24.5	115	
1.2.3	Cost of redundancy dismissal, salary weeks	30.3	116	
1.3	Business environment	53.7	118	
1.3.1	Ease of starting a business*	73.4	115	
1.3.2	Ease of resolving insolvency*	42.9	85	
1.3.3	Ease of paying taxes*	45.0	117	
2	**Human capital & research**	**37.3**	**47**	
2.1	Education	52.1	50	
2.1.1	Expenditure on education, % GDP	5.3	41	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	20.9	50	
2.1.3	School life expectancy, years	17.1	15	●
2.1.4	PISA scales in reading, maths, & science	396.7	55	
2.1.5	Pupil-teacher ratio, secondary◴	10.9	33	●
2.2	Tertiary education	40.8	42	
2.2.1	Tertiary enrolment, % gross	80.0	14	●
2.2.2	Graduates in science & engineering, %	14.1	89	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	19.0	47	
2.3.1	Researchers, FTE/mn pop.◴	1,193.9	43	
2.3.2	Gross expenditure on R&D, % GDP◴	0.6	55	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	48.1	29	●
3	**Infrastructure**	**43.3**	**65**	
3.1	Information & communication technologies (ICTs)	55.9	50	
3.1.1	ICT access*	66.0	56	
3.1.2	ICT use*	47.6	53	
3.1.3	Government's online service*	55.1	55	
3.1.4	E-participation*	54.9	54	
3.2	General infrastructure	28.7	88	
3.2.1	Electricity output, kWh/cap	3,357.6	57	
3.2.2	Logistics performance*	3.0	58	
3.2.3	Gross capital formation, % GDP	17.4	105	
3.3	Ecological sustainability	45.3	55	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.3	53	
3.3.2	Environmental performance*	79.8	43	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.4	53	
4	**Market sophistication**	**35.7**	**106**	
4.1	Credit	18.0	111	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	14.3	119	○
4.1.3	Microfinance gross loans, % GDP	0.0	78	○
4.2	Investment	25.2	111	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	11.2	78	
4.2.3	Total value of stocks traded, % GDP	0.9	57	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	83	○
4.3	Trade, competition, & market scale	63.8	54	
4.3.1	Applied tariff rate, weighted mean, %	6.3	95	
4.3.2	Intensity of local competition†	54.9	113	
4.3.3	Domestic market scale, bn PPP$	951.0	23	●
5	**Business sophistication**	**30.8**	**69**	
5.1	Knowledge workers	45.9	39	
5.1.1	Knowledge-intensive employment, %	23.9	59	
5.1.2	Firms offering formal training, % firms◴	63.6	7	●
5.1.3	GERD performed by business, % of GDP◴	0.1	57	
5.1.4	GERD financed by business, %◴	26.5	57	
5.1.5	Females employed w/advanced degrees, % total	16.4	35	
5.2	Innovation linkages	16.8	121	○
5.2.1	University/industry research collaboration†	43.9	64	
5.2.2	State of cluster development†	34.6	106	
5.2.3	GERD financed by abroad, %◴	0.6	93	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	70	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	65	
5.3	Knowledge absorption	29.8	58	
5.3.1	Intellectual property payments, % total trade	2.4	6	●
5.3.2	High-tech imports less re-imports, % total trade	10.8	28	●
5.3.3	ICT services imports, % total trade	1.4	36	
5.3.4	FDI net inflows, % GDP	1.1	97	
5.3.5	Research talent, % in business enterprise◴	7.0	68	
6	**Knowledge & technology outputs**	**18.0**	**97**	
6.1	Knowledge creation	9.2	67	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	73	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.2	43	
6.1.4	Scientific & technical articles/bn PPP$ GDP	8.6	69	
6.1.5	Citable documents H index	273.0	35	●
6.2	Knowledge impact	23.1	111	
6.2.1	Growth rate of PPP$ GDP/worker, %	(1.1)	103	○
6.2.2	New businesses/th pop. 15–64	0.4	90	
6.2.3	Computer software spending, % GDP	0.2	69	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	7.1	49	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	21.6	83	
6.3.1	Intellectual property receipts, % total trade	0.2	40	
6.3.2	High-tech exports less re-exports, % total trade	1.8	54	
6.3.3	ICT services exports, % total trade	1.7	57	
6.3.4	FDI net outflows, % GDP	0.4	65	
7	**Creative outputs**	**25.3**	**83**	
7.1	Intangible assets	33.8	101	
7.1.1	Trademarks by origin/bn PPP$ GDP	46.4	51	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.8	71	
7.1.3	ICTs & business model creation†	43.5	116	○
7.1.4	ICTs & organizational model creation†	47.2	83	
7.2	Creative goods & services	15.7	80	
7.2.1	Cultural & creative services exports, % of total trade	0.4	28	
7.2.2	National feature films/mn pop. 15–69	5.9	30	
7.2.3	Global ent. & media market/th pop. 15–69	10.5	32	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.2	74	
7.3	Online creativity	17.7	44	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.3	63	
7.3.2	Country-code TLDs/th pop. 15–69	6.8	46	
7.3.3	Wikipedia edits/mn pop. 15–69	3,777.6	35	●
7.3.4	Video uploads on YouTube/pop. 15–69	33.0	35	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Armenia

Key indicators

Population (millions)	3.0
GDP (US$ billions)	10.6
GDP per capita, PPP$	8,467.9
Income group	Lower-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.1**	**60**	
Innovation Output Sub-Index		31.9	43	
Innovation Input Sub-Index		38.4	80	
Innovation Efficiency Ratio		0.8	15	●
Global Innovation Index 2015 (out of 141)		37.3	61	
1	**Institutions**	**63.8**	**61**	
1.1	Political environment	46.0	75	
1.1.1	Political stability & safety*	57.7	80	
1.1.2	Government effectiveness*	34.3	80	
1.2	Regulatory environment	69.3	54	
1.2.1	Regulatory quality*	50.1	62	
1.2.2	Rule of law*	39.1	78	
1.2.3	Cost of redundancy dismissal, salary weeks	11.0	39	
1.3	Business environment	76.1	44	
1.3.1	Ease of starting a business*	97.8	5	●
1.3.2	Ease of resolving insolvency*	48.0	64	
1.3.3	Ease of paying taxes*	82.5	36	
2	**Human capital & research**	**18.5**	**104**	
2.1	Education	26.0	119	○
2.1.1	Expenditure on education, % GDP	2.4	111	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	15.9	75	
2.1.3	School life expectancy, years[4]	12.3	84	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	28.1	86	
2.2.1	Tertiary enrolment, % gross	46.6	58	
2.2.2	Graduates in science & engineering, %	14.1	90	○
2.2.3	Tertiary inbound mobility, %	3.9	40	
2.3	Research & development (R&D)	1.5	95	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	0.2	82	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**39.7**	**74**	
3.1	Information & communication technologies (ICTs)	51.8	60	
3.1.1	ICT access*	60.8	65	
3.1.2	ICT use*	31.9	76	
3.1.3	Government's online service*	61.4	43	
3.1.4	E-participation*	52.9	59	
3.2	General infrastructure	25.7	102	
3.2.1	Electricity output, kWh/cap	2,587.2	67	
3.2.2	Logistics performance*	2.7	87	
3.2.3	Gross capital formation, % GDP	19.6	90	
3.3	Ecological sustainability	41.6	72	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	74	
3.3.2	Environmental performance*	81.6	37	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	114	○
4	**Market sophistication**	**41.3**	**78**	
4.1	Credit	41.4	42	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	48.9	69	
4.1.3	Microfinance gross loans, % GDP	3.4	12	●
4.2	Investment	30.0	93	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP[4]	1.2	93	○
4.2.3	Total value of stocks traded, % GDP[4]	0.0	83	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	52.6	95	
4.3.1	Applied tariff rate, weighted mean, %	2.2	53	
4.3.2	Intensity of local competition†	63.5	83	
4.3.3	Domestic market scale, bn PPP$	24.4	111	
5	**Business sophistication**	**28.6**	**82**	
5.1	Knowledge workers	40.0	58	
5.1.1	Knowledge-intensive employment, %[4]	26.9	49	
5.1.2	Firms offering formal training, % firms	16.2	86	○
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[4]	27.4	5	●
5.2	Innovation linkages	21.5	106	
5.2.1	University/industry research collaboration†	34.2	102	
5.2.2	State of cluster development†	36.2	96	
5.2.3	GERD financed by abroad, %	5.1	66	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	41	
5.3	Knowledge absorption	24.4	89	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	5.6	86	
5.3.3	ICT services imports, % total trade	1.0	59	
5.3.4	FDI net inflows, % GDP	3.5	49	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**28.2**	**48**	
6.1	Knowledge creation	27.7	34	
6.1.1	Patents by origin/bn PPP$ GDP	5.0	23	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	49	
6.1.3	Utility models by origin/bn PPP$ GDP	2.2	12	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	29.9	24	●
6.1.5	Citable documents H index	126.0	62	
6.2	Knowledge impact	30.4	91	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.8	29	
6.2.2	New businesses/th pop. 15–64	1.5	55	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.7	113	○
6.2.5	High- & medium-high-tech manufactures, %	4.3	93	○
6.3	Knowledge diffusion	26.5	55	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.2	95	
6.3.3	ICT services exports, % total trade	3.0	24	●
6.3.4	FDI net outflows, % GDP	0.1	79	
7	**Creative outputs**	**35.6**	**44**	
7.1	Intangible assets	49.3	38	
7.1.1	Trademarks by origin/bn PPP$ GDP	99.3	13	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.3	60	
7.1.3	ICTs & business model creation†	59.0	61	
7.1.4	ICTs & organizational model creation†	55.0	60	
7.2	Creative goods & services	29.8	44	
7.2.1	Cultural & creative services exports, % of total trade	0.3	36	
7.2.2	National feature films/mn pop. 15–69	12.8	7	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.5	33	
7.2.5	Creative goods exports, % total trade	0.5	60	
7.3	Online creativity	13.9	50	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.0	66	
7.3.2	Country-code TLDs/th pop. 15–69	4.5	56	
7.3.3	Wikipedia edits/mn pop. 15–69	4,651.3	30	●
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Australia

Key indicators

Population (millions)	24.0
GDP (US$ billions)	1,223.9
GDP per capita, PPP$	47,389.1
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**53.1**	**19**	
Innovation Output Sub-Index		41.3	27	
Innovation Input Sub-Index		64.9	11	
Innovation Efficiency Ratio		0.6	73	○
Global Innovation Index 2015 (out of 141)		55.2	17	
1	**Institutions**	**88.8**	**10**	
1.1	Political environment	86.5	16	
1.1.1	Political stability & safety*	89.8	12	
1.1.2	Government effectiveness*	83.2	16	
1.2	Regulatory environment	92.9	12	
1.2.1	Regulatory quality*	91.1	5	●
1.2.2	Rule of law*	95.2	9	
1.2.3	Cost of redundancy dismissal, salary weeks	11.7	43	
1.3	Business environment	86.8	14	
1.3.1	Ease of starting a business*	96.5	11	
1.3.2	Ease of resolving insolvency*	81.7	13	
1.3.3	Ease of paying taxes*	82.4	37	
2	**Human capital & research**	**59.7**	**9**	
2.1	Education	56.3	37	
2.1.1	Expenditure on education, % GDP	4.9	54	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	16.5	73	○
2.1.3	School life expectancy, years	20.4	1	●
2.1.4	PISA scales in reading, maths, & science	512.5	14	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	57.5	8	●
2.2.1	Tertiary enrolment, % gross	86.6	7	●
2.2.2	Graduates in science & engineering, %[4]	15.9	79	○
2.2.3	Tertiary inbound mobility, %	18.0	5	●
2.3	Research & development (R&D)	65.2	13	
2.3.1	Researchers, FTE/mn pop.[4]	4,530.7	12	
2.3.2	Gross expenditure on R&D, % GDP[4]	2.2	14	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	511.5	18	
2.3.4	QS university ranking, average score top 3*	85.3	6	●
3	**Infrastructure**	**65.1**	**6**	●
3.1	Information & communication technologies (ICTs)	86.7	7	●
3.1.1	ICT access*	83.7	16	
3.1.2	ICT use*	75.8	16	
3.1.3	Government's online service*	92.9	8	
3.1.4	E-participation*	94.1	7	●
3.2	General infrastructure	56.9	10	
3.2.1	Electricity output, kWh/cap	10,534.1	12	
3.2.2	Logistics performance*	3.8	16	
3.2.3	Gross capital formation, % GDP	26.3	36	
3.3	Ecological sustainability	51.7	33	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.1	68	○
3.3.2	Environmental performance*	87.2	13	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	5.2	20	
4	**Market sophistication**	**65.8**	**10**	
4.1	Credit	70.4	6	●
4.1.1	Ease of getting credit*	90.0	5	●
4.1.2	Domestic credit to private sector, % GDP	129.6	15	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	48.5	26	
4.2.1	Ease of protecting minority investors*	56.7	62	○
4.2.2	Market capitalization, % GDP	88.6	18	
4.2.3	Total value of stocks traded, % GDP	50.6	15	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	16	
4.3	Trade, competition, & market scale	78.4	11	
4.3.1	Applied tariff rate, weighted mean, %	1.8	49	
4.3.2	Intensity of local competition†	82.2	8	●
4.3.3	Domestic market scale, bn PPP$	1,099.8	19	
5	**Business sophistication**	**45.0**	**23**	
5.1	Knowledge workers	65.2	9	
5.1.1	Knowledge-intensive employment, %	44.9	13	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP[4]	1.2	15	
5.1.4	GERD financed by business, %[4]	61.9	7	
5.1.5	Females employed w/advanced degrees, % total[4]	22.6	15	
5.2	Innovation linkages	38.5	37	
5.2.1	University/industry research collaboration†	64.1	20	
5.2.2	State of cluster development†	51.0	39	
5.2.3	GERD financed by abroad, %[4]	1.6	83	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	4	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.0	25	
5.3	Knowledge absorption	31.4	49	
5.3.1	Intellectual property payments, % total trade	1.3	19	
5.3.2	High-tech imports less re-imports, % total trade	10.0	31	
5.3.3	ICT services imports, % total trade	0.9	66	○
5.3.4	FDI net inflows, % GDP	3.2	56	
5.3.5	Research talent, % in business enterprise[4]	27.9	47	○
6	**Knowledge & technology outputs**	**34.3**	**32**	
6.1	Knowledge creation	33.6	28	
6.1.1	Patents by origin/bn PPP$ GDP	1.8	51	
6.1.2	PCT patent applications/bn PPP$ GDP	1.5	24	
6.1.3	Utility models by origin/bn PPP$ GDP	0.9	26	
6.1.4	Scientific & technical articles/bn PPP$ GDP	48.3	9	
6.1.5	Citable documents H index	644.0	10	
6.2	Knowledge impact	50.0	18	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.5	47	
6.2.2	New businesses/th pop. 15–64	14.9	5	●
6.2.3	Computer software spending, % GDP	0.3	39	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	17.9	21	
6.2.5	High- & medium-high-tech manufactures, %	24.8	49	
6.3	Knowledge diffusion	19.3	100	○
6.3.1	Intellectual property receipts, % total trade	0.3	28	
6.3.2	High-tech exports less re-exports, % total trade	1.8	53	
6.3.3	ICT services exports, % total trade	0.6	90	○
6.3.4	FDI net outflows, % GDP	(0.1)	107	○
7	**Creative outputs**	**48.2**	**18**	
7.1	Intangible assets	49.6	37	
7.1.1	Trademarks by origin/bn PPP$ GDP	65.4	27	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.4	48	
7.1.3	ICTs & business model creation†	64.8	40	
7.1.4	ICTs & organizational model creation†	66.3	24	
7.2	Creative goods & services	32.7	37	
7.2.1	Cultural & creative services exports, % of total trade	0.3	31	
7.2.2	National feature films/mn pop. 15–69	1.6	61	○
7.2.3	Global ent. & media market/th pop. 15–69	61.7	8	
7.2.4	Printing & publishing manufactures, %	2.2	18	
7.2.5	Creative goods exports, % total trade	0.7	53	
7.3	Online creativity	61.1	9	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	68.7	9	
7.3.2	Country-code TLDs/th pop. 15–69	62.9	14	
7.3.3	Wikipedia edits/mn pop. 15–69	7,868.5	9	
7.3.4	Video uploads on YouTube/pop. 15–69	54.6	16	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Austria

Key indicators

Population (millions)	8.5
GDP (US$ billions)	374.1
GDP per capita, PPP$	47,249.9
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**52.6**	**20**	
Innovation Output Sub-Index		44.4	22	
Innovation Input Sub-Index		60.9	19	
Innovation Efficiency Ratio		0.7	43	
Global Innovation Index 2015 (out of 141)		54.1	18	
1	**Institutions**	**87.6**	**14**	
1.1	Political environment	88.8	12	●
1.1.1	Political stability & safety*	95.1	3	●
1.1.2	Government effectiveness*	82.6	17	
1.2	Regulatory environment	94.4	10	●
1.2.1	Regulatory quality*	81.7	18	
1.2.2	Rule of law*	95.9	8	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	79.6	32	
1.3.1	Ease of starting a business*	83.5	80	○
1.3.2	Ease of resolving insolvency*	78.9	17	
1.3.3	Ease of paying taxes*	76.5	61	○
2	**Human capital & research**	**60.8**	**8**	●
2.1	Education	58.3	29	
2.1.1	Expenditure on education, % GDP	5.5	38	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	27.0	25	
2.1.3	School life expectancy, years	15.9	32	
2.1.4	PISA scales in reading, maths, & science	500.3	18	
2.1.5	Pupil-teacher ratio, secondary◴	9.7	22	
2.2	Tertiary education	65.7	2	●
2.2.1	Tertiary enrolment, % gross	80.0	13	
2.2.2	Graduates in science & engineering, %	27.9	13	
2.2.3	Tertiary inbound mobility, %	15.5	9	●
2.3	Research & development (R&D)	58.3	17	
2.3.1	Researchers, FTE/mn pop.	4,814.5	10	●
2.3.2	Gross expenditure on R&D, % GDP	3.0	7	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	107.9	28	
2.3.4	QS university ranking, average score top 3*	52.4	25	
3	**Infrastructure**	**57.1**	**24**	
3.1	Information & communication technologies (ICTs)	71.1	27	
3.1.1	ICT access*	82.1	19	
3.1.2	ICT use*	64.7	27	
3.1.3	Government's online service*	74.8	23	
3.1.4	E-participation*	62.7	40	
3.2	General infrastructure	46.8	28	
3.2.1	Electricity output, kWh/cap	7,207.8	26	
3.2.2	Logistics performance*	3.6	21	
3.2.3	Gross capital formation, % GDP	22.3	61	○
3.3	Ecological sustainability	53.3	26	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.9	33	
3.3.2	Environmental performance*	86.6	18	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.0	35	
4	**Market sophistication**	**51.3**	**29**	
4.1	Credit	47.0	31	
4.1.1	Ease of getting credit*	60.0	53	○
4.1.2	Domestic credit to private sector, % GDP	88.6	32	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	33.2	81	○
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP	22.2	60	○
4.2.3	Total value of stocks traded, % GDP	6.6	41	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	30	
4.3	Trade, competition, & market scale	73.5	21	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	78.9	14	
4.3.3	Domestic market scale, bn PPP$	396.8	43	
5	**Business sophistication**	**47.6**	**18**	
5.1	Knowledge workers	59.5	22	
5.1.1	Knowledge-intensive employment, %	40.4	22	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	2.1	6	●
5.1.4	GERD financed by business, %	47.2	24	
5.1.5	Females employed w/advanced degrees, % total	15.8	37	
5.2	Innovation linkages	42.5	24	
5.2.1	University/industry research collaboration†	61.3	23	
5.2.2	State of cluster development†	65.4	15	
5.2.3	GERD financed by abroad, %	15.1	29	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	50	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	4.3	9	●
5.3	Knowledge absorption	40.8	23	
5.3.1	Intellectual property payments, % total trade	0.8	36	
5.3.2	High-tech imports less re-imports, % total trade	8.8	50	
5.3.3	ICT services imports, % total trade	1.9	21	
5.3.4	FDI net inflows, % GDP	1.9	82	○
5.3.5	Research talent, % in business enterprise	63.7	8	●
6	**Knowledge & technology outputs**	**39.4**	**24**	
6.1	Knowledge creation	42.2	20	
6.1.1	Patents by origin/bn PPP$ GDP	10.2	12	●
6.1.2	PCT patent applications/bn PPP$ GDP	3.5	12	
6.1.3	Utility models by origin/bn PPP$ GDP	1.4	20	
6.1.4	Scientific & technical articles/bn PPP$ GDP	35.0	19	
6.1.5	Citable documents H index	449.0	17	
6.2	Knowledge impact	39.1	49	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.5)	99	○
6.2.2	New businesses/th pop. 15–64	0.7	81	○
6.2.3	Computer software spending, % GDP	0.6	14	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	10.6	36	
6.2.5	High- & medium-high-tech manufactures, %	43.2	16	
6.3	Knowledge diffusion	36.8	32	
6.3.1	Intellectual property receipts, % total trade	0.5	23	
6.3.2	High-tech exports less re-exports, % total trade	9.4	20	
6.3.3	ICT services exports, % total trade	2.8	28	
6.3.4	FDI net outflows, % GDP	2.1	30	
7	**Creative outputs**	**49.5**	**16**	
7.1	Intangible assets	55.2	23	
7.1.1	Trademarks by origin/bn PPP$ GDP	64.7	29	
7.1.2	Industrial designs by origin/bn PPP$ GDP	9.0	15	
7.1.3	ICTs & business model creation†	71.0	24	
7.1.4	ICTs & organizational model creation†	62.2	31	
7.2	Creative goods & services	41.1	16	
7.2.1	Cultural & creative services exports, % of total trade◴	1.0	10	
7.2.2	National feature films/mn pop. 15–69	7.5	22	
7.2.3	Global ent. & media market/th pop. 15–69	63.0	7	
7.2.4	Printing & publishing manufactures, %	1.4	36	
7.2.5	Creative goods exports, % total trade	1.5	34	
7.3	Online creativity	46.6	19	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	39.3	19	
7.3.2	Country-code TLDs/th pop. 15–69	73.6	11	●
7.3.3	Wikipedia edits/mn pop. 15–69	4,879.5	26	
7.3.4	Video uploads on YouTube/pop. 15–69	37.3	29	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Azerbaijan

Key indicators

Population (millions)	9.8
GDP (US$ billions)	54.0
GDP per capita, PPP$	17,993.4
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.6**	**85**	
Innovation Output Sub-Index		20.9	94	
Innovation Input Sub-Index		38.4	81	
Innovation Efficiency Ratio		0.5	101	
Global Innovation Index 2015 (out of 141)		30.1	93	
1	**Institutions**	**56.4**	**76**	
1.1	Political environment	40.0	92	
1.1.1	Political stability & safety*	50.4	89	
1.1.2	Government effectiveness*	29.6	86	
1.2	Regulatory environment	53.8	97	
1.2.1	Regulatory quality*	37.5	87	
1.2.2	Rule of law*	32.0	97	
1.2.3	Cost of redundancy dismissal, salary weeks	21.7	91	
1.3	Business environment	75.4	48	
1.3.1	Ease of starting a business*	97.8	7	●
1.3.2	Ease of resolving insolvency*	44.7	75	
1.3.3	Ease of paying taxes*	83.8	30	●
2	**Human capital & research**	**22.9**	**93**	
2.1	Education	32.2	105	
2.1.1	Expenditure on education, % GDP	2.5	109	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	12.6	82	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	29.1	83	
2.2.1	Tertiary enrolment, % gross	23.2	88	
2.2.2	Graduates in science & engineering, %	22.0	45	
2.2.3	Tertiary inbound mobility, %	2.3	62	
2.3	Research & development (R&D)	7.5	69	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	0.2	86	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	18.6	55	
3	**Infrastructure**	**40.8**	**73**	
3.1	Information & communication technologies (ICTs)	48.6	70	
3.1.1	ICT access*	61.1	64	
3.1.2	ICT use*	47.0	56	
3.1.3	Government's online service*	43.3	75	
3.1.4	E-participation*	43.1	74	
3.2	General infrastructure	25.2	104	
3.2.1	Electricity output, kWh/cap	2,479.2	69	
3.2.2	Logistics performance*	2.4	113	○
3.2.3	Gross capital formation, % GDP	22.3	62	
3.3	Ecological sustainability	48.5	44	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.0	29	●
3.3.2	Environmental performance*	83.8	31	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	87	
4	**Market sophistication**	**52.1**	**27**	●
4.1	Credit	35.4	53	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	30.7	94	
4.1.3	Microfinance gross loans, % GDP	4.5	11	●
4.2	Investment	63.3	13	
4.2.1	Ease of protecting minority investors*	63.3	35	●
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	57.7	77	
4.3.1	Applied tariff rate, weighted mean, %	4.6	82	
4.3.2	Intensity of local competition†	55.8	111	○
4.3.3	Domestic market scale, bn PPP$	165.9	62	
5	**Business sophistication**	**19.7**	**123**	○
5.1	Knowledge workers	23.3	103	
5.1.1	Knowledge-intensive employment, %	23.4	61	
5.1.2	Firms offering formal training, % firms	20.2	80	
5.1.3	GERD performed by business, % of GDP	0.0	76	
5.1.4	GERD financed by business, %	5.3	77	
5.1.5	Females employed w/advanced degrees, % total◴	12.9	48	
5.2	Innovation linkages	17.7	117	○
5.2.1	University/industry research collaboration†	36.0	95	
5.2.2	State of cluster development†	40.1	88	
5.2.3	GERD financed by abroad, %	0.2	97	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	55	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	78	
5.3	Knowledge absorption	18.0	113	○
5.3.1	Intellectual property payments, % total trade◴	0.1	96	
5.3.2	High-tech imports less re-imports, % total trade	2.2	119	○
5.3.3	ICT services imports, % total trade	0.6	89	
5.3.4	FDI net inflows, % GDP	5.9	23	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.6**	**101**	
6.1	Knowledge creation	3.0	110	
6.1.1	Patents by origin/bn PPP$ GDP	1.2	60	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	94	○
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	46	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.6	112	○
6.1.5	Citable documents H index	58.0	109	
6.2	Knowledge impact	28.2	100	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.3	54	
6.2.2	New businesses/th pop. 15–64	1.0	71	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.5	97	
6.2.5	High- & medium-high-tech manufactures, %	10.4	76	
6.3	Knowledge diffusion	21.6	82	
6.3.1	Intellectual property receipts, % total trade◴	0.0	101	○
6.3.2	High-tech exports less re-exports, % total trade	0.1	105	
6.3.3	ICT services exports, % total trade	0.5	97	
6.3.4	FDI net outflows, % GDP	2.6	23	●
7	**Creative outputs**	**24.1**	**87**	
7.1	Intangible assets	39.5	78	
7.1.1	Trademarks by origin/bn PPP$ GDP	22.2	76	
7.1.2	Industrial designs by origin/bn PPP$ GDP◴	0.3	87	
7.1.3	ICTs & business model creation†	63.2	44	
7.1.4	ICTs & organizational model creation†	62.5	29	●
7.2	Creative goods & services	12.5	86	
7.2.1	Cultural & creative services exports, % of total trade	0.0	62	
7.2.2	National feature films/mn pop. 15–69	9.9	13	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	0.6	82	
7.2.5	Creative goods exports, % total trade	0.0	113	○
7.3	Online creativity	5.0	76	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.1	94	
7.3.2	Country-code TLDs/th pop. 15–69	1.2	79	
7.3.3	Wikipedia edits/mn pop. 15–69	1,709.4	57	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bahrain

Key indicators

Population (millions)	1.4
GDP (US$ billions)	30.4
GDP per capita, PPP$	50,094.9
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.5**	**57**	
Innovation Output Sub-Index		26.2	67	
Innovation Input Sub-Index		44.8	51	
Innovation Efficiency Ratio		0.6	92	
Global Innovation Index 2015 (out of 141)		37.7	59	
1	**Institutions**	**66.4**	**55**	
1.1	Political environment	47.5	71	
1.1.1	Political stability & safety*	39.4	111	○
1.1.2	Government effectiveness*	55.5	41	
1.2	Regulatory environment	80.1	29	
1.2.1	Regulatory quality*	62.0	40	
1.2.2	Rule of law*	58.3	46	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	71.8	59	
1.3.1	Ease of starting a business*	77.1	106	
1.3.2	Ease of resolving insolvency*	44.3	76	
1.3.3	Ease of paying taxes*	93.9	8	●
2	**Human capital & research**	**31.4**	**68**	
2.1	Education	42.8	80	
2.1.1	Expenditure on education, % GDP	2.6	106	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	9.9	26	
2.2	Tertiary education	43.7	34	
2.2.1	Tertiary enrolment, % gross	36.8	70	
2.2.2	Graduates in science & engineering, %	19.5	59	
2.2.3	Tertiary inbound mobility, %	13.2	11	●
2.3	Research & development (R&D)	7.7	67	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	15.4	59	
3	**Infrastructure**	**55.3**	**29**	
3.1	Information & communication technologies (ICTs)	82.4	10	●
3.1.1	ICT access*	77.9	30	
3.1.2	ICT use*	75.6	17	●
3.1.3	Government's online service*	93.7	7	●
3.1.4	E-participation*	82.4	14	●
3.2	General infrastructure	50.9	19	●
3.2.1	Electricity output, kWh/cap	19,485.7	1	●
3.2.2	Logistics performance*	3.1	50	
3.2.3	Gross capital formation, % GDP	17.6	102	
3.3	Ecological sustainability	32.6	107	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	3.7	113	○
3.3.2	Environmental performance*	70.1	77	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.2	58	
4	**Market sophistication**	**38.7**	**91**	
4.1	Credit	31.9	72	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	63.0	48	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	26.6	108	
4.2.1	Ease of protecting minority investors*	48.3	90	
4.2.2	Market capitalization, % GDP	65.6	27	
4.2.3	Total value of stocks traded, % GDP[4]	1.0	55	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	57	
4.3	Trade, competition, & market scale	57.7	76	
4.3.1	Applied tariff rate, weighted mean, %	3.7	67	
4.3.2	Intensity of local competition†	71.5	46	
4.3.3	Domestic market scale, bn PPP$	62.2	88	
5	**Business sophistication**	**32.1**	**59**	
5.1	Knowledge workers	n/a	n/a	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	46.1	15	●
5.2.1	University/industry research collaboration†	37.9	84	
5.2.2	State of cluster development†	57.5	26	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	3	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP[4]	0.0	82	
5.3	Knowledge absorption	18.1	112	○
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	5.0	97	
5.3.3	ICT services imports, % total trade[4]	0.3	111	○
5.3.4	FDI net inflows, % GDP	2.8	61	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**25.3**	**61**	
6.1	Knowledge creation	1.7	124	○
6.1.1	Patents by origin/bn PPP$ GDP	0.1	102	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	64	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.2	116	○
6.1.5	Citable documents H index	48.0	115	○
6.2	Knowledge impact	37.7	57	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.1	23	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.3	27	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.0	62	
6.2.5	High- & medium-high-tech manufactures, %[4]	9.9	78	
6.3	Knowledge diffusion	36.5	33	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.2	93	
6.3.3	ICT services exports, % total trade[4]	3.3	20	
6.3.4	FDI net outflows, % GDP[4]	3.2	17	●
7	**Creative outputs**	**27.1**	**74**	
7.1	Intangible assets	36.9	91	
7.1.1	Trademarks by origin/bn PPP$ GDP	6.7	103	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.2	99	○
7.1.3	ICTs & business model creation†	65.1	37	
7.1.4	ICTs & organizational model creation†	60.7	36	
7.2	Creative goods & services	22.7	65	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	0.0	101	○
7.2.3	Global ent. & media market/th pop. 15–69	9.2	34	
7.2.4	Printing & publishing manufactures, %[4]	1.0	63	
7.2.5	Creative goods exports, % total trade	2.3	20	●
7.3	Online creativity	11.8	57	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	6.0	52	
7.3.2	Country-code TLDs/th pop. 15–69	1.5	74	
7.3.3	Wikipedia edits/mn pop. 15–69	1,547.7	62	
7.3.4	Video uploads on YouTube/pop. 15–69	28.1	43	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bangladesh

Key indicators

Population (millions)	161.0
GDP (US$ billions)	205.7
GDP per capita, PPP$	3,606.6
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**22.9**	**117**	
Innovation Output Sub-Index		15.7	117	
Innovation Input Sub-Index		30.0	115	
Innovation Efficiency Ratio		0.5	107	
Global Innovation Index 2015 (out of 141)		23.7	129	
1	**Institutions**	**43.3**	**118**	
1.1	Political environment	29.3	112	
1.1.1	Political stability & safety*	41.1	104	
1.1.2	Government effectiveness*	17.6	113	
1.2	Regulatory environment	39.9	118	
1.2.1	Regulatory quality*	21.4	118	
1.2.2	Rule of law*	29.2	105	
1.2.3	Cost of redundancy dismissal, salary weeks	31.0	118	
1.3	Business environment	60.8	94	
1.3.1	Ease of starting a business*	81.7	87	
1.3.2	Ease of resolving insolvency*	26.4	122	
1.3.3	Ease of paying taxes*	74.4	67	
2	**Human capital & research**	**12.4**	**124**	○
2.1	Education	17.0	127	○
2.1.1	Expenditure on education, % GDP	2.0	116	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	12.1	94	
2.1.3	School life expectancy, years[d]	9.9	106	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	35.2	108	○
2.2	Tertiary education	17.1	104	
2.2.1	Tertiary enrolment, % gross[d]	13.4	100	
2.2.2	Graduates in science & engineering, %[d]	15.6	82	
2.2.3	Tertiary inbound mobility, %[d]	0.1	102	
2.3	Research & development (R&D)	3.0	85	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	6.0	66	●
3	**Infrastructure**	**30.7**	**105**	
3.1	Information & communication technologies (ICTs)	27.0	105	
3.1.1	ICT access*	28.2	113	
3.1.2	ICT use*	6.0	115	
3.1.3	Government's online service*	34.6	90	
3.1.4	E-participation*	39.2	80	
3.2	General infrastructure	30.6	79	
3.2.1	Electricity output, kWh/cap	337.9	108	
3.2.2	Logistics performance*	2.6	101	
3.2.3	Gross capital formation, % GDP	29.5	25	●
3.3	Ecological sustainability	34.6	98	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.8	16	●
3.3.2	Environmental performance*	41.8	122	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	116	
4	**Market sophistication**	**40.5**	**83**	
4.1	Credit	22.6	102	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	42.4	78	
4.1.3	Microfinance gross loans, % GDP	1.8	19	●
4.2	Investment	38.5	57	●
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP	20.1	65	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	60.4	67	
4.3.1	Applied tariff rate, weighted mean, %[d]	8.4	107	
4.3.2	Intensity of local competition†	66.3	73	
4.3.3	Domestic market scale, bn PPP$	536.5	34	●
5	**Business sophistication**	**23.1**	**110**	
5.1	Knowledge workers	27.9	92	
5.1.1	Knowledge-intensive employment, %[d]	20.0	70	
5.1.2	Firms offering formal training, % firms	21.9	78	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	23.8	87	
5.2.1	University/industry research collaboration†	26.0	119	○
5.2.2	State of cluster development†	46.0	58	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	69	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	109	○
5.3	Knowledge absorption	17.7	116	
5.3.1	Intellectual property payments, % total trade[d]	0.1	103	
5.3.2	High-tech imports less re-imports, % total trade[d]	9.0	46	●
5.3.3	ICT services imports, % total trade[d]	0.1	119	○
5.3.4	FDI net inflows, % GDP	1.4	93	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.3**	**111**	
6.1	Knowledge creation	4.7	95	
6.1.1	Patents by origin/bn PPP$ GDP	0.1	107	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.8	111	
6.1.5	Citable documents H index	124.0	63	●
6.2	Knowledge impact	27.8	104	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.4	19	●
6.2.2	New businesses/th pop. 15–64[d]	0.1	102	
6.2.3	Computer software spending, % GDP	0.2	72	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.7	112	
6.2.5	High- & medium-high-tech manufactures, %[d]	9.7	79	
6.3	Knowledge diffusion	16.6	112	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	94	
6.3.2	High-tech exports less re-exports, % total trade[d]	0.1	104	
6.3.3	ICT services exports, % total trade[d]	1.1	75	
6.3.4	FDI net outflows, % GDP	0.0	92	
7	**Creative outputs**	**15.1**	**121**	
7.1	Intangible assets	29.3	109	
7.1.1	Trademarks by origin/bn PPP$ GDP	14.8	88	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.3	49	●
7.1.3	ICTs & business model creation†	46.5	109	
7.1.4	ICTs & organizational model creation†	42.4	99	
7.2	Creative goods & services	1.3	121	
7.2.1	Cultural & creative services exports, % of total trade	0.0	78	
7.2.2	National feature films/mn pop. 15–69[d]	0.7	84	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	0.2	94	○
7.2.5	Creative goods exports, % total trade[d]	0.1	93	
7.3	Online creativity	0.4	110	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.4	112	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	124	○
7.3.3	Wikipedia edits/mn pop. 15–69	121.6	105	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Belarus

Key indicators

Population (millions)	9.5
GDP (US$ billions)	54.6
GDP per capita, PPP$	17,654.2
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.4**	**79**	
Innovation Output Sub-Index		18.8	103	○
Innovation Input Sub-Index		42.0	64	
Innovation Efficiency Ratio		0.4	116	○
Global Innovation Index 2015 (out of 141)		38.2	53	
1	**Institutions**	**56.0**	**77**	
1.1	Political environment	45.6	77	
1.1.1	Political stability & safety*	65.9	56	
1.1.2	Government effectiveness*	25.3	98	○
1.2	Regulatory environment	47.9	109	○
1.2.1	Regulatory quality*	18.9	123	○
1.2.2	Rule of law*	26.8	111	○
1.2.3	Cost of redundancy dismissal, salary weeks	21.7	91	
1.3	Business environment	74.5	52	
1.3.1	Ease of starting a business*	96.3	12	●
1.3.2	Ease of resolving insolvency*	48.4	62	
1.3.3	Ease of paying taxes*	78.7	53	
2	**Human capital & research**	**42.6**	**35**	
2.1	Education	65.0	12	●
2.1.1	Expenditure on education, % GDP	5.0	50	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	15.6	36	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	8.1	7	●
2.2	Tertiary education	52.1	15	●
2.2.1	Tertiary enrolment, % gross	88.9	4	●
2.2.2	Graduates in science & engineering, %	28.6	10	●
2.2.3	Tertiary inbound mobility, %	2.9	54	
2.3	Research & development (R&D)	10.7	56	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP◴	0.7	52	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	17.3	56	
3	**Infrastructure**	**43.6**	**63**	
3.1	Information & communication technologies (ICTs)	49.6	67	
3.1.1	ICT access*	76.8	34	
3.1.2	ICT use*	54.0	43	
3.1.3	Government's online service*	32.3	91	
3.1.4	E-participation*	35.3	85	
3.2	General infrastructure	39.6	49	
3.2.1	Electricity output, kWh/cap	3,327.0	58	
3.2.2	Logistics performance*	2.6	94	
3.2.3	Gross capital formation, % GDP	33.9	8	●
3.3	Ecological sustainability	41.7	70	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.3	93	○
3.3.2	Environmental performance*	82.3	35	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.1	44	
4	**Market sophistication**	**39.1**	**89**	
4.1	Credit	16.0	116	○
4.1.1	Ease of getting credit*	40.0	92	○
4.1.2	Domestic credit to private sector, % GDP	24.5	104	○
4.1.3	Microfinance gross loans, % GDP	0.0	83	○
4.2	Investment	39.4	53	
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	79	○
4.3	Trade, competition, & market scale	61.9	60	
4.3.1	Applied tariff rate, weighted mean, %	3.0	61	
4.3.2	Intensity of local competition†	n/a	n/a	
4.3.3	Domestic market scale, bn PPP$	172.8	61	
5	**Business sophistication**	**28.7**	**81**	
5.1	Knowledge workers	58.5	23	●
5.1.1	Knowledge-intensive employment, %◴	35.9	33	
5.1.2	Firms offering formal training, % firms	51.1	23	●
5.1.3	GERD performed by business, % of GDP◴	0.4	37	
5.1.4	GERD financed by business, %◴	43.8	29	
5.1.5	Females employed w/advanced degrees, % total◴	33.8	1	●
5.2	Innovation linkages	9.2	126	○
5.2.1	University/industry research collaboration†	n/a	n/a	
5.2.2	State of cluster development†	n/a	n/a	
5.2.3	GERD financed by abroad, %◴	7.9	50	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	53	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	40	
5.3	Knowledge absorption	18.4	109	○
5.3.1	Intellectual property payments, % total trade	0.5	58	
5.3.2	High-tech imports less re-imports, % total trade	5.3	91	
5.3.3	ICT services imports, % total trade	0.5	94	
5.3.4	FDI net inflows, % GDP	2.4	70	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**28.1**	**49**	
6.1	Knowledge creation	22.3	41	
6.1.1	Patents by origin/bn PPP$ GDP	4.5	27	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	66	
6.1.3	Utility models by origin/bn PPP$ GDP	2.4	10	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.3	84	
6.1.5	Citable documents H index	122.0	65	
6.2	Knowledge impact	41.3	42	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.5	49	
6.2.2	New businesses/th pop. 15–64	1.1	68	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	17.2	22	●
6.2.5	High- & medium-high-tech manufactures, %◴	31.4	37	
6.3	Knowledge diffusion	20.8	90	
6.3.1	Intellectual property receipts, % total trade	0.1	53	
6.3.2	High-tech exports less re-exports, % total trade	1.6	56	
6.3.3	ICT services exports, % total trade	2.1	46	
6.3.4	FDI net outflows, % GDP	0.0	86	
7	**Creative outputs**	**9.5**	**124**	○
7.1	Intangible assets	12.6	124	○
7.1.1	Trademarks by origin/bn PPP$ GDP	30.2	67	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.0	66	
7.1.3	ICTs & business model creation†	n/a	n/a	
7.1.4	ICTs & organizational model creation†	n/a	n/a	
7.2	Creative goods & services	5.4	108	○
7.2.1	Cultural & creative services exports, % of total trade	0.1	57	
7.2.2	National feature films/mn pop. 15–69◴	0.1	98	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.3	67	
7.3	Online creativity	7.3	68	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.8	84	
7.3.2	Country-code TLDs/th pop. 15–69	6.3	47	
7.3.3	Wikipedia edits/mn pop. 15–69	1,864.6	55	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Belgium

Key indicators

Population (millions)	11.3
GDP (US$ billions)	454.7
GDP per capita, PPP$	43,585.0
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**52.0**	**23**	
Innovation Output Sub-Index		45.7	18	
Innovation Input Sub-Index		58.2	20	
Innovation Efficiency Ratio		0.8	27	
Global Innovation Index 2015 (out of 141)		50.9	25	
1	**Institutions**	**80.5**	**25**	
1.1	Political environment	79.3	19	
1.1.1	Political stability & safety*	80.6	33	
1.1.2	Government effectiveness*	77.9	22	
1.2	Regulatory environment	78.1	32	
1.2.1	Regulatory quality*	73.8	23	
1.2.2	Rule of law*	84.8	20	
1.2.3	Cost of redundancy dismissal, salary weeks	19.7	84	○
1.3	Business environment	84.1	19	
1.3.1	Ease of starting a business*	94.5	20	
1.3.2	Ease of resolving insolvency*	84.0	9	●
1.3.3	Ease of paying taxes*	73.8	70	○
2	**Human capital & research**	**58.9**	**12**	
2.1	Education	72.1	6	●
2.1.1	Expenditure on education, % GDP[4]	6.4	20	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	38.6	8	●
2.1.3	School life expectancy, years	19.6	2	●
2.1.4	PISA scales in reading, maths, & science	509.8	15	
2.1.5	Pupil-teacher ratio, secondary[4]	9.4	19	
2.2	Tertiary education	44.3	32	
2.2.1	Tertiary enrolment, % gross	72.3	23	
2.2.2	Graduates in science & engineering, %[4]	16.4	76	○
2.2.3	Tertiary inbound mobility, %	10.0	16	
2.3	Research & development (R&D)	60.3	16	
2.3.1	Researchers, FTE/mn pop.	4,175.9	19	
2.3.2	Gross expenditure on R&D, % GDP	2.5	11	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	402.1	21	
2.3.4	QS university ranking, average score top 3*	66.2	15	
3	**Infrastructure**	**55.3**	**28**	
3.1	Information & communication technologies (ICTs)	70.6	29	
3.1.1	ICT access*	84.5	15	
3.1.2	ICT use*	67.6	25	
3.1.3	Government's online service*	67.7	31	
3.1.4	E-participation*	62.7	40	
3.2	General infrastructure	50.6	22	
3.2.1	Electricity output, kWh/cap	6,387.2	28	
3.2.2	Logistics performance*	4.0	3	●
3.2.3	Gross capital formation, % GDP	22.0	64	○
3.3	Ecological sustainability	44.8	56	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.0	70	○
3.3.2	Environmental performance*	80.2	41	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.5	39	
4	**Market sophistication**	**49.7**	**37**	
4.1	Credit	33.4	63	
4.1.1	Ease of getting credit*	45.0	81	○
4.1.2	Domestic credit to private sector, % GDP	58.2	53	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	40.2	48	
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP	71.2	25	
4.2.3	Total value of stocks traded, % GDP	20.2	27	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	22	
4.3	Trade, competition, & market scale	75.6	16	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	82.9	5	●
4.3.3	Domestic market scale, bn PPP$	483.3	36	
5	**Business sophistication**	**46.7**	**19**	
5.1	Knowledge workers	68.1	5	●
5.1.1	Knowledge-intensive employment, %	46.2	10	●
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.8	12	
5.1.4	GERD financed by business, %[4]	57.0	13	
5.1.5	Females employed w/advanced degrees, % total	23.2	13	
5.2	Innovation linkages	40.4	31	
5.2.1	University/industry research collaboration†	76.3	6	●
5.2.2	State of cluster development†	59.6	21	
5.2.3	GERD financed by abroad, %[4]	13.1	34	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	40	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.1	17	
5.3	Knowledge absorption	31.6	47	
5.3.1	Intellectual property payments, % total trade	0.8	40	
5.3.2	High-tech imports less re-imports, % total trade	9.5	39	
5.3.3	ICT services imports, % total trade	1.9	22	
5.3.4	FDI net inflows, % GDP	(3.8)	128	○
5.3.5	Research talent, % in business enterprise	50.8	21	
6	**Knowledge & technology outputs**	**44.0**	**17**	
6.1	Knowledge creation	45.3	18	
6.1.1	Patents by origin/bn PPP$ GDP	5.8	21	
6.1.2	PCT patent applications/bn PPP$ GDP	2.4	16	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	40.4	15	
6.1.5	Citable documents H index	547.0	13	
6.2	Knowledge impact	40.7	46	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.7	74	○
6.2.2	New businesses/th pop. 15–64[4]	2.1	47	
6.2.3	Computer software spending, % GDP	0.7	5	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	7.6	45	
6.2.5	High- & medium-high-tech manufactures, %	34.4	32	
6.3	Knowledge diffusion	45.9	15	
6.3.1	Intellectual property receipts, % total trade	0.7	17	
6.3.2	High-tech exports less re-exports, % total trade	10.0	19	
6.3.3	ICT services exports, % total trade	2.6	36	
6.3.4	FDI net outflows, % GDP	4.9	10	●
7	**Creative outputs**	**47.5**	**20**	
7.1	Intangible assets	49.2	39	
7.1.1	Trademarks by origin/bn PPP$ GDP	42.7	54	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.8	43	
7.1.3	ICTs & business model creation†	73.4	20	
7.1.4	ICTs & organizational model creation†	68.0	21	
7.2	Creative goods & services	44.8	11	●
7.2.1	Cultural & creative services exports, % of total trade[4]	1.4	5	●
7.2.2	National feature films/mn pop. 15–69	8.9	15	
7.2.3	Global ent. & media market/th pop. 15–69	51.1	15	
7.2.4	Printing & publishing manufactures, %	1.5	34	
7.2.5	Creative goods exports, % total trade	1.6	32	
7.3	Online creativity	46.6	18	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	23.7	26	
7.3.2	Country-code TLDs/th pop. 15–69	69.1	12	
7.3.3	Wikipedia edits/mn pop. 15–69	6,650.7	17	
7.3.4	Video uploads on YouTube/pop. 15–69	44.6	25	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Benin

Key indicators

Population (millions)	10.9
GDP (US$ billions)	8.5
GDP per capita, PPP$	2,113.2
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**22.2**	**121**	
Innovation Output Sub-Index		13.3	121	
Innovation Input Sub-Index		31.2	111	
Innovation Efficiency Ratio		0.4	118	
Global Innovation Index 2015 (out of 141)		n/a	n/a	
1	**Institutions**	**53.6**	**86**	
1.1	Political environment	44.6	80	
1.1.1	Political stability & safety*	64.1	64	
1.1.2	Government effectiveness*	25.2	100	
1.2	Regulatory environment	62.8	76	
1.2.1	Regulatory quality*	32.2	100	
1.2.2	Rule of law*	33.4	94	
1.2.3	Cost of redundancy dismissal, salary weeks	11.6	42	●
1.3	Business environment	53.4	120	
1.3.1	Ease of starting a business*	82.2	86	
1.3.2	Ease of resolving insolvency*	38.1	96	
1.3.3	Ease of paying taxes*	39.9	122	○
2	**Human capital & research**	**22.4**	**96**	
2.1	Education	42.7	81	
2.1.1	Expenditure on education, % GDP	4.8	57	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	14.9	86	
2.1.3	School life expectancy, years	12.1	88	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	9.9	27	●
2.2	Tertiary education	24.5	94	
2.2.1	Tertiary enrolment, % gross	15.4	99	
2.2.2	Graduates in science & engineering, %④	12.7	92	
2.2.3	Tertiary inbound mobility, %④	7.9	20	●
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**20.0**	**124**	○
3.1	Information & communication technologies (ICTs)	15.6	124	○
3.1.1	ICT access*	30.8	109	
3.1.2	ICT use*	2.9	122	○
3.1.3	Government's online service*	11.0	121	○
3.1.4	E-participation*	17.6	115	
3.2	General infrastructure	23.7	112	
3.2.1	Electricity output, kWh/cap	16.8	118	○
3.2.2	Logistics performance*	2.6	102	
3.2.3	Gross capital formation, % GDP	22.5	58	●
3.3	Ecological sustainability	20.8	123	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	3.9	112	
3.3.2	Environmental performance*	43.7	119	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	124	○
4	**Market sophistication**	**28.8**	**124**	○
4.1	Credit	15.6	117	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	22.9	105	
4.1.3	Microfinance gross loans, % GDP	0.8	33	●
4.2	Investment	40.0	49	
4.2.1	Ease of protecting minority investors*	40.0	112	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	30.7	125	○
4.3.1	Applied tariff rate, weighted mean, %	15.6	126	○
4.3.2	Intensity of local competition†	65.7	79	
4.3.3	Domestic market scale, bn PPP$	19.9	116	
5	**Business sophistication**	**31.0**	**68**	
5.1	Knowledge workers	31.1	88	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms④	27.0	64	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	36.2	45	
5.2.1	University/industry research collaboration†	27.9	115	
5.2.2	State of cluster development†	40.4	87	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	25.6	81	
5.3.1	Intellectual property payments, % total trade④	0.2	85	
5.3.2	High-tech imports less re-imports, % total trade	4.4	106	
5.3.3	ICT services imports, % total trade④	1.9	19	●
5.3.4	FDI net inflows, % GDP	3.9	41	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**10.8**	**121**	
6.1	Knowledge creation	6.5	81	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	85	
6.1.2	PCT patent applications/bn PPP$ GDP④	0.1	79	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	13.6	52	●
6.1.5	Citable documents H index	59.0	108	
6.2	Knowledge impact	4.8	120	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.3	82	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	21.2	86	
6.3.1	Intellectual property receipts, % total trade④	0.0	102	○
6.3.2	High-tech exports less re-exports, % total trade	0.1	103	
6.3.3	ICT services exports, % total trade④	2.6	34	●
6.3.4	FDI net outflows, % GDP④	0.5	59	
7	**Creative outputs**	**15.8**	**115**	
7.1	Intangible assets	31.4	104	
7.1.1	Trademarks by origin/bn PPP$ GDP	10.2	97	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	46.9	107	
7.1.4	ICTs & organizational model creation†	42.1	103	
7.2	Creative goods & services	0.3	[128]	
7.2.1	Cultural & creative services exports, % of total trade④	0.0	73	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	118	
7.3	Online creativity	0.3	114	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	105	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	122	○
7.3.3	Wikipedia edits/mn pop. 15–69	19.6	120	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bhutan

Key indicators

Population (millions)	0.8
GDP (US$ billions)	2.2
GDP per capita, PPP$	8,200.7
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.9**	**96**	
Innovation Output Sub-Index		12.3	122	
Innovation Input Sub-Index		43.5	54	
Innovation Efficiency Ratio		0.3	128	○
Global Innovation Index 2015 (out of 141)		26.1	121	
1	**Institutions**	**64.2**	**60**	
1.1	Political environment	67.1	42	
1.1.1	Political stability & safety*	87.6	21	●
1.1.2	Government effectiveness*	46.6	56	
1.2	Regulatory environment	68.6	56	
1.2.1	Regulatory quality*	19.7	121	
1.2.2	Rule of law*	55.8	47	
1.2.3	Cost of redundancy dismissal, salary weeks	8.3	18	●
1.3	Business environment	57.0	107	
1.3.1	Ease of starting a business*	85.6	70	
1.3.2	Ease of resolving insolvency*	0.0	127	○
1.3.3	Ease of paying taxes*	85.5	25	●
2	**Human capital & research**	**30.9**	**69**	
2.1	Education	54.7	41	
2.1.1	Expenditure on education, % GDP	6.0	26	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	36.4	11	●
2.1.3	School life expectancy, years	12.5	83	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	14.3	59	
2.2	Tertiary education	38.1	51	
2.2.1	Tertiary enrolment, % gross	10.9	102	
2.2.2	Graduates in science & engineering, %	26.8	19	●
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**47.8**	**49**	
3.1	Information & communication technologies (ICTs)	29.5	100	
3.1.1	ICT access*	35.7	102	
3.1.2	ICT use*	22.7	90	
3.1.3	Government's online service*	24.4	106	
3.1.4	E-participation*	35.3	85	
3.2	General infrastructure	68.5	3	●
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.3	120	○
3.2.3	Gross capital formation, % GDP	55.9	1	●
3.3	Ecological sustainability	45.4	51	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	65.0	93	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	68	
4	**Market sophistication**	**42.2**	**74**	
4.1	Credit	55.3	16	●
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	43.8	75	
4.1.3	Microfinance gross loans, % GDP	8.2	1	●
4.2	Investment	46.7	27	
4.2.1	Ease of protecting minority investors*	46.7	92	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	24.5	128	○
4.3.1	Applied tariff rate, weighted mean, %[4]	10.0	119	
4.3.2	Intensity of local competition†	60.4	97	
4.3.3	Domestic market scale, bn PPP$	5.9	128	○
5	**Business sophistication**	**32.1**	**58**	
5.1	Knowledge workers	21.7	106	
5.1.1	Knowledge-intensive employment, %	14.8	88	
5.1.2	Firms offering formal training, % firms	26.0	67	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[4]	1.1	84	○
5.2	Innovation linkages	37.3	41	
5.2.1	University/industry research collaboration†	28.1	114	
5.2.2	State of cluster development†	42.0	79	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	37.4	29	
5.3.1	Intellectual property payments, % total trade	0.1	100	
5.3.2	High-tech imports less re-imports, % total trade[4]	3.3	115	
5.3.3	ICT services imports, % total trade	5.5	1	●
5.3.4	FDI net inflows, % GDP	0.4	116	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**2.0**	**128**	○
6.1	Knowledge creation	3.5	106	
6.1.1	Patents by origin/bn PPP$ GDP[4]	0.6	72	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.5	92	
6.1.5	Citable documents H index	23.0	128	○
6.2	Knowledge impact	1.4	[126]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	0.1	104	○
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.2	103	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	0.9	128	○
6.3.1	Intellectual property receipts, % total trade	0.0	98	
6.3.2	High-tech exports less re-exports, % total trade[4]	0.0	118	○
6.3.3	ICT services exports, % total trade	0.3	109	
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**22.6**	**93**	
7.1	Intangible assets	27.8	116	
7.1.1	Trademarks by origin/bn PPP$ GDP[4]	2.9	107	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	44.7	112	
7.1.4	ICTs & organizational model creation†	37.7	113	
7.2	Creative goods & services	33.6	34	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[4]	58.6	1	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade[4]	0.0	116	
7.3	Online creativity	1.5	100	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.4	73	
7.3.2	Country-code TLDs/th pop. 15–69	0.7	83	
7.3.3	Wikipedia edits/mn pop. 15–69	178.9	103	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bolivia, Plurinational State of

Key indicators

Population (millions)	10.7
GDP (US$ billions)	33.2
GDP per capita, PPP$	6,465.3
Income group	Lower-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**25.2**	**109**	
Innovation Output Sub-Index		18.8	102	
Innovation Input Sub-Index		31.7	108	
Innovation Efficiency Ratio		0.6	89	
Global Innovation Index 2015 (out of 141)		28.6	104	
1	**Institutions**	**29.2**	**127**	○
1.1	Political environment	38.2	95	
1.1.1	Political stability & safety*	53.9	85	
1.1.2	Government effectiveness*	22.6	103	
1.2	Regulatory environment	10.9	127	○
1.2.1	Regulatory quality*	23.4	116	
1.2.2	Rule of law*	20.3	124	○
1.2.3	Cost of redundancy dismissal, salary weeks[d]	82.3	126	○
1.3	Business environment	38.4	127	○
1.3.1	Ease of starting a business*	59.7	126	○
1.3.2	Ease of resolving insolvency*	43.3	82	
1.3.3	Ease of paying taxes*	12.2	128	○
2	**Human capital & research**	**29.3**	**77**	
2.1	Education	52.5	47	●
2.1.1	Expenditure on education, % GDP	7.0	10	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	20.3	53	●
2.1.3	School life expectancy, years[d]	14.0	61	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	18.2	78	
2.2	Tertiary education	34.4	66	
2.2.1	Tertiary enrolment, % gross[d]	38.4	69	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	1.1	100	
2.3.1	Researchers, FTE/mn pop.[d]	166.0	74	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.2	94	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**32.2**	**101**	
3.1	Information & communication technologies (ICTs)	36.7	89	
3.1.1	ICT access*	43.1	91	
3.1.2	ICT use*	23.3	89	
3.1.3	Government's online service*	39.4	81	
3.1.4	E-participation*	41.2	77	
3.2	General infrastructure	21.5	120	○
3.2.1	Electricity output, kWh/cap	755.7	97	
3.2.2	Logistics performance*	2.5	110	
3.2.3	Gross capital formation, % GDP	20.3	81	
3.3	Ecological sustainability	38.3	85	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	75	
3.3.2	Environmental performance*	71.1	69	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.7	71	
4	**Market sophistication**	**42.4**	**70**	
4.1	Credit	51.2	21	●
4.1.1	Ease of getting credit*	35.0	101	
4.1.2	Domestic credit to private sector, % GDP	50.3	64	
4.1.3	Microfinance gross loans, % GDP	16.4	1	●
4.2	Investment	22.6	126	○
4.2.1	Ease of protecting minority investors*	41.7	109	
4.2.2	Market capitalization, % GDP[d]	16.4	70	
4.2.3	Total value of stocks traded, % GDP[d]	0.1	79	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	53.3	93	
4.3.1	Applied tariff rate, weighted mean, %	4.2	76	
4.3.2	Intensity of local competition†	54.4	116	○
4.3.3	Domestic market scale, bn PPP$	70.3	85	
5	**Business sophistication**	**25.2**	**98**	
5.1	Knowledge workers	39.1	59	●
5.1.1	Knowledge-intensive employment, %[d]	15.3	85	
5.1.2	Firms offering formal training, % firms[d]	57.1	13	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	5.2	78	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	19.9	111	
5.2.1	University/industry research collaboration†	42.3	70	
5.2.2	State of cluster development†	35.4	102	
5.2.3	GERD financed by abroad, %[d]	1.9	79	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	75	
5.3	Knowledge absorption	16.7	119	
5.3.1	Intellectual property payments, % total trade	0.5	54	●
5.3.2	High-tech imports less re-imports, % total trade	9.4	42	●
5.3.3	ICT services imports, % total trade	0.6	83	
5.3.4	FDI net inflows, % GDP	0.2	120	○
5.3.5	Research talent, % in business enterprise[d]	0.4	80	○
6	**Knowledge & technology outputs**	**17.6**	**102**	
6.1	Knowledge creation	3.0	112	
6.1.1	Patents by origin/bn PPP$ GDP	0.1	101	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.2	45	
6.1.4	Scientific & technical articles/bn PPP$ GDP	3.1	107	
6.1.5	Citable documents H index	78.0	92	
6.2	Knowledge impact	32.5	81	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.1	25	●
6.2.2	New businesses/th pop. 15–64	0.6	85	
6.2.3	Computer software spending, % GDP	0.2	66	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.9	77	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	17.2	111	
6.3.1	Intellectual property receipts, % total trade	0.1	42	●
6.3.2	High-tech exports less re-exports, % total trade	0.3	92	
6.3.3	ICT services exports, % total trade	0.7	87	
6.3.4	FDI net outflows, % GDP[d]	0.0	94	
7	**Creative outputs**	**20.1**	**102**	
7.1	Intangible assets	31.1	105	
7.1.1	Trademarks by origin/bn PPP$ GDP	35.1	63	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.4	86	
7.1.3	ICTs & business model creation†	46.5	108	
7.1.4	ICTs & organizational model creation†	42.3	100	
7.2	Creative goods & services	15.8	79	
7.2.1	Cultural & creative services exports, % of total trade	0.0	59	
7.2.2	National feature films/mn pop. 15–69[d]	4.2	38	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.7	49	●
7.3	Online creativity	2.3	96	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.0	81	
7.3.2	Country-code TLDs/th pop. 15–69	0.6	89	
7.3.3	Wikipedia edits/mn pop. 15–69	590.5	87	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bosnia and Herzegovina

Key indicators

Population (millions)	3.8
GDP (US$ billions)	15.8
GDP per capita, PPP$	10,491.8
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.6**	**87**	
Innovation Output Sub-Index		18.7	104	
Innovation Input Sub-Index		40.5	70	
Innovation Efficiency Ratio		0.5	115	○
Global Innovation Index 2015 (out of 141)		32.3	79	
1	**Institutions**	**58.7**	**69**	
1.1	Political environment	43.7	87	
1.1.1	Political stability & safety*	61.3	71	
1.1.2	Government effectiveness*	26.1	95	
1.2	Regulatory environment	69.9	49	
1.2.1	Regulatory quality*	42.5	77	
1.2.2	Rule of law*	42.0	72	
1.2.3	Cost of redundancy dismissal, salary weeks	9.2	27	●
1.3	Business environment	62.5	86	
1.3.1	Ease of starting a business*	63.5	124	○
1.3.2	Ease of resolving insolvency*	66.4	35	●
1.3.3	Ease of paying taxes*	57.6	106	
2	**Human capital & research**	**41.0**	**39**	●
2.1	Education	90.0	[1]	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	10.6	32	●
2.2	Tertiary education	31.1	80	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	15.4	84	
2.2.3	Tertiary inbound mobility, %	7.3	22	●
2.3	Research & development (R&D)	2.0	92	
2.3.1	Researchers, FTE/mn pop.	266.6	67	
2.3.2	Gross expenditure on R&D, % GDP	0.3	80	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**33.0**	**97**	
3.1	Information & communication technologies (ICTs)	36.6	90	
3.1.1	ICT access*	57.1	69	
3.1.2	ICT use*	37.4	67	
3.1.3	Government's online service*	28.3	103	
3.1.4	E-participation*	23.5	108	
3.2	General infrastructure	27.3	96	
3.2.1	Electricity output, kWh/cap	4,556.4	45	
3.2.2	Logistics performance*	2.7	78	
3.2.3	Gross capital formation, % GDP	17.6	103	
3.3	Ecological sustainability	35.2	95	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.4	104	○
3.3.2	Environmental performance*	63.3	99	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.9	24	●
4	**Market sophistication**	**42.8**	**67**	
4.1	Credit	34.3	59	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	54.8	57	
4.1.3	Microfinance gross loans, % GDP	1.4	27	●
4.2	Investment	39.5	52	
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP◴	12.4	75	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	54.6	88	
4.3.1	Applied tariff rate, weighted mean, %	1.5	45	
4.3.2	Intensity of local competition†	56.6	110	○
4.3.3	Domestic market scale, bn PPP$	38.3	97	
5	**Business sophistication**	**27.1**	**88**	
5.1	Knowledge workers	38.4	64	
5.1.1	Knowledge-intensive employment, %	24.9	54	
5.1.2	Firms offering formal training, % firms	52.4	20	●
5.1.3	GERD performed by business, % of GDP	0.1	66	
5.1.4	GERD financed by business, %	24.2	59	
5.1.5	Females employed w/advanced degrees, % total	9.5	65	
5.2	Innovation linkages	25.4	83	
5.2.1	University/industry research collaboration†	55.3	34	●
5.2.2	State of cluster development†	32.7	111	○
5.2.3	GERD financed by abroad, %	12.1	43	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	88	
5.3	Knowledge absorption	17.5	117	○
5.3.1	Intellectual property payments, % total trade	0.1	98	
5.3.2	High-tech imports less re-imports, % total trade	6.8	70	
5.3.3	ICT services imports, % total trade	0.8	71	
5.3.4	FDI net inflows, % GDP	2.7	66	
5.3.5	Research talent, % in business enterprise	5.7	70	
6	**Knowledge & technology outputs**	**17.8**	**99**	
6.1	Knowledge creation	6.3	82	
6.1.1	Patents by origin/bn PPP$ GDP	1.1	64	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	61	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	9.9	65	
6.1.5	Citable documents H index	55.0	111	
6.2	Knowledge impact	28.4	97	
6.2.1	Growth rate of PPP$ GDP/worker, %	(2.0)	106	○
6.2.2	New businesses/th pop. 15–64	0.8	78	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	22.1	17	●
6.2.5	High- & medium-high-tech manufactures, %◴	11.1	74	
6.3	Knowledge diffusion	18.6	105	
6.3.1	Intellectual property receipts, % total trade	0.2	39	
6.3.2	High-tech exports less re-exports, % total trade	1.1	63	
6.3.3	ICT services exports, % total trade	1.0	77	
6.3.4	FDI net outflows, % GDP	(0.0)	100	
7	**Creative outputs**	**19.6**	**103**	
7.1	Intangible assets	25.9	120	○
7.1.1	Trademarks by origin/bn PPP$ GDP	14.9	87	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.7	54	
7.1.3	ICTs & business model creation†	43.6	114	○
7.1.4	ICTs & organizational model creation†	35.0	118	○
7.2	Creative goods & services	13.4	84	
7.2.1	Cultural & creative services exports, % of total trade	0.0	77	○
7.2.2	National feature films/mn pop. 15–69	3.8	42	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %◴	1.1	60	
7.2.5	Creative goods exports, % total trade	0.3	68	
7.3	Online creativity	13.3	52	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.5	72	
7.3.2	Country-code TLDs/th pop. 15–69	2.1	67	
7.3.3	Wikipedia edits/mn pop. 15–69	3,913.2	34	●
7.3.4	Video uploads on YouTube/pop. 15–69	19.6	52	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Botswana

Key indicators

Population (millions)	2.3
GDP (US$ billions)	12.9
GDP per capita, PPP$	16,368.2
Income group	Upper-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.0**	**90**	
Innovation Output Sub-Index		17.0	111	
Innovation Input Sub-Index		40.9	69	
Innovation Efficiency Ratio		0.4	119	○
Global Innovation Index 2015 (out of 141)		30.5	90	
1	**Institutions**	**68.3**	**49**	
1.1	Political environment	68.1	40	●
1.1.1	Political stability & safety*	88.3	16	●
1.1.2	Government effectiveness*	48.0	52	
1.2	Regulatory environment	67.3	63	
1.2.1	Regulatory quality*	60.6	44	
1.2.2	Rule of law*	62.9	40	●
1.2.3	Cost of redundancy dismissal, salary weeks	21.7	94	
1.3	Business environment	69.4	67	
1.3.1	Ease of starting a business*	76.2	107	
1.3.2	Ease of resolving insolvency*	54.7	53	
1.3.3	Ease of paying taxes*	77.5	58	
2	**Human capital & research**	**32.6**	**58**	
2.1	Education	71.9	7	●
2.1.1	Expenditure on education, % GDP[4]	9.6	1	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	42.1	4	●
2.1.3	School life expectancy, years	13.1	74	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[4]	11.2	35	●
2.2	Tertiary education	24.3	96	
2.2.1	Tertiary enrolment, % gross	27.5	82	
2.2.2	Graduates in science & engineering, %	17.5	70	
2.2.3	Tertiary inbound mobility, %	1.6	73	
2.3	Research & development (R&D)	1.7	94	
2.3.1	Researchers, FTE/mn pop.[4]	164.9	75	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.3	81	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**37.0**	**89**	
3.1	Information & communication technologies (ICTs)	32.0	96	
3.1.1	ICT access*	42.2	93	
3.1.2	ICT use*	23.7	87	
3.1.3	Government's online service*	30.7	97	
3.1.4	E-participation*	31.4	97	
3.2	General infrastructure	32.9	68	
3.2.1	Electricity output, kWh/cap	431.2	105	○
3.2.2	Logistics performance*	2.5	109	○
3.2.3	Gross capital formation, % GDP	32.8	11	●
3.3	Ecological sustainability	45.9	50	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.5	17	●
3.3.2	Environmental performance*	70.7	72	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	95	
4	**Market sophistication**	**42.8**	**66**	
4.1	Credit	33.1	65	
4.1.1	Ease of getting credit*	55.0	63	
4.1.2	Domestic credit to private sector, % GDP	31.9	90	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	36.9	63	
4.2.1	Ease of protecting minority investors*	55.0	72	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP[4]	0.8	60	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	58.5	73	
4.3.1	Applied tariff rate, weighted mean, %	0.5	4	●
4.3.2	Intensity of local competition†	67.2	70	
4.3.3	Domestic market scale, bn PPP$	35.9	99	
5	**Business sophistication**	**23.9**	**105**	
5.1	Knowledge workers	31.3	87	
5.1.1	Knowledge-intensive employment, %[4]	17.9	77	
5.1.2	Firms offering formal training, % firms[4]	51.9	21	●
5.1.3	GERD performed by business, % of GDP[4]	0.0	74	
5.1.4	GERD financed by business, %[4]	5.8	76	
5.1.5	Females employed w/advanced degrees, % total[4]	9.2	66	
5.2	Innovation linkages	26.1	79	
5.2.1	University/industry research collaboration†	35.7	96	
5.2.2	State of cluster development†	38.6	93	
5.2.3	GERD financed by abroad, %[4]	6.8	57	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	14.4	124	○
5.3.1	Intellectual property payments, % total trade[4]	0.1	90	
5.3.2	High-tech imports less re-imports, % total trade	3.5	111	○
5.3.3	ICT services imports, % total trade[4]	0.6	91	
5.3.4	FDI net inflows, % GDP	2.5	68	
5.3.5	Research talent, % in business enterprise[4]	10.5	66	
6	**Knowledge & technology outputs**	**18.6**	**93**	
6.1	Knowledge creation	2.6	118	○
6.1.1	Patents by origin/bn PPP$ GDP	0.1	103	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.0	61	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.5	93	
6.1.5	Citable documents H index	71.0	97	
6.2	Knowledge impact	38.5	54	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	13.1	8	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.5	120	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	14.8	119	○
6.3.1	Intellectual property receipts, % total trade[4]	0.0	95	○
6.3.2	High-tech exports less re-exports, % total trade	0.2	94	
6.3.3	ICT services exports, % total trade[4]	0.2	110	○
6.3.4	FDI net outflows, % GDP[4]	(0.0)	97	
7	**Creative outputs**	**15.3**	**118**	○
7.1	Intangible assets	26.9	118	○
7.1.1	Trademarks by origin/bn PPP$ GDP	10.0	98	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	89	
7.1.3	ICTs & business model creation†	48.2	101	
7.1.4	ICTs & organizational model creation†	40.1	108	
7.2	Creative goods & services	6.1	105	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.2	80	
7.3	Online creativity	1.5	99	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.2	93	
7.3.2	Country-code TLDs/th pop. 15–69	1.7	70	
7.3.3	Wikipedia edits/mn pop. 15–69	240.5	99	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Brazil

Key indicators

Population (millions)	207.8
GDP (US$ billions)	1,772.6
GDP per capita, PPP$	15,614.5
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.2**	**69**	
Innovation Output Sub-Index		23.7	79	
Innovation Input Sub-Index		42.7	58	
Innovation Efficiency Ratio		0.6	100	○
Global Innovation Index 2015 (out of 141)		34.9	70	
1	**Institutions**	**55.3**	**78**	
1.1	Political environment	48.6	70	
1.1.1	Political stability & safety*	62.5	68	
1.1.2	Government effectiveness*	34.8	79	
1.2	Regulatory environment	64.6	73	
1.2.1	Regulatory quality*	42.9	75	
1.2.2	Rule of law*	45.1	64	
1.2.3	Cost of redundancy dismissal, salary weeks	15.4	65	
1.3	Business environment	52.6	123	○
1.3.1	Ease of starting a business*	64.3	123	○
1.3.2	Ease of resolving insolvency*	52.7	58	
1.3.3	Ease of paying taxes*	40.9	121	○
2	**Human capital & research**	**32.5**	**60**	
2.1	Education	43.8	75	
2.1.1	Expenditure on education, % GDP	5.9	28	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	22.7	46	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	402.1	53	○
2.1.5	Pupil-teacher ratio, secondary[d]	17.3	74	
2.2	Tertiary education	13.8	111	○
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %[d]	12.0	96	○
2.2.3	Tertiary inbound mobility, %[d]	0.2	98	○
2.3	Research & development (R&D)	39.9	30	●
2.3.1	Researchers, FTE/mn pop.[d]	698.1	52	
2.3.2	Gross expenditure on R&D, % GDP[d]	1.2	29	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	557.8	17	●
2.3.4	QS university ranking, average score top 3*	52.3	26	●
3	**Infrastructure**	**44.9**	**59**	
3.1	Information & communication technologies (ICTs)	61.2	42	
3.1.1	ICT access*	62.8	61	
3.1.2	ICT use*	51.6	46	
3.1.3	Government's online service*	59.8	49	
3.1.4	E-participation*	70.6	24	●
3.2	General infrastructure	28.1	91	
3.2.1	Electricity output, kWh/cap	2,851.6	65	
3.2.2	Logistics performance*	2.9	63	
3.2.3	Gross capital formation, % GDP	18.0	98	○
3.3	Ecological sustainability	45.3	52	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.8	45	
3.3.2	Environmental performance*	78.9	45	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.0	63	
4	**Market sophistication**	**43.9**	**57**	
4.1	Credit	24.0	95	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	67.1	45	
4.1.3	Microfinance gross loans, % GDP	0.1	59	
4.2	Investment	35.5	68	
4.2.1	Ease of protecting minority investors*	65.0	28	●
4.2.2	Market capitalization, % GDP	36.0	46	
4.2.3	Total value of stocks traded, % GDP	27.6	23	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	47	
4.3	Trade, competition, & market scale	72.3	28	●
4.3.1	Applied tariff rate, weighted mean, %[d]	7.8	103	○
4.3.2	Intensity of local competition†	72.9	40	
4.3.3	Domestic market scale, bn PPP$	3,275.8	7	●
5	**Business sophistication**	**37.0**	**39**	
5.1	Knowledge workers	41.6	52	
5.1.1	Knowledge-intensive employment, %	21.6	63	
5.1.2	Firms offering formal training, % firms[d]	42.2	34	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	40.3	35	
5.1.5	Females employed w/advanced degrees, % total	9.1	67	
5.2	Innovation linkages	31.5	61	
5.2.1	University/industry research collaboration†	46.7	53	
5.2.2	State of cluster development†	52.5	35	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	66	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	58	
5.3	Knowledge absorption	38.0	28	●
5.3.1	Intellectual property payments, % total trade	2.0	8	●
5.3.2	High-tech imports less re-imports, % total trade	12.3	22	●
5.3.3	ICT services imports, % total trade	1.3	43	
5.3.4	FDI net inflows, % GDP	4.1	39	
5.3.5	Research talent, % in business enterprise[d]	25.9	50	
6	**Knowledge & technology outputs**	**23.7**	**67**	
6.1	Knowledge creation	15.5	53	
6.1.1	Patents by origin/bn PPP$ GDP	1.4	56	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	52	
6.1.3	Utility models by origin/bn PPP$ GDP	0.8	29	
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.2	59	
6.1.5	Citable documents H index	379.0	23	●
6.2	Knowledge impact	34.2	75	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.3	85	○
6.2.2	New businesses/th pop. 15–64	2.9	39	
6.2.3	Computer software spending, % GDP	0.3	55	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.6	58	
6.2.5	High- & medium-high-tech manufactures, %	38.7	23	●
6.3	Knowledge diffusion	21.3	85	
6.3.1	Intellectual property receipts, % total trade	0.1	44	
6.3.2	High-tech exports less re-exports, % total trade	3.0	42	
6.3.3	ICT services exports, % total trade	0.5	95	
6.3.4	FDI net outflows, % GDP	1.1	46	
7	**Creative outputs**	**23.6**	**90**	
7.1	Intangible assets	37.0	90	
7.1.1	Trademarks by origin/bn PPP$ GDP	39.1	59	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.1	63	
7.1.3	ICTs & business model creation†	55.5	74	
7.1.4	ICTs & organizational model creation†	49.9	77	
7.2	Creative goods & services	8.8	97	
7.2.1	Cultural & creative services exports, % of total trade	0.1	46	
7.2.2	National feature films/mn pop. 15–69	0.9	78	
7.2.3	Global ent. & media market/th pop. 15–69	8.1	39	
7.2.4	Printing & publishing manufactures, %	0.8	74	○
7.2.5	Creative goods exports, % total trade	0.2	78	
7.3	Online creativity	11.7	58	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.7	89	
7.3.2	Country-code TLDs/th pop. 15–69	8.9	43	
7.3.3	Wikipedia edits/mn pop. 15–69	971.2	73	
7.3.4	Video uploads on YouTube/pop. 15–69	28.8	42	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Bulgaria

Key indicators

Population (millions)	7.1
GDP (US$ billions)	49.0
GDP per capita, PPP$	19,097.3
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**41.4**	**38**	
Innovation Output Sub-Index		37.5	35	
Innovation Input Sub-Index		45.3	49	
Innovation Efficiency Ratio		0.8	16	●
Global Innovation Index 2015 (out of 141)		42.2	39	
1	**Institutions**	**67.8**	**50**	
1.1	Political environment	53.2	59	
1.1.1	Political stability & safety*	64.9	60	
1.1.2	Government effectiveness*	41.6	65	
1.2	Regulatory environment	75.4	37	
1.2.1	Regulatory quality*	59.0	46	
1.2.2	Rule of law*	45.2	63	
1.2.3	Cost of redundancy dismissal, salary weeks	8.6	19	●
1.3	Business environment	74.7	51	
1.3.1	Ease of starting a business*	91.1	43	
1.3.2	Ease of resolving insolvency*	58.9	45	
1.3.3	Ease of paying taxes*	74.2	69	
2	**Human capital & research**	**32.1**	**65**	
2.1	Education	44.7	70	
2.1.1	Expenditure on education, % GDP	3.6	88	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	20.4	52	
2.1.3	School life expectancy, years	15.0	46	
2.1.4	PISA scales in reading, maths, & science	440.4	42	
2.1.5	Pupil-teacher ratio, secondary	13.2	50	
2.2	Tertiary education	40.2	45	
2.2.1	Tertiary enrolment, % gross	70.8	26	
2.2.2	Graduates in science & engineering, %	20.1	55	
2.2.3	Tertiary inbound mobility, %	4.0	38	
2.3	Research & development (R&D)	11.5	54	
2.3.1	Researchers, FTE/mn pop.	1,817.9	38	
2.3.2	Gross expenditure on R&D, % GDP	0.8	43	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	6.7	65	
3	**Infrastructure**	**46.7**	**55**	
3.1	Information & communication technologies (ICTs)	42.5	81	
3.1.1	ICT access*	68.5	50	
3.1.2	ICT use*	52.2	44	
3.1.3	Government's online service*	23.6	109	○
3.1.4	E-participation*	25.5	104	○
3.2	General infrastructure	38.2	58	
3.2.1	Electricity output, kWh/cap	5,924.2	31	
3.2.2	Logistics performance*	3.2	45	
3.2.3	Gross capital formation, % GDP	21.7	68	
3.3	Ecological sustainability	59.4	14	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.4	91	○
3.3.2	Environmental performance*	83.4	33	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	13.6	1	●
4	**Market sophistication**	**43.7**	**59**	
4.1	Credit	30.8	74	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	59.6	51	
4.1.3	Microfinance gross loans, % GDP	0.0	74	○
4.2	Investment	37.3	62	
4.2.1	Ease of protecting minority investors*	71.7	14	●
4.2.2	Market capitalization, % GDP	9.7	84	○
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	73	○
4.3	Trade, competition, & market scale	63.0	56	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	60.2	99	○
4.3.3	Domestic market scale, bn PPP$	129.1	69	
5	**Business sophistication**	**36.2**	**45**	
5.1	Knowledge workers	43.2	46	
5.1.1	Knowledge-intensive employment, %	31.9	43	
5.1.2	Firms offering formal training, % firms	42.7	33	
5.1.3	GERD performed by business, % of GDP	0.5	34	
5.1.4	GERD financed by business, %④	19.5	63	
5.1.5	Females employed w/advanced degrees, % total	19.4	25	
5.2	Innovation linkages	39.6	34	
5.2.1	University/industry research collaboration†	33.3	103	○
5.2.2	State of cluster development†	36.0	100	○
5.2.3	GERD financed by abroad, %④	48.3	6	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	44	
5.3	Knowledge absorption	25.8	80	
5.3.1	Intellectual property payments, % total trade	0.6	47	
5.3.2	High-tech imports less re-imports, % total trade	6.8	69	
5.3.3	ICT services imports, % total trade	0.9	65	
5.3.4	FDI net inflows, % GDP	3.5	48	
5.3.5	Research talent, % in business enterprise	26.4	49	
6	**Knowledge & technology outputs**	**32.1**	**38**	
6.1	Knowledge creation	19.2	46	
6.1.1	Patents by origin/bn PPP$ GDP	1.9	48	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	40	
6.1.3	Utility models by origin/bn PPP$ GDP	1.7	16	
6.1.4	Scientific & technical articles/bn PPP$ GDP	14.7	49	
6.1.5	Citable documents H index	167.0	46	
6.2	Knowledge impact	51.4	16	●
6.2.1	Growth rate of PPP$ GDP/worker, %	1.3	55	
6.2.2	New businesses/th pop. 15–64	8.9	13	●
6.2.3	Computer software spending, % GDP	0.3	43	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	44.4	3	●
6.2.5	High- & medium-high-tech manufactures, %	19.1	61	
6.3	Knowledge diffusion	25.7	60	
6.3.1	Intellectual property receipts, % total trade	0.1	54	
6.3.2	High-tech exports less re-exports, % total trade	3.0	43	
6.3.3	ICT services exports, % total trade	2.3	41	
6.3.4	FDI net outflows, % GDP	1.4	38	
7	**Creative outputs**	**43.0**	**29**	
7.1	Intangible assets	61.9	11	●
7.1.1	Trademarks by origin/bn PPP$ GDP	119.9	7	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	14.7	7	●
7.1.3	ICTs & business model creation†	56.4	72	
7.1.4	ICTs & organizational model creation†	54.0	62	
7.2	Creative goods & services	25.3	54	
7.2.1	Cultural & creative services exports, % of total trade④	0.8	16	●
7.2.2	National feature films/mn pop. 15–69	2.8	49	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.2	55	
7.2.5	Creative goods exports, % total trade	0.8	48	
7.3	Online creativity	22.7	37	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	23.6	27	●
7.3.2	Country-code TLDs/th pop. 15–69	2.4	66	
7.3.3	Wikipedia edits/mn pop. 15–69	4,772.6	28	
7.3.4	Video uploads on YouTube/pop. 15–69	29.5	40	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Burkina Faso

Key indicators

Population (millions)	18.1
GDP (US$ billions)	11.0
GDP per capita, PPP$	1,723.6
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**21.0**	**122**	○
Innovation Output Sub-Index		9.3	127	○
Innovation Input Sub-Index		32.8	105	
Innovation Efficiency Ratio		0.3	127	○
Global Innovation Index 2015 (out of 141)		28.7	102	
1	**Institutions**	**53.2**	**89**	
1.1	Political environment	33.4	105	
1.1.1	Political stability & safety*	43.3	101	
1.1.2	Government effectiveness*	23.5	102	
1.2	Regulatory environment	65.1	71	
1.2.1	Regulatory quality*	36.4	88	
1.2.2	Rule of law*	33.8	92	
1.2.3	Cost of redundancy dismissal, salary weeks	10.5	36	●
1.3	Business environment	61.0	93	
1.3.1	Ease of starting a business*	86.7	59	●
1.3.2	Ease of resolving insolvency*	38.1	96	
1.3.3	Ease of paying taxes*	58.1	105	
2	**Human capital & research**	**16.1**	**110**	
2.1	Education	26.3	117	
2.1.1	Expenditure on education, % GDP	4.5	67	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	15.2	82	
2.1.3	School life expectancy, years	7.7	116	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	27.1	99	
2.2	Tertiary education	20.9	102	
2.2.1	Tertiary enrolment, % gross	4.8	114	
2.2.2	Graduates in science & engineering, %	17.6	69	
2.2.3	Tertiary inbound mobility, %	2.9	52	●
2.3	Research & development (R&D)	1.0	105	
2.3.1	Researchers, FTE/mn pop.[d]	47.5	86	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.2	87	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**23.5**	**120**	
3.1	Information & communication technologies (ICTs)	19.1	115	
3.1.1	ICT access*	26.3	115	
3.1.2	ICT use*	6.3	112	
3.1.3	Government's online service*	29.9	101	
3.1.4	E-participation*	13.7	120	○
3.2	General infrastructure	22.1	117	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.6	93	
3.2.3	Gross capital formation, % GDP	13.8	116	
3.3	Ecological sustainability	29.3	115	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	43.7	118	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	119	
4	**Market sophistication**	**29.3**	**122**	○
4.1	Credit	18.9	109	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	28.0	97	
4.1.3	Microfinance gross loans, % GDP	1.4	28	●
4.2	Investment	31.6	87	
4.2.1	Ease of protecting minority investors*	41.7	109	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	40	●
4.3	Trade, competition, & market scale	37.5	122	○
4.3.1	Applied tariff rate, weighted mean, %	8.4	107	
4.3.2	Intensity of local competition†	n/a	n/a	
4.3.3	Domestic market scale, bn PPP$	29.4	107	
5	**Business sophistication**	**41.9**	**28**	●
5.1	Knowledge workers	23.9	101	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	24.8	73	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	11.9	69	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	76.3	[1]	
5.2.1	University/industry research collaboration†	n/a	n/a	
5.2.2	State of cluster development†	n/a	n/a	
5.2.3	GERD financed by abroad, %[d]	59.6	2	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	25.5	83	
5.3.1	Intellectual property payments, % total trade[d]	0.0	112	○
5.3.2	High-tech imports less re-imports, % total trade	4.2	108	
5.3.3	ICT services imports, % total trade[d]	2.4	11	●
5.3.4	FDI net inflows, % GDP	2.7	65	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.4**	**105**	
6.1	Knowledge creation	5.5	92	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	95	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP[d]	0.1	47	
6.1.4	Scientific & technical articles/bn PPP$ GDP	11.3	61	●
6.1.5	Citable documents H index	77.0	93	
6.2	Knowledge impact	28.1	101	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.5	77	
6.2.2	New businesses/th pop. 15–64[d]	0.2	97	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.5	96	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	18.7	104	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	78	
6.3.2	High-tech exports less re-exports, % total trade	0.3	85	
6.3.3	ICT services exports, % total trade[d]	1.9	52	●
6.3.4	FDI net outflows, % GDP[d]	0.0	89	
7	**Creative outputs**	**1.2**	**127**	○
7.1	Intangible assets	0.6	127	○
7.1.1	Trademarks by origin/bn PPP$ GDP	2.8	108	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.0	110	○
7.1.3	ICTs & business model creation†	n/a	n/a	
7.1.4	ICTs & organizational model creation†	n/a	n/a	
7.2	Creative goods & services	3.5	112	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	1.8	57	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	106	
7.3	Online creativity	0.0	127	○
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.1	123	○
7.3.2	Country-code TLDs/th pop. 15–69	0.0	120	
7.3.3	Wikipedia edits/mn pop. 15–69	8.7	125	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Burundi

Key indicators

Population (millions)	11.2
GDP (US$ billions)	2.9
GDP per capita, PPP$	818.5
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**20.9**	**123**	
Innovation Output Sub-Index		11.8	123	
Innovation Input Sub-Index		30.0	114	
Innovation Efficiency Ratio		0.4	122	
Global Innovation Index 2015 (out of 141)		21.0	136	
1	**Institutions**	**48.0**	**103**	
1.1	Political environment	24.6	119	
1.1.1	Political stability & safety*	40.6	105	
1.1.2	Government effectiveness*	8.6	121	
1.2	Regulatory environment	54.5	95	
1.2.1	Regulatory quality*	25.6	111	
1.2.2	Rule of law*	23.8	117	
1.2.3	Cost of redundancy dismissal, salary weeks	15.9	69	
1.3	Business environment	64.8	80	
1.3.1	Ease of starting a business*	94.5	19	●
1.3.2	Ease of resolving insolvency*	30.5	116	
1.3.3	Ease of paying taxes*	69.5	82	
2	**Human capital & research**	**14.6**	**115**	
2.1	Education	37.0	94	
2.1.1	Expenditure on education, % GDP	5.4	39	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	30.1	20	●
2.1.3	School life expectancy, years	10.6	101	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	37.2	109	
2.2	Tertiary education	6.1	119	
2.2.1	Tertiary enrolment, % gross	4.4	116	
2.2.2	Graduates in science & engineering, %	6.4	100	
2.2.3	Tertiary inbound mobility, %	1.0	80	
2.3	Research & development (R&D)	0.6	109	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	99	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**23.0**	**121**	
3.1	Information & communication technologies (ICTs)	3.7	127	○
3.1.1	ICT access*	n/a	n/a	
3.1.2	ICT use*	n/a	n/a	
3.1.3	Government's online service*	1.6	126	○
3.1.4	E-participation*	5.9	126	○
3.2	General infrastructure	21.9	118	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.6	100	
3.2.3	Gross capital formation, % GDP	14.7	115	
3.3	Ecological sustainability	43.4	59	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	43.4	120	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	n/a	n/a	
4	**Market sophistication**	**32.8**	**113**	
4.1	Credit	16.7	115	
4.1.1	Ease of getting credit*	10.0	124	
4.1.2	Domestic credit to private sector, % GDP	15.4	116	
4.1.3	Microfinance gross loans, % GDP	2.9	15	●
4.2	Investment	46.7	27	
4.2.1	Ease of protecting minority investors*	46.7	92	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	35.1	123	
4.3.1	Applied tariff rate, weighted mean, %	5.4	88	
4.3.2	Intensity of local competition†	48.6	121	
4.3.3	Domestic market scale, bn PPP$	8.4	127	○
5	**Business sophistication**	**31.8**	**62**	
5.1	Knowledge workers	37.7	67	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	32.0	52	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	32.5	57	●
5.2.1	University/industry research collaboration†	29.7	110	
5.2.2	State of cluster development†	28.9	121	
5.2.3	GERD financed by abroad, %[d]	39.9	11	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.2	53	●
5.3	Knowledge absorption	25.2	84	
5.3.1	Intellectual property payments, % total trade[d]	0.0	113	○
5.3.2	High-tech imports less re-imports, % total trade	11.2	24	●
5.3.3	ICT services imports, % total trade[d]	1.3	41	●
5.3.4	FDI net inflows, % GDP[d]	0.3	119	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**8.0**	**127**	○
6.1	Knowledge creation	2.8	117	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	3.9	105	
6.1.5	Citable documents H index	28.0	125	○
6.2	Knowledge impact	0.7	[128]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.0	128	○
6.2.5	High- & medium-high-tech manufactures, %[d]	1.8	97	
6.3	Knowledge diffusion	20.5	92	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	85	
6.3.2	High-tech exports less re-exports, % total trade	0.1	112	
6.3.3	ICT services exports, % total trade[d]	2.8	29	●
6.3.4	FDI net outflows, % GDP[d]	0.0	90	
7	**Creative outputs**	**15.6**	**116**	
7.1	Intangible assets	26.4	119	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	29.0	123	○
7.1.4	ICTs & organizational model creation†	23.9	123	○
7.2	Creative goods & services	9.7	93	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.3	33	●
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	0.8	75	
7.2.5	Creative goods exports, % total trade	0.0	111	
7.3	Online creativity	0.1	125	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.0	126	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	109	
7.3.3	Wikipedia edits/mn pop. 15–69	7.6	126	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Cambodia

Key indicators

Population (millions)	15.6
GDP (US$ billions)	18.2
GDP per capita, PPP$	3,487.5
Income group	Low income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.9**	**95**	
Innovation Output Sub-Index		20.8	95	
Innovation Input Sub-Index		35.1	94	
Innovation Efficiency Ratio		0.6	90	
Global Innovation Index 2015 (out of 141)		30.4	91	
1	**Institutions**	**51.1**	**95**	
1.1	Political environment	41.0	90	
1.1.1	Political stability & safety*	61.9	69	
1.1.2	Government effectiveness*	20.2	105	
1.2	Regulatory environment	53.4	99	
1.2.1	Regulatory quality*	34.8	96	
1.2.2	Rule of law*	24.0	116	
1.2.3	Cost of redundancy dismissal, salary weeks	19.4	82	
1.3	Business environment	58.8	102	
1.3.1	Ease of starting a business*	58.1	127	○
1.3.2	Ease of resolving insolvency*	45.1	73	
1.3.3	Ease of paying taxes*	73.1	74	
2	**Human capital & research**	**14.1**	**119**	○
2.1	Education	28.0	113	
2.1.1	Expenditure on education, % GDP[d]	2.6	107	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years[d]	10.5	102	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	28.9	102	
2.2	Tertiary education	14.2	108	
2.2.1	Tertiary enrolment, % gross[d]	15.9	95	
2.2.2	Graduates in science & engineering, %[d]	12.5	93	○
2.2.3	Tertiary inbound mobility, %[d]	0.1	105	○
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**25.2**	**116**	
3.1	Information & communication technologies (ICTs)	20.6	113	
3.1.1	ICT access*	37.7	101	
3.1.2	ICT use*	7.8	108	
3.1.3	Government's online service*	17.3	112	
3.1.4	E-participation*	19.6	112	
3.2	General infrastructure	26.1	99	
3.2.1	Electricity output, kWh/cap	117.4	114	○
3.2.2	Logistics performance*	2.7	79	
3.2.3	Gross capital formation, % GDP	22.5	59	●
3.3	Ecological sustainability	29.0	116	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.6	81	
3.3.2	Environmental performance*	51.2	112	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	112	
4	**Market sophistication**	**48.4**	**44**	●
4.1	Credit	66.7	9	●
4.1.1	Ease of getting credit*	80.0	14	●
4.1.2	Domestic credit to private sector, % GDP	54.1	59	●
4.1.3	Microfinance gross loans, % GDP	23.7	1	●
4.2	Investment	34.3	73	
4.2.1	Ease of protecting minority investors*	48.3	90	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	51	
4.3	Trade, competition, & market scale	44.3	114	
4.3.1	Applied tariff rate, weighted mean, %[d]	9.9	116	○
4.3.2	Intensity of local competition†	61.5	92	
4.3.3	Domestic market scale, bn PPP$	50.2	94	
5	**Business sophistication**	**36.5**	**42**	●
5.1	Knowledge workers	45.3	43	
5.1.1	Knowledge-intensive employment, %[d]	4.1	100	○
5.1.2	Firms offering formal training, % firms	67.9	4	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	37.0	42	●
5.2.1	University/industry research collaboration†	33.0	105	
5.2.2	State of cluster development†	45.7	61	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	24	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	27.2	69	
5.3.1	Intellectual property payments, % total trade	0.2	84	
5.3.2	High-tech imports less re-imports, % total trade[d]	4.3	107	
5.3.3	ICT services imports, % total trade	0.6	87	
5.3.4	FDI net inflows, % GDP	10.3	9	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**20.9**	**85**	
6.1	Knowledge creation	3.6	105	
6.1.1	Patents by origin/bn PPP$ GDP	0.0	113	○
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.7	98	
6.1.5	Citable documents H index	65.0	104	
6.2	Knowledge impact	42.5	36	●
6.2.1	Growth rate of PPP$ GDP/worker, %	5.2	4	●
6.2.2	New businesses/th pop. 15–64[d]	0.2	96	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.6	117	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	16.5	113	
6.3.1	Intellectual property receipts, % total trade	0.0	75	
6.3.2	High-tech exports less re-exports, % total trade[d]	0.7	66	
6.3.3	ICT services exports, % total trade	0.4	101	
6.3.4	FDI net outflows, % GDP[d]	0.3	73	
7	**Creative outputs**	**20.8**	**100**	
7.1	Intangible assets	35.7	95	
7.1.1	Trademarks by origin/bn PPP$ GDP	23.6	74	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.7	74	
7.1.3	ICTs & business model creation†	56.8	69	
7.1.4	ICTs & organizational model creation†	53.8	63	
7.2	Creative goods & services	10.9	90	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	1.4	64	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade[d]	0.4	62	●
7.3	Online creativity	0.8	106	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.9	99	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	113	
7.3.3	Wikipedia edits/mn pop. 15–69	202.6	102	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Cameroon

Key indicators

Population (millions)	23.3
GDP (US$ billions)	28.5
GDP per capita, PPP$	3,143.7
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**22.8**	**118**	
Innovation Output Sub-Index		16.8	113	
Innovation Input Sub-Index		28.9	118	
Innovation Efficiency Ratio		0.6	93	
Global Innovation Index 2015 (out of 141)		27.8	110	
1	**Institutions**	**43.0**	**120**	○
1.1	Political environment	28.9	115	
1.1.1	Political stability & safety*	39.4	112	
1.1.2	Government effectiveness*	18.5	110	
1.2	Regulatory environment	50.0	108	
1.2.1	Regulatory quality*	21.5	117	
1.2.2	Rule of law*	25.4	113	
1.2.3	Cost of redundancy dismissal, salary weeks	19.9	85	
1.3	Business environment	50.1	124	○
1.3.1	Ease of starting a business*	77.4	104	
1.3.2	Ease of resolving insolvency*	36.5	99	
1.3.3	Ease of paying taxes*	36.3	123	○
2	**Human capital & research**	**18.5**	**105**	
2.1	Education	31.2	108	
2.1.1	Expenditure on education, % GDP	3.0	99	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.7	56	●
2.1.3	School life expectancy, years[d]	10.4	103	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	20.4	85	
2.2	Tertiary education	24.3	97	
2.2.1	Tertiary enrolment, % gross[d]	11.9	101	
2.2.2	Graduates in science & engineering, %[d]	21.0	48	●
2.2.3	Tertiary inbound mobility, %[d]	1.4	76	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**23.5**	**119**	
3.1	Information & communication technologies (ICTs)	16.8	119	
3.1.1	ICT access*	28.3	111	
3.1.2	ICT use*	3.7	117	○
3.1.3	Government's online service*	19.7	111	
3.1.4	E-participation*	15.7	118	○
3.2	General infrastructure	20.8	122	○
3.2.1	Electricity output, kWh/cap	307.8	109	
3.2.2	Logistics performance*	2.3	119	○
3.2.3	Gross capital formation, % GDP	22.7	57	●
3.3	Ecological sustainability	32.9	105	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.4	64	●
3.3.2	Environmental performance*	57.1	108	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	100	
4	**Market sophistication**	**34.5**	**108**	
4.1	Credit	17.4	113	
4.1.1	Ease of getting credit*	35.0	101	
4.1.2	Domestic credit to private sector, % GDP	15.6	115	
4.1.3	Microfinance gross loans, % GDP	1.0	32	●
4.2	Investment	43.3	35	
4.2.1	Ease of protecting minority investors*	43.3	104	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	42.7	117	
4.3.1	Applied tariff rate, weighted mean, %[d]	11.7	122	○
4.3.2	Intensity of local competition†	59.8	101	
4.3.3	Domestic market scale, bn PPP$	67.8	86	
5	**Business sophistication**	**24.9**	**101**	
5.1	Knowledge workers	29.2	90	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	25.5	70	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	29.5	73	●
5.2.1	University/industry research collaboration†	39.6	78	
5.2.2	State of cluster development†	38.9	90	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	94	
5.3	Knowledge absorption	16.1	121	○
5.3.1	Intellectual property payments, % total trade[d]	0.1	97	
5.3.2	High-tech imports less re-imports, % total trade	5.9	82	
5.3.3	ICT services imports, % total trade[d]	0.5	101	
5.3.4	FDI net inflows, % GDP	1.6	90	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.0**	**113**	
6.1	Knowledge creation	6.0	88	
6.1.1	Patents by origin/bn PPP$ GDP	0.4	82	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	92	○
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	10.6	64	●
6.1.5	Citable documents H index	85.0	88	
6.2	Knowledge impact	28.0	102	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.8	41	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.2	71	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.8	108	
6.2.5	High- & medium-high-tech manufactures, %[d]	5.1	91	
6.3	Knowledge diffusion	14.0	121	○
6.3.1	Intellectual property receipts, % total trade[d]	0.0	93	
6.3.2	High-tech exports less re-exports, % total trade	0.3	88	
6.3.3	ICT services exports, % total trade[d]	1.3	72	●
6.3.4	FDI net outflows, % GDP[d]	(1.3)	113	○
7	**Creative outputs**	**17.5**	**109**	
7.1	Intangible assets	29.2	112	
7.1.1	Trademarks by origin/bn PPP$ GDP	7.3	102	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.6	75	
7.1.3	ICTs & business model creation†	51.1	91	
7.1.4	ICTs & organizational model creation†	46.2	85	
7.2	Creative goods & services	11.4	88	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.1	55	
7.2.2	National feature films/mn pop. 15–69[d]	1.8	56	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	1.3	46	●
7.2.5	Creative goods exports, % total trade	0.0	114	
7.3	Online creativity	0.2	117	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	117	
7.3.2	Country-code TLDs/th pop. 15–69	0.3	99	
7.3.3	Wikipedia edits/mn pop. 15–69	27.5	117	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Canada

Key indicators

Population (millions)	35.9
GDP (US$ billions)	1,552.4
GDP per capita, PPP$	45,552.6
Income group	High income
Region	Northern America

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**54.7**	**15**	
Innovation Output Sub-Index		44.0	23	
Innovation Input Sub-Index		65.4	10	
Innovation Efficiency Ratio		0.7	57	○
Global Innovation Index 2015 (out of 141)		55.7	16	
1	**Institutions**	**91.7**	**6**	●
1.1	Political environment	90.0	8	●
1.1.1	Political stability & safety*	92.1	8	●
1.1.2	Government effectiveness*	87.9	11	
1.2	Regulatory environment	94.1	11	
1.2.1	Regulatory quality*	90.1	6	●
1.2.2	Rule of law*	94.3	12	
1.2.3	Cost of redundancy dismissal, salary weeks	10.0	32	
1.3	Business environment	90.9	2	●
1.3.1	Ease of starting a business*	98.2	3	●
1.3.2	Ease of resolving insolvency*	81.4	15	
1.3.3	Ease of paying taxes*	93.0	9	
2	**Human capital & research**	**52.9**	**22**	
2.1	Education	42.4	82	○
2.1.1	Expenditure on education, % GDP[d]	5.3	42	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	18.3	64	○
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	522.2	8	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	n/a	n/a	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	63.5	14	
2.3.1	Researchers, FTE/mn pop.[d]	4,518.5	13	
2.3.2	Gross expenditure on R&D, % GDP	1.6	22	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	929.8	13	
2.3.4	QS university ranking, average score top 3*	85.6	4	●
3	**Infrastructure**	**62.3**	**11**	
3.1	Information & communication technologies (ICTs)	80.8	11	
3.1.1	ICT access*	81.3	21	
3.1.2	ICT use*	68.4	24	
3.1.3	Government's online service*	91.3	10	
3.1.4	E-participation*	82.4	14	
3.2	General infrastructure	64.5	4	●
3.2.1	Electricity output, kWh/cap	17,991.5	5	●
3.2.2	Logistics performance*	3.9	12	
3.2.3	Gross capital formation, % GDP	23.6	54	○
3.3	Ecological sustainability	41.7	69	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.3	94	○
3.3.2	Environmental performance*	85.1	25	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.3	54	○
4	**Market sophistication**	**73.6**	**3**	●
4.1	Credit	66.9	8	●
4.1.1	Ease of getting credit*	85.0	7	
4.1.2	Domestic credit to private sector, % GDP[d]	124.9	18	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	74.7	4	●
4.2.1	Ease of protecting minority investors*	76.7	6	●
4.2.2	Market capitalization, % GDP	117.3	7	
4.2.3	Total value of stocks traded, % GDP	75.6	10	
4.2.4	Venture capital deals/bn PPP$ GDP	0.7	1	●
4.3	Trade, competition, & market scale	79.2	9	
4.3.1	Applied tariff rate, weighted mean, %	1.5	43	
4.3.2	Intensity of local competition†	75.9	23	
4.3.3	Domestic market scale, bn PPP$	1,596.0	15	
5	**Business sophistication**	**46.5**	**20**	
5.1	Knowledge workers	53.9	26	
5.1.1	Knowledge-intensive employment, %	43.7	16	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.8	24	
5.1.4	GERD financed by business, %	45.4	27	
5.1.5	Females employed w/advanced degrees, % total	16.3	36	
5.2	Innovation linkages	44.5	21	
5.2.1	University/industry research collaboration†	65.0	18	
5.2.2	State of cluster development†	63.3	19	
5.2.3	GERD financed by abroad, %	6.0	62	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	7	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.1	18	
5.3	Knowledge absorption	41.0	21	
5.3.1	Intellectual property payments, % total trade	1.8	10	
5.3.2	High-tech imports less re-imports, % total trade	9.9	32	
5.3.3	ICT services imports, % total trade	1.1	56	○
5.3.4	FDI net inflows, % GDP	3.2	54	
5.3.5	Research talent, % in business enterprise[d]	56.0	16	
6	**Knowledge & technology outputs**	**40.9**	**23**	
6.1	Knowledge creation	43.4	19	
6.1.1	Patents by origin/bn PPP$ GDP	2.6	40	
6.1.2	PCT patent applications/bn PPP$ GDP	1.7	23	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	37.0	17	
6.1.5	Citable documents H index	794.0	5	●
6.2	Knowledge impact	43.2	35	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.8	42	
6.2.2	New businesses/th pop. 15–64	1.3	61	○
6.2.3	Computer software spending, % GDP	0.8	2	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	6.0	54	
6.2.5	High- & medium-high-tech manufactures, %	29.4	39	
6.3	Knowledge diffusion	36.2	35	
6.3.1	Intellectual property receipts, % total trade	0.7	18	
6.3.2	High-tech exports less re-exports, % total trade	6.0	29	
6.3.3	ICT services exports, % total trade	1.6	64	○
6.3.4	FDI net outflows, % GDP	3.2	19	
7	**Creative outputs**	**47.1**	**23**	
7.1	Intangible assets	50.6	33	
7.1.1	Trademarks by origin/bn PPP$ GDP	50.0	44	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.5	78	○
7.1.3	ICTs & business model creation†	74.4	18	
7.1.4	ICTs & organizational model creation†	74.0	12	
7.2	Creative goods & services	25.9	51	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.9	14	
7.2.2	National feature films/mn pop. 15–69	3.6	43	
7.2.3	Global ent. & media market/th pop. 15–69	50.9	16	
7.2.4	Printing & publishing manufactures, %	0.4	89	○
7.2.5	Creative goods exports, % total trade	0.9	40	
7.3	Online creativity	61.2	8	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	81.6	6	●
7.3.2	Country-code TLDs/th pop. 15–69	35.6	18	
7.3.3	Wikipedia edits/mn pop. 15–69	7,167.2	16	
7.3.4	Video uploads on YouTube/pop. 15–69	74.8	8	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Chile

Key indicators

Population (millions)	17.9
GDP (US$ billions)	240.2
GDP per capita, PPP$	23,459.6
Income group	High income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**38.4**	**44**	
Innovation Output Sub-Index		28.6	53	
Innovation Input Sub-Index		48.3	40	
Innovation Efficiency Ratio		0.6	91	
Global Innovation Index 2015 (out of 141)		41.2	42	
1	**Institutions**	**73.6**	**36**	
1.1	Political environment	73.0	34	
1.1.1	Political stability & safety*	75.1	43	
1.1.2	Government effectiveness*	70.8	26	
1.2	Regulatory environment	72.0	44	
1.2.1	Regulatory quality*	82.0	17	●
1.2.2	Rule of law*	82.7	22	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	106	○
1.3	Business environment	76.0	45	
1.3.1	Ease of starting a business*	89.8	52	
1.3.2	Ease of resolving insolvency*	54.2	55	
1.3.3	Ease of paying taxes*	84.0	29	
2	**Human capital & research**	**32.2**	**62**	
2.1	Education	44.4	73	
2.1.1	Expenditure on education, % GDP	4.6	66	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	15.2	84	○
2.1.3	School life expectancy, years	16.2	27	
2.1.4	PISA scales in reading, maths, & science	436.3	45	○
2.1.5	Pupil-teacher ratio, secondary[4]	21.0	86	○
2.2	Tertiary education	37.2	56	
2.2.1	Tertiary enrolment, % gross	83.8	9	●
2.2.2	Graduates in science & engineering, %[4]	19.2	61	
2.2.3	Tertiary inbound mobility, %	0.3	95	○
2.3	Research & development (R&D)	15.0	49	
2.3.1	Researchers, FTE/mn pop.	428.0	61	
2.3.2	Gross expenditure on R&D, % GDP	0.4	68	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	47.2	31	
3	**Infrastructure**	**51.7**	**38**	
3.1	Information & communication technologies (ICTs)	72.6	24	
3.1.1	ICT access*	65.5	58	
3.1.2	ICT use*	48.8	52	
3.1.3	Government's online service*	81.9	16	●
3.1.4	E-participation*	94.1	7	●
3.2	General infrastructure	38.0	61	
3.2.1	Electricity output, kWh/cap	4,296.8	48	
3.2.2	Logistics performance*	3.3	40	
3.2.3	Gross capital formation, % GDP	22.3	60	
3.3	Ecological sustainability	44.5	57	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.6	62	
3.3.2	Environmental performance*	77.7	51	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.4	40	
4	**Market sophistication**	**47.1**	**47**	
4.1	Credit	33.9	61	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	109.4	23	
4.1.3	Microfinance gross loans, % GDP	0.7	34	
4.2	Investment	35.6	67	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP	90.4	16	●
4.2.3	Total value of stocks traded, % GDP	10.5	34	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	84	○
4.3	Trade, competition, & market scale	71.9	30	
4.3.1	Applied tariff rate, weighted mean, %[4]	1.8	47	
4.3.2	Intensity of local competition†	76.2	21	●
4.3.3	Domestic market scale, bn PPP$	410.9	41	
5	**Business sophistication**	**36.6**	**41**	
5.1	Knowledge workers	44.5	45	
5.1.1	Knowledge-intensive employment, %	24.8	55	
5.1.2	Firms offering formal training, % firms[4]	57.5	12	●
5.1.3	GERD performed by business, % of GDP	0.1	58	
5.1.4	GERD financed by business, %	32.0	47	
5.1.5	Females employed w/advanced degrees, % total	15.5	38	
5.2	Innovation linkages	30.3	66	
5.2.1	University/industry research collaboration†	53.3	38	
5.2.2	State of cluster development†	44.4	67	
5.2.3	GERD financed by abroad, %	13.8	31	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	16	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	49	
5.3	Knowledge absorption	35.0	36	
5.3.1	Intellectual property payments, % total trade[4]	1.0	26	
5.3.2	High-tech imports less re-imports, % total trade	8.3	53	
5.3.3	ICT services imports, % total trade[4]	0.9	67	
5.3.4	FDI net inflows, % GDP	8.5	16	●
5.3.5	Research talent, % in business enterprise	29.8	43	
6	**Knowledge & technology outputs**	**26.0**	**59**	
6.1	Knowledge creation	11.0	59	
6.1.1	Patents by origin/bn PPP$ GDP	1.1	63	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	43	
6.1.3	Utility models by origin/bn PPP$ GDP[4]	0.2	41	
6.1.4	Scientific & technical articles/bn PPP$ GDP	17.0	43	
6.1.5	Citable documents H index	233.0	37	
6.2	Knowledge impact	38.8	52	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.3	86	○
6.2.2	New businesses/th pop. 15–64	8.0	14	●
6.2.3	Computer software spending, % GDP	0.3	44	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	11.0	35	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	28.1	45	
6.3.1	Intellectual property receipts, % total trade[4]	0.1	55	
6.3.2	High-tech exports less re-exports, % total trade	0.9	65	
6.3.3	ICT services exports, % total trade[4]	0.6	91	○
6.3.4	FDI net outflows, % GDP	4.7	11	●
7	**Creative outputs**	**31.2**	**55**	
7.1	Intangible assets	46.9	49	
7.1.1	Trademarks by origin/bn PPP$ GDP	70.4	22	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	93	○
7.1.3	ICTs & business model creation†	67.9	30	
7.1.4	ICTs & organizational model creation†	56.7	48	
7.2	Creative goods & services	8.6	99	○
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	2.4	52	
7.2.3	Global ent. & media market/th pop. 15–69	9.0	35	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.2	76	
7.3	Online creativity	22.3	38	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.3	76	
7.3.2	Country-code TLDs/th pop. 15–69	13.6	37	
7.3.3	Wikipedia edits/mn pop. 15–69	5,520.3	21	●
7.3.4	Video uploads on YouTube/pop. 15–69	32.5	37	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

China

Key indicators

Population (millions)	1,376.0
GDP (US$ billions)	10,982.8
GDP per capita, PPP$	14,107.4
Income group	Upper-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**50.6**	**25**	
Innovation Output Sub-Index		48.0	15	
Innovation Input Sub-Index		53.1	29	
Innovation Efficiency Ratio		0.9	7	
Global Innovation Index 2015 (out of 141)		47.5	29	
1	**Institutions**	**55.2**	**79**	
1.1	Political environment	49.9	66	
1.1.1	Political stability & safety*	51.3	88	
1.1.2	Government effectiveness*	48.5	49	
1.2	Regulatory environment	50.0	107	○
1.2.1	Regulatory quality*	38.1	84	
1.2.2	Rule of law*	38.8	80	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	107	○
1.3	Business environment	65.8	77	
1.3.1	Ease of starting a business*	77.5	103	
1.3.2	Ease of resolving insolvency*	55.4	52	
1.3.3	Ease of paying taxes*	64.5	92	
2	**Human capital & research**	**48.1**	**29**	
2.1	Education	72.4	4	●
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	13.8	63	
2.1.4	PISA scales in reading, maths, & science	587.5	1	●
2.1.5	Pupil-teacher ratio, secondary[d]	15.1	64	
2.2	Tertiary education	14.1	109	○
2.2.1	Tertiary enrolment, % gross	30.2	78	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	0.3	93	○
2.3	Research & development (R&D)	57.7	18	
2.3.1	Researchers, FTE/mn pop.	1,113.1	46	
2.3.2	Gross expenditure on R&D, % GDP	2.0	15	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	2,094.5	9	
2.3.4	QS university ranking, average score top 3*	84.4	7	
3	**Infrastructure**	**52.0**	**36**	
3.1	Information & communication technologies (ICTs)	54.1	53	
3.1.1	ICT access*	52.5	75	
3.1.2	ICT use*	38.4	63	
3.1.3	Government's online service*	60.6	47	
3.1.4	E-participation*	64.7	33	
3.2	General infrastructure	61.7	6	
3.2.1	Electricity output, kWh/cap	3,997.5	53	
3.2.2	Logistics performance*	3.5	27	
3.2.3	Gross capital formation, % GDP	44.3	4	●
3.3	Ecological sustainability	40.1	76	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.6	102	○
3.3.2	Environmental performance*	65.1	92	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.5	16	
4	**Market sophistication**	**56.6**	**21**	
4.1	Credit	35.3	54	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	141.9	10	
4.1.3	Microfinance gross loans, % GDP	0.0	75	○
4.2	Investment	46.6	29	
4.2.1	Ease of protecting minority investors*	43.3	104	○
4.2.2	Market capitalization, % GDP	58.0	30	
4.2.3	Total value of stocks traded, % GDP	115.5	1	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	33	
4.3	Trade, competition, & market scale	87.8	3	●
4.3.1	Applied tariff rate, weighted mean, %[d]	3.6	64	
4.3.2	Intensity of local competition†	73.5	35	
4.3.3	Domestic market scale, bn PPP$	18,088.1	1	●
5	**Business sophistication**	**53.8**	**7**	
5.1	Knowledge workers	85.8	1	●
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	79.2	1	●
5.1.3	GERD performed by business, % of GDP	1.6	13	
5.1.4	GERD financed by business, %	75.4	2	●
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	29.9	67	
5.2.1	University/industry research collaboration†	56.7	31	
5.2.2	State of cluster development†	58.8	23	
5.2.3	GERD financed by abroad, %	0.8	90	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	49	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.9	26	
5.3	Knowledge absorption	45.6	14	
5.3.1	Intellectual property payments, % total trade	1.0	30	
5.3.2	High-tech imports less re-imports, % total trade	18.5	7	
5.3.3	ICT services imports, % total trade	0.5	98	
5.3.4	FDI net inflows, % GDP	2.8	64	
5.3.5	Research talent, % in business enterprise	62.1	9	
6	**Knowledge & technology outputs**	**53.3**	**6**	
6.1	Knowledge creation	64.9	7	
6.1.1	Patents by origin/bn PPP$ GDP	44.3	1	●
6.1.2	PCT patent applications/bn PPP$ GDP	1.5	25	
6.1.3	Utility models by origin/bn PPP$ GDP	47.6	1	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	13.9	50	
6.1.5	Citable documents H index	495.0	16	
6.2	Knowledge impact	54.6	11	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.4	20	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.4	23	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	19.0	20	
6.2.5	High- & medium-high-tech manufactures, %[d]	43.1	18	
6.3	Knowledge diffusion	40.4	25	
6.3.1	Intellectual property receipts, % total trade	0.0	72	
6.3.2	High-tech exports less re-exports, % total trade	28.0	1	●
6.3.3	ICT services exports, % total trade	0.9	85	
6.3.4	FDI net outflows, % GDP[d]	1.7	36	
7	**Creative outputs**	**42.7**	**30**	
7.1	Intangible assets	68.0	3	●
7.1.1	Trademarks by origin/bn PPP$ GDP	114.8	8	
7.1.2	Industrial designs by origin/bn PPP$ GDP	30.3	1	●
7.1.3	ICTs & business model creation†	62.0	48	
7.1.4	ICTs & organizational model creation†	62.3	30	
7.2	Creative goods & services	31.9	38	
7.2.1	Cultural & creative services exports, % of total trade	0.0	71	○
7.2.2	National feature films/mn pop. 15–69	0.6	85	○
7.2.3	Global ent. & media market/th pop. 15–69	3.4	48	
7.2.4	Printing & publishing manufactures, %[d]	0.5	87	○
7.2.5	Creative goods exports, % total trade	14.7	1	●
7.3	Online creativity	3.0	92	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.3	74	
7.3.2	Country-code TLDs/th pop. 15–69	5.5	50	
7.3.3	Wikipedia edits/mn pop. 15–69	149.8	104	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Colombia

Key indicators

Population (millions)	48.2
GDP (US$ billions)	293.2
GDP per capita, PPP$	13,846.5
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**34.2**	**63**	
Innovation Output Sub-Index		24.6	74	
Innovation Input Sub-Index		43.8	53	
Innovation Efficiency Ratio		0.6	96	
Global Innovation Index 2015 (out of 141)		36.4	67	
1	**Institutions**	**58.2**	**71**	
1.1	Political environment	35.5	100	
1.1.1	Political stability & safety*	35.0	117	○
1.1.2	Government effectiveness*	36.0	75	
1.2	Regulatory environment	65.4	70	
1.2.1	Regulatory quality*	57.2	51	
1.2.2	Rule of law*	38.6	81	
1.2.3	Cost of redundancy dismissal, salary weeks	16.7	70	
1.3	Business environment	73.8	55	
1.3.1	Ease of starting a business*	86.1	65	
1.3.2	Ease of resolving insolvency*	72.1	28	
1.3.3	Ease of paying taxes*	63.3	94	
2	**Human capital & research**	**27.9**	**80**	
2.1	Education	38.9	91	
2.1.1	Expenditure on education, % GDP	4.7	61	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	17.7	68	
2.1.3	School life expectancy, years[d]	14.3	57	
2.1.4	PISA scales in reading, maths, & science	392.9	58	○
2.1.5	Pupil-teacher ratio, secondary	24.9	93	○
2.2	Tertiary education	33.4	71	
2.2.1	Tertiary enrolment, % gross	51.3	53	
2.2.2	Graduates in science & engineering, %	22.7	37	
2.2.3	Tertiary inbound mobility, %	0.0	106	○
2.3	Research & development (R&D)	11.5	55	
2.3.1	Researchers, FTE/mn pop.[d]	151.9	78	
2.3.2	Gross expenditure on R&D, % GDP	0.2	88	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	40.6	34	
3	**Infrastructure**	**52.5**	**35**	
3.1	Information & communication technologies (ICTs)	65.2	38	
3.1.1	ICT access*	55.4	72	
3.1.2	ICT use*	38.3	64	
3.1.3	Government's online service*	78.7	17	●
3.1.4	E-participation*	88.2	11	●
3.2	General infrastructure	27.8	92	
3.2.1	Electricity output, kWh/cap	1,338.7	88	
3.2.2	Logistics performance*	2.6	92	
3.2.3	Gross capital formation, % GDP	24.0	48	
3.3	Ecological sustainability	64.5	5	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	16.4	3	●
3.3.2	Environmental performance*	75.9	56	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	5.4	19	●
4	**Market sophistication**	**49.4**	**40**	
4.1	Credit	45.2	33	
4.1.1	Ease of getting credit*	95.0	2	●
4.1.2	Domestic credit to private sector, % GDP	52.7	60	
4.1.3	Microfinance gross loans, % GDP	1.7	21	
4.2	Investment	33.6	77	
4.2.1	Ease of protecting minority investors*	71.7	14	●
4.2.2	Market capitalization, % GDP	38.8	42	
4.2.3	Total value of stocks traded, % GDP	5.5	43	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	74	○
4.3	Trade, competition, & market scale	69.3	37	
4.3.1	Applied tariff rate, weighted mean, %	4.5	81	
4.3.2	Intensity of local competition†	73.9	34	
4.3.3	Domestic market scale, bn PPP$	642.5	30	
5	**Business sophistication**	**30.8**	**70**	
5.1	Knowledge workers	42.1	49	
5.1.1	Knowledge-intensive employment, %[d]	16.8	83	
5.1.2	Firms offering formal training, % firms[d]	65.2	6	●
5.1.3	GERD performed by business, % of GDP	0.1	67	
5.1.4	GERD financed by business, %	30.5	50	
5.1.5	Females employed w/advanced degrees, % total[d]	13.2	46	
5.2	Innovation linkages	21.3	107	○
5.2.1	University/industry research collaboration†	48.8	48	
5.2.2	State of cluster development†	44.9	62	
5.2.3	GERD financed by abroad, %	3.2	73	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	73	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	69	
5.3	Knowledge absorption	29.1	61	
5.3.1	Intellectual property payments, % total trade	0.7	42	
5.3.2	High-tech imports less re-imports, % total trade	16.2	10	●
5.3.3	ICT services imports, % total trade	0.8	74	
5.3.4	FDI net inflows, % GDP	4.3	36	
5.3.5	Research talent, % in business enterprise[d]	0.8	78	○
6	**Knowledge & technology outputs**	**21.2**	**82**	
6.1	Knowledge creation	6.0	87	
6.1.1	Patents by origin/bn PPP$ GDP	0.4	81	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	56	
6.1.3	Utility models by origin/bn PPP$ GDP	0.3	40	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.5	91	
6.1.5	Citable documents H index	169.0	45	
6.2	Knowledge impact	38.8	51	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.3	34	
6.2.2	New businesses/th pop. 15–64[d]	2.0	48	
6.2.3	Computer software spending, % GDP	0.2	58	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	22.6	16	●
6.2.5	High- & medium-high-tech manufactures, %	20.0	58	
6.3	Knowledge diffusion	18.8	103	
6.3.1	Intellectual property receipts, % total trade	0.1	56	
6.3.2	High-tech exports less re-exports, % total trade	1.1	64	
6.3.3	ICT services exports, % total trade	0.3	107	○
6.3.4	FDI net outflows, % GDP	1.0	48	
7	**Creative outputs**	**27.9**	**68**	
7.1	Intangible assets	39.1	79	
7.1.1	Trademarks by origin/bn PPP$ GDP	31.0	65	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.4	83	
7.1.3	ICTs & business model creation†	60.7	55	
7.1.4	ICTs & organizational model creation†	58.2	42	
7.2	Creative goods & services	18.4	73	
7.2.1	Cultural & creative services exports, % of total trade	0.1	53	
7.2.2	National feature films/mn pop. 15–69	0.8	81	
7.2.3	Global ent. & media market/th pop. 15–69	4.3	47	
7.2.4	Printing & publishing manufactures, %	2.2	19	●
7.2.5	Creative goods exports, % total trade	0.2	75	
7.3	Online creativity	15.2	48	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.1	64	
7.3.2	Country-code TLDs/th pop. 15–69	21.0	29	
7.3.3	Wikipedia edits/mn pop. 15–69	2,259.6	49	
7.3.4	Video uploads on YouTube/pop. 15–69	20.0	51	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Costa Rica

Key indicators

Population (millions)	4.8
GDP (US$ billions)	52.9
GDP per capita, PPP$	15,482.3
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**38.4**	**45**	
Innovation Output Sub-Index		31.9	44	
Innovation Input Sub-Index		44.9	50	
Innovation Efficiency Ratio		0.7	50	
Global Innovation Index 2015 (out of 141)		38.6	51	
1	**Institutions**	**66.7**	**53**	
1.1	Political environment	64.3	44	
1.1.1	Political stability & safety*	78.5	37	
1.1.2	Government effectiveness*	50.1	45	
1.2	Regulatory environment	68.8	55	
1.2.1	Regulatory quality*	57.9	48	
1.2.2	Rule of law*	59.9	42	
1.2.3	Cost of redundancy dismissal, salary weeks	18.7	78	
1.3	Business environment	66.9	73	
1.3.1	Ease of starting a business*	81.0	90	
1.3.2	Ease of resolving insolvency*	44.1	78	
1.3.3	Ease of paying taxes*	75.7	65	
2	**Human capital & research**	**32.1**	**64**	
2.1	Education	61.2	18	●
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	15.1	43	
2.1.4	PISA scales in reading, maths, & science	425.6	46	
2.1.5	Pupil-teacher ratio, secondary	14.4	60	
2.2	Tertiary education	31.1	79	
2.2.1	Tertiary enrolment, % gross	53.0	50	
2.2.2	Graduates in science & engineering, %	13.1	91	○
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	4.1	76	
2.3.1	Researchers, FTE/mn pop.[4]	357.8	64	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.6	57	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**47.4**	**52**	
3.1	Information & communication technologies (ICTs)	64.5	40	
3.1.1	ICT access*	63.0	60	
3.1.2	ICT use*	51.2	48	
3.1.3	Government's online service*	61.4	43	
3.1.4	E-participation*	82.4	14	●
3.2	General infrastructure	25.5	103	
3.2.1	Electricity output, kWh/cap	2,101.6	76	
3.2.2	Logistics performance*	2.7	82	
3.2.3	Gross capital formation, % GDP	19.7	89	
3.3	Ecological sustainability	52.1	30	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	12.0	15	●
3.3.2	Environmental performance*	80.0	42	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.3	57	
4	**Market sophistication**	**38.1**	**96**	
4.1	Credit	35.8	52	
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	55.1	55	
4.1.3	Microfinance gross loans, % GDP	0.1	56	
4.2	Investment	18.9	128	○
4.2.1	Ease of protecting minority investors*	35.0	121	○
4.2.2	Market capitalization, % GDP[4]	3.6	91	○
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	60	
4.3	Trade, competition, & market scale	59.7	70	
4.3.1	Applied tariff rate, weighted mean, %[4]	2.8	59	
4.3.2	Intensity of local competition†	70.8	53	
4.3.3	Domestic market scale, bn PPP$	71.2	84	
5	**Business sophistication**	**40.4**	**33**	
5.1	Knowledge workers	37.8	66	
5.1.1	Knowledge-intensive employment, %[4]	25.0	53	
5.1.2	Firms offering formal training, % firms[4]	54.7	19	
5.1.3	GERD performed by business, % of GDP[4]	0.2	53	
5.1.4	GERD financed by business, %[4]	5.0	79	○
5.1.5	Females employed w/advanced degrees, % total[4]	13.2	47	
5.2	Innovation linkages	29.7	72	
5.2.1	University/industry research collaboration†	56.0	32	
5.2.2	State of cluster development†	50.4	41	
5.2.3	GERD financed by abroad, %[4]	7.3	55	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	64	
5.3	Knowledge absorption	53.6	5	●
5.3.1	Intellectual property payments, % total trade	0.4	62	
5.3.2	High-tech imports less re-imports, % total trade[4]	23.7	1	●
5.3.3	ICT services imports, % total trade	0.5	96	
5.3.4	FDI net inflows, % GDP	5.2	28	
5.3.5	Research talent, % in business enterprise[4]	69.2	4	●
6	**Knowledge & technology outputs**	**26.8**	**57**	
6.1	Knowledge creation	4.0	99	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	92	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	63	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	58	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.8	79	
6.1.5	Citable documents H index	127.0	61	
6.2	Knowledge impact	25.2	108	○
6.2.1	Growth rate of PPP$ GDP/worker, %	0.1	88	○
6.2.2	New businesses/th pop. 15–64	1.1	66	
6.2.3	Computer software spending, % GDP	0.3	46	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.5	70	
6.2.5	High- & medium-high-tech manufactures, %	11.7	73	
6.3	Knowledge diffusion	51.1	9	●
6.3.1	Intellectual property receipts, % total trade	0.0	76	
6.3.2	High-tech exports less re-exports, % total trade[4]	19.1	6	●
6.3.3	ICT services exports, % total trade	10.3	1	●
6.3.4	FDI net outflows, % GDP	1.0	49	
7	**Creative outputs**	**37.0**	**39**	
7.1	Intangible assets	46.5	52	
7.1.1	Trademarks by origin/bn PPP$ GDP	71.9	21	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.1	105	○
7.1.3	ICTs & business model creation†	63.2	43	
7.1.4	ICTs & organizational model creation†	59.7	39	
7.2	Creative goods & services	44.5	12	●
7.2.1	Cultural & creative services exports, % of total trade	7.0	1	●
7.2.2	National feature films/mn pop. 15–69	0.6	86	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	2.7	9	●
7.2.5	Creative goods exports, % total trade[4]	0.7	54	
7.3	Online creativity	10.2	59	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	12.3	37	
7.3.2	Country-code TLDs/th pop. 15–69	1.9	68	
7.3.3	Wikipedia edits/mn pop. 15–69	2,245.2	50	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Côte d'Ivoire

Key indicators

Population (millions)	22.7
GDP (US$ billions)	31.2
GDP per capita, PPP$	3,315.8
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**25.8**	**108**	
Innovation Output Sub-Index		23.3	81	
Innovation Input Sub-Index		28.3	121	○
Innovation Efficiency Ratio		0.8	19	●
Global Innovation Index 2015 (out of 141)		27.2	116	
1	**Institutions**	**49.4**	**98**	
1.1	Political environment	27.5	116	
1.1.1	Political stability & safety*	37.6	115	
1.1.2	Government effectiveness*	17.3	114	
1.2	Regulatory environment	60.3	79	
1.2.1	Regulatory quality*	29.3	104	
1.2.2	Rule of law*	31.9	98	
1.2.3	Cost of redundancy dismissal, salary weeks	13.1	52	●
1.3	Business environment	60.4	95	
1.3.1	Ease of starting a business*	91.4	40	●
1.3.2	Ease of resolving insolvency*	47.0	68	●
1.3.3	Ease of paying taxes*	42.7	120	○
2	**Human capital & research**	**14.5**	**116**	
2.1	Education	35.6	99	
2.1.1	Expenditure on education, % GDP	4.7	60	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	25.7	31	●
2.1.3	School life expectancy, years	8.8	109	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	22.3	89	
2.2	Tertiary education	7.9	115	○
2.2.1	Tertiary enrolment, % gross	8.7	108	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	1.7	71	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**24.0**	**118**	○
3.1	Information & communication technologies (ICTs)	20.6	112	
3.1.1	ICT access*	34.4	104	
3.1.2	ICT use*	13.2	102	
3.1.3	Government's online service*	17.3	112	
3.1.4	E-participation*	17.6	115	○
3.2	General infrastructure	23.0	114	
3.2.1	Electricity output, kWh/cap	372.4	106	
3.2.2	Logistics performance*	2.8	76	
3.2.3	Gross capital formation, % GDP	18.5	96	
3.3	Ecological sustainability	28.2	117	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.3	106	
3.3.2	Environmental performance*	59.9	102	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	99	
4	**Market sophistication**	**29.5**	**121**	○
4.1	Credit	13.3	119	○
4.1.1	Ease of getting credit*	30.0	106	○
4.1.2	Domestic credit to private sector, % GDP	20.3	108	
4.1.3	Microfinance gross loans, % GDP	0.3	47	
4.2	Investment	24.0	119	○
4.2.1	Ease of protecting minority investors*	38.3	115	○
4.2.2	Market capitalization, % GDP	34.1	47	●
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	61	
4.3	Trade, competition, & market scale	51.1	99	
4.3.1	Applied tariff rate, weighted mean, %	6.6	97	
4.3.2	Intensity of local competition†	60.1	100	
4.3.3	Domestic market scale, bn PPP$	71.7	83	
5	**Business sophistication**	**24.1**	**104**	
5.1	Knowledge workers	20.7	114	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms◴	19.1	81	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	33.8	52	
5.2.1	University/industry research collaboration†	39.0	81	
5.2.2	State of cluster development†	31.2	117	○
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	17.7	115	
5.3.1	Intellectual property payments, % total trade◴	0.2	87	
5.3.2	High-tech imports less re-imports, % total trade	5.9	81	
5.3.3	ICT services imports, % total trade◴	0.8	75	
5.3.4	FDI net inflows, % GDP	1.3	94	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**27.1**	**53**	●
6.1	Knowledge creation	2.9	115	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	84	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	86	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	3.0	109	
6.1.5	Citable documents H index	82.0	91	
6.2	Knowledge impact	56.4	[4]	
6.2.1	Growth rate of PPP$ GDP/worker, %	5.1	5	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.8	92	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	22.0	80	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	2.1	49	●
6.3.3	ICT services exports, % total trade◴	0.9	82	
6.3.4	FDI net outflows, % GDP◴	(0.0)	99	
7	**Creative outputs**	**19.5**	**105**	
7.1	Intangible assets	35.9	94	
7.1.1	Trademarks by origin/bn PPP$ GDP	9.7	99	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.9	41	●
7.1.3	ICTs & business model creation†	57.2	68	
7.1.4	ICTs & organizational model creation†	55.7	56	●
7.2	Creative goods & services	6.1	104	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.2	79	
7.3	Online creativity	0.3	113	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.6	108	
7.3.2	Country-code TLDs/th pop. 15–69	0.2	103	
7.3.3	Wikipedia edits/mn pop. 15–69	23.7	119	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Croatia

Key indicators

Population (millions)	4.2
GDP (US$ billions)	48.9
GDP per capita, PPP$	21,581.4
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**38.3**	**47**	
Innovation Output Sub-Index		30.2	48	
Innovation Input Sub-Index		46.4	45	
Innovation Efficiency Ratio		0.7	68	
Global Innovation Index 2015 (out of 141)		41.7	40	
1	**Institutions**	**70.9**	**42**	
1.1	Political environment	68.1	41	
1.1.1	Political stability & safety*	77.8	40	
1.1.2	Government effectiveness*	58.3	40	
1.2	Regulatory environment	70.4	48	
1.2.1	Regulatory quality*	54.7	55	
1.2.2	Rule of law*	54.9	50	
1.2.3	Cost of redundancy dismissal, salary weeks	15.1	63	
1.3	Business environment	74.4	53	
1.3.1	Ease of starting a business*	86.2	64	
1.3.2	Ease of resolving insolvency*	53.9	56	
1.3.3	Ease of paying taxes*	83.0	34	
2	**Human capital & research**	**35.7**	**50**	
2.1	Education	59.1	26	●
2.1.1	Expenditure on education, % GDP[4]	4.2	78	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years[4]	14.9	50	
2.1.4	PISA scales in reading, maths, & science	482.4	33	
2.1.5	Pupil-teacher ratio, secondary[4]	7.8	2	●
2.2	Tertiary education	37.6	54	
2.2.1	Tertiary enrolment, % gross[4]	61.7	40	
2.2.2	Graduates in science & engineering, %[4]	23.8	32	
2.2.3	Tertiary inbound mobility, %[4]	0.5	89	○
2.3	Research & development (R&D)	10.4	58	
2.3.1	Researchers, FTE/mn pop.	1,437.3	41	
2.3.2	Gross expenditure on R&D, % GDP	0.8	41	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	6.8	64	
3	**Infrastructure**	**48.4**	**47**	
3.1	Information & communication technologies (ICTs)	52.9	57	
3.1.1	ICT access*	73.3	38	
3.1.2	ICT use*	58.5	35	
3.1.3	Government's online service*	46.5	70	
3.1.4	E-participation*	33.3	89	○
3.2	General infrastructure	29.5	82	
3.2.1	Electricity output, kWh/cap	3,128.2	60	
3.2.2	Logistics performance*	3.1	53	
3.2.3	Gross capital formation, % GDP	17.7	101	○
3.3	Ecological sustainability	62.9	8	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.8	45	
3.3.2	Environmental performance*	87.0	15	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	10.7	7	●
4	**Market sophistication**	**42.2**	**73**	
4.1	Credit	27.2	85	
4.1.1	Ease of getting credit*	55.0	63	
4.1.2	Domestic credit to private sector, % GDP	69.5	42	
4.1.3	Microfinance gross loans, % GDP[4]	0.0	73	○
4.2	Investment	37.8	61	
4.2.1	Ease of protecting minority investors*	65.0	28	
4.2.2	Market capitalization, % GDP[4]	38.6	43	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	65	○
4.3	Trade, competition, & market scale	61.8	61	
4.3.1	Applied tariff rate, weighted mean, %	1.3	40	
4.3.2	Intensity of local competition†	64.9	81	
4.3.3	Domestic market scale, bn PPP$	88.7	76	
5	**Business sophistication**	**34.6**	**50**	
5.1	Knowledge workers	49.3	33	
5.1.1	Knowledge-intensive employment, %	35.7	35	
5.1.2	Firms offering formal training, % firms	49.3	26	
5.1.3	GERD performed by business, % of GDP	0.4	39	
5.1.4	GERD financed by business, %	42.9	31	
5.1.5	Females employed w/advanced degrees, % total	15.0	39	
5.2	Innovation linkages	24.5	86	
5.2.1	University/industry research collaboration†	39.9	77	
5.2.2	State of cluster development†	34.1	107	○
5.2.3	GERD financed by abroad, %	12.8	36	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	50	
5.3	Knowledge absorption	29.9	55	
5.3.1	Intellectual property payments, % total trade	1.1	25	●
5.3.2	High-tech imports less re-imports, % total trade	6.9	68	
5.3.3	ICT services imports, % total trade	1.4	39	
5.3.4	FDI net inflows, % GDP	6.9	18	●
5.3.5	Research talent, % in business enterprise	15.1	59	○
6	**Knowledge & technology outputs**	**26.5**	**58**	
6.1	Knowledge creation	19.3	45	
6.1.1	Patents by origin/bn PPP$ GDP	2.1	46	
6.1.2	PCT patent applications/bn PPP$ GDP	0.3	46	
6.1.3	Utility models by origin/bn PPP$ GDP	0.9	27	
6.1.4	Scientific & technical articles/bn PPP$ GDP	33.8	20	●
6.1.5	Citable documents H index	177.0	43	
6.2	Knowledge impact	39.1	50	
6.2.1	Growth rate of PPP$ GDP/worker, %	(3.0)	107	○
6.2.2	New businesses/th pop. 15–64	4.6	25	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	31.6	7	●
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	21.0	88	
6.3.1	Intellectual property receipts, % total trade	0.1	58	
6.3.2	High-tech exports less re-exports, % total trade	3.5	38	
6.3.3	ICT services exports, % total trade	1.9	50	
6.3.4	FDI net outflows, % GDP[4]	(0.3)	109	○
7	**Creative outputs**	**33.9**	**48**	
7.1	Intangible assets	45.6	57	
7.1.1	Trademarks by origin/bn PPP$ GDP	55.1	37	
7.1.2	Industrial designs by origin/bn PPP$ GDP	7.1	18	●
7.1.3	ICTs & business model creation†	55.2	76	
7.1.4	ICTs & organizational model creation†	55.1	59	
7.2	Creative goods & services	24.5	57	
7.2.1	Cultural & creative services exports, % of total trade	0.2	39	
7.2.2	National feature films/mn pop. 15–69	8.5	18	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.8	45	
7.3	Online creativity	20.0	43	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	14.9	32	
7.3.2	Country-code TLDs/th pop. 15–69	10.7	39	
7.3.3	Wikipedia edits/mn pop. 15–69	3,562.7	37	
7.3.4	Video uploads on YouTube/pop. 15–69	27.9	45	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Cyprus

Key indicators

Population (millions)	1.2
GDP (US$ billions)	19.3
GDP per capita, PPP$	32,785.5
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**46.3**	**31**	
Innovation Output Sub-Index		40.8	29	
Innovation Input Sub-Index		51.9	33	
Innovation Efficiency Ratio		0.8	26	
Global Innovation Index 2015 (out of 141)		43.5	34	
1	**Institutions**	**81.6**	**20**	
1.1	Political environment	75.3	27	
1.1.1	Political stability & safety*	79.9	35	
1.1.2	Government effectiveness*	70.6	28	
1.2	Regulatory environment	86.3	19	
1.2.1	Regulatory quality*	71.9	28	
1.2.2	Rule of law*	73.5	28	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	83.3	22	
1.3.1	Ease of starting a business*	89.2	53	
1.3.2	Ease of resolving insolvency*	79.0	16	
1.3.3	Ease of paying taxes*	81.7	38	
2	**Human capital & research**	**38.7**	**44**	
2.1	Education	63.1	14	
2.1.1	Expenditure on education, % GDP◴	6.6	19	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	38.3	9	●
2.1.3	School life expectancy, years	14.2	58	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	9.7	23	
2.2	Tertiary education	48.4	21	
2.2.1	Tertiary enrolment, % gross	53.1	49	
2.2.2	Graduates in science & engineering, %	19.0	64	
2.2.3	Tertiary inbound mobility, %	14.3	10	●
2.3	Research & development (R&D)	4.8	75	
2.3.1	Researchers, FTE/mn pop.	749.8	50	
2.3.2	Gross expenditure on R&D, % GDP	0.5	62	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**41.6**	**71**	
3.1	Information & communication technologies (ICTs)	49.5	68	
3.1.1	ICT access*	70.4	48	
3.1.2	ICT use*	48.9	51	
3.1.3	Government's online service*	47.2	68	
3.1.4	E-participation*	31.4	97	○
3.2	General infrastructure	25.8	101	○
3.2.1	Electricity output, kWh/cap	4,931.0	41	
3.2.2	Logistics performance*	3.0	56	
3.2.3	Gross capital formation, % GDP	11.9	122	○
3.3	Ecological sustainability	49.5	43	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.0	31	
3.3.2	Environmental performance*	80.2	40	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.0	47	
4	**Market sophistication**	**56.8**	**20**	
4.1	Credit	82.5	4	●
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	251.5	1	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	30.8	90	
4.2.1	Ease of protecting minority investors*	66.7	25	
4.2.2	Market capitalization, % GDP	17.4	69	○
4.2.3	Total value of stocks traded, % GDP	0.2	70	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	38	
4.3	Trade, competition, & market scale	57.2	79	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	71.5	45	
4.3.3	Domestic market scale, bn PPP$	27.5	109	○
5	**Business sophistication**	**40.6**	**32**	
5.1	Knowledge workers	40.6	54	
5.1.1	Knowledge-intensive employment, %	35.8	34	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.1	60	
5.1.4	GERD financed by business, %◴	12.1	68	
5.1.5	Females employed w/advanced degrees, % total	24.1	10	
5.2	Innovation linkages	41.6	28	
5.2.1	University/industry research collaboration†	53.2	39	
5.2.2	State of cluster development†	48.2	51	
5.2.3	GERD financed by abroad, %◴	19.6	22	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	5	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.7	28	
5.3	Knowledge absorption	39.7	24	
5.3.1	Intellectual property payments, % total trade	0.5	51	
5.3.2	High-tech imports less re-imports, % total trade	3.3	114	○
5.3.3	ICT services imports, % total trade	7.4	1	●
5.3.4	FDI net inflows, % GDP	3.7	45	
5.3.5	Research talent, % in business enterprise	20.8	54	
6	**Knowledge & technology outputs**	**42.4**	**20**	
6.1	Knowledge creation	25.2	36	
6.1.1	Patents by origin/bn PPP$ GDP	1.9	49	
6.1.2	PCT patent applications/bn PPP$ GDP	1.8	22	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	37.2	16	
6.1.5	Citable documents H index	113.0	70	
6.2	Knowledge impact	43.2	34	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.4)	95	○
6.2.2	New businesses/th pop. 15–64	13.7	7	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	10.0	37	
6.2.5	High- & medium-high-tech manufactures, %	13.8	69	
6.3	Knowledge diffusion	58.7	6	●
6.3.1	Intellectual property receipts, % total trade	0.0	69	
6.3.2	High-tech exports less re-exports, % total trade	0.5	77	
6.3.3	ICT services exports, % total trade	9.1	1	●
6.3.4	FDI net outflows, % GDP	9.9	7	●
7	**Creative outputs**	**39.2**	**35**	
7.1	Intangible assets	43.4	61	
7.1.1	Trademarks by origin/bn PPP$ GDP	68.1	25	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.1	38	
7.1.3	ICTs & business model creation†	55.7	73	
7.1.4	ICTs & organizational model creation†	50.2	75	
7.2	Creative goods & services	30.6	41	
7.2.1	Cultural & creative services exports, % of total trade◴	0.6	22	
7.2.2	National feature films/mn pop. 15–69	2.3	53	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	2.9	7	●
7.2.5	Creative goods exports, % total trade	0.0	109	○
7.3	Online creativity	39.5	23	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	73.1	8	●
7.3.2	Country-code TLDs/th pop. 15–69	5.5	51	
7.3.3	Wikipedia edits/mn pop. 15–69	5,408.8	22	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Czech Republic

Key indicators

Population (millions)	10.5
GDP (US$ billions)	181.9
GDP per capita, PPP$	31,549.5
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**49.4**	**27**	
Innovation Output Sub-Index		44.5	21	
Innovation Input Sub-Index		54.3	26	
Innovation Efficiency Ratio		0.8	21	
Global Innovation Index 2015 (out of 141)		51.3	24	
1	**Institutions**	**76.1**	**30**	
1.1	Political environment	77.2	23	
1.1.1	Political stability & safety*	86.9	22	
1.1.2	Government effectiveness*	67.5	32	
1.2	Regulatory environment	74.3	40	
1.2.1	Regulatory quality*	70.1	31	
1.2.2	Rule of law*	75.5	25	
1.2.3	Cost of redundancy dismissal, salary weeks	20.2	86	○
1.3	Business environment	76.7	43	
1.3.1	Ease of starting a business*	85.2	71	
1.3.2	Ease of resolving insolvency*	77.7	20	
1.3.3	Ease of paying taxes*	67.1	87	○
2	**Human capital & research**	**48.3**	**28**	
2.1	Education	54.8	40	
2.1.1	Expenditure on education, % GDP	4.3	75	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	25.4	33	
2.1.3	School life expectancy, years	16.7	18	
2.1.4	PISA scales in reading, maths, & science	500.0	19	
2.1.5	Pupil-teacher ratio, secondary[d]	11.5	40	
2.2	Tertiary education	49.3	19	
2.2.1	Tertiary enrolment, % gross	65.4	32	
2.2.2	Graduates in science & engineering, %	23.2	35	
2.2.3	Tertiary inbound mobility, %	9.4	18	
2.3	Research & development (R&D)	40.6	27	
2.3.1	Researchers, FTE/mn pop.	3,418.5	25	
2.3.2	Gross expenditure on R&D, % GDP	2.0	17	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	38.5	39	
2.3.4	QS university ranking, average score top 3*	34.0	38	
3	**Infrastructure**	**53.7**	**31**	
3.1	Information & communication technologies (ICTs)	49.9	66	
3.1.1	ICT access*	74.1	37	
3.1.2	ICT use*	62.9	29	
3.1.3	Government's online service*	37.0	85	○
3.1.4	E-participation*	25.5	104	○
3.2	General infrastructure	49.6	25	
3.2.1	Electricity output, kWh/cap	8,066.4	21	
3.2.2	Logistics performance*	3.5	31	
3.2.3	Gross capital formation, % GDP	26.3	35	
3.3	Ecological sustainability	61.6	11	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.3	85	○
3.3.2	Environmental performance*	84.7	27	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	18.5	1	●
4	**Market sophistication**	**50.5**	**31**	
4.1	Credit	44.3	36	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	50.4	63	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	34.8	71	
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP[d]	36.5	45	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	53	
4.3	Trade, competition, & market scale	72.4	27	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	79.1	13	●
4.3.3	Domestic market scale, bn PPP$	315.9	48	
5	**Business sophistication**	**42.9**	**26**	
5.1	Knowledge workers	52.9	28	
5.1.1	Knowledge-intensive employment, %	37.9	28	
5.1.2	Firms offering formal training, % firms	55.1	17	
5.1.3	GERD performed by business, % of GDP	1.1	17	
5.1.4	GERD financed by business, %[d]	37.6	40	
5.1.5	Females employed w/advanced degrees, % total	11.1	59	○
5.2	Innovation linkages	33.7	53	
5.2.1	University/industry research collaboration†	50.0	41	
5.2.2	State of cluster development†	48.0	52	
5.2.3	GERD financed by abroad, %[d]	27.2	15	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	65	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.7	30	
5.3	Knowledge absorption	41.9	19	●
5.3.1	Intellectual property payments, % total trade	0.7	41	
5.3.2	High-tech imports less re-imports, % total trade	15.9	11	●
5.3.3	ICT services imports, % total trade	1.2	47	
5.3.4	FDI net inflows, % GDP	2.4	71	
5.3.5	Research talent, % in business enterprise	50.7	22	
6	**Knowledge & technology outputs**	**42.8**	**19**	●
6.1	Knowledge creation	46.0	17	●
6.1.1	Patents by origin/bn PPP$ GDP	3.4	34	
6.1.2	PCT patent applications/bn PPP$ GDP	0.6	31	
6.1.3	Utility models by origin/bn PPP$ GDP	4.6	6	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	35.2	18	●
6.1.5	Citable documents H index	294.0	32	
6.2	Knowledge impact	51.5	15	●
6.2.1	Growth rate of PPP$ GDP/worker, %	1.4	52	
6.2.2	New businesses/th pop. 15–64	3.4	35	
6.2.3	Computer software spending, % GDP	0.3	38	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	41.9	4	●
6.2.5	High- & medium-high-tech manufactures, %	43.2	17	
6.3	Knowledge diffusion	31.0	37	
6.3.1	Intellectual property receipts, % total trade	0.3	27	
6.3.2	High-tech exports less re-exports, % total trade	16.3	8	●
6.3.3	ICT services exports, % total trade	1.8	53	
6.3.4	FDI net outflows, % GDP	(0.8)	112	○
7	**Creative outputs**	**46.2**	**24**	
7.1	Intangible assets	52.4	26	
7.1.1	Trademarks by origin/bn PPP$ GDP	64.6	30	
7.1.2	Industrial designs by origin/bn PPP$ GDP	6.0	24	
7.1.3	ICTs & business model creation†	67.4	34	
7.1.4	ICTs & organizational model creation†	64.5	28	
7.2	Creative goods & services	42.5	13	●
7.2.1	Cultural & creative services exports, % of total trade[d]	0.5	24	
7.2.2	National feature films/mn pop. 15–69	5.7	31	
7.2.3	Global ent. & media market/th pop. 15–69	19.1	26	
7.2.4	Printing & publishing manufactures, %	1.1	61	○
7.2.5	Creative goods exports, % total trade	10.0	4	●
7.3	Online creativity	37.6	24	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	17.9	30	
7.3.2	Country-code TLDs/th pop. 15–69	57.0	15	●
7.3.3	Wikipedia edits/mn pop. 15–69	3,275.3	41	
7.3.4	Video uploads on YouTube/pop. 15–69	51.4	20	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Denmark

Key indicators

Population (millions)	5.7
GDP (US$ billions)	295.0
GDP per capita, PPP$	45,709.4
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**58.5**	**8**	
Innovation Output Sub-Index		49.8	13	
Innovation Input Sub-Index		67.1	8	
Innovation Efficiency Ratio		0.7	34	
Global Innovation Index 2015 (out of 141)		57.7	10	
1	**Institutions**	**91.6**	**7**	
1.1	Political environment	87.8	13	
1.1.1	Political stability & safety*	86.3	23	
1.1.2	Government effectiveness*	89.2	9	
1.2	Regulatory environment	96.6	4	●
1.2.1	Regulatory quality*	87.3	12	
1.2.2	Rule of law*	99.3	2	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	90.3	5	●
1.3.1	Ease of starting a business*	94.0	28	
1.3.2	Ease of resolving insolvency*	84.8	8	
1.3.3	Ease of paying taxes*	91.9	12	
2	**Human capital & research**	**65.8**	**4**	●
2.1	Education	70.9	8	
2.1.1	Expenditure on education, % GDP◴	8.5	3	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	29.4	21	
2.1.3	School life expectancy, years	19.2	4	●
2.1.4	PISA scales in reading, maths, & science	498.2	22	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	50.8	17	
2.2.1	Tertiary enrolment, % gross	81.2	12	
2.2.2	Graduates in science & engineering, %	20.4	52	○
2.2.3	Tertiary inbound mobility, %	10.1	15	
2.3	Research & development (R&D)	75.6	7	
2.3.1	Researchers, FTE/mn pop.	7,198.2	2	●
2.3.2	Gross expenditure on R&D, % GDP	3.1	6	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	696.5	15	
2.3.4	QS university ranking, average score top 3*	70.0	14	
3	**Infrastructure**	**58.8**	**21**	
3.1	Information & communication technologies (ICTs)	74.1	22	
3.1.1	ICT access*	87.2	13	
3.1.2	ICT use*	88.3	1	●
3.1.3	Government's online service*	66.1	35	
3.1.4	E-participation*	54.9	54	○
3.2	General infrastructure	44.3	35	
3.2.1	Electricity output, kWh/cap	5,656.9	33	
3.2.2	Logistics performance*	3.8	17	
3.2.3	Gross capital formation, % GDP	19.9	86	○
3.3	Ecological sustainability	57.9	20	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.4	18	
3.3.2	Environmental performance*	89.2	4	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.6	25	
4	**Market sophistication**	**71.3**	**6**	●
4.1	Credit	70.3	7	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	178.7	5	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	74.4	5	●
4.2.1	Ease of protecting minority investors*	68.3	20	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	8	
4.3	Trade, competition, & market scale	69.4	36	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	71.7	44	
4.3.3	Domestic market scale, bn PPP$	250.7	55	
5	**Business sophistication**	**47.9**	**17**	
5.1	Knowledge workers	67.7	7	
5.1.1	Knowledge-intensive employment, %	45.3	11	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	2.0	8	
5.1.4	GERD financed by business, %	57.9	12	
5.1.5	Females employed w/advanced degrees, % total	21.1	21	
5.2	Innovation linkages	39.7	33	
5.2.1	University/industry research collaboration†	65.0	19	
5.2.2	State of cluster development†	57.7	24	
5.2.3	GERD financed by abroad, %	7.4	52	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	25	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	4.3	10	
5.3	Knowledge absorption	36.2	32	
5.3.1	Intellectual property payments, % total trade	0.9	35	
5.3.2	High-tech imports less re-imports, % total trade	6.3	76	○
5.3.3	ICT services imports, % total trade	2.2	14	
5.3.4	FDI net inflows, % GDP	(0.2)	125	○
5.3.5	Research talent, % in business enterprise	59.5	13	
6	**Knowledge & technology outputs**	**46.4**	**14**	
6.1	Knowledge creation	53.1	12	
6.1.1	Patents by origin/bn PPP$ GDP	13.4	8	
6.1.2	PCT patent applications/bn PPP$ GDP	5.2	9	
6.1.3	Utility models by origin/bn PPP$ GDP	0.6	32	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	64.5	2	●
6.1.5	Citable documents H index	518.0	14	
6.2	Knowledge impact	43.9	32	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.4	79	○
6.2.2	New businesses/th pop. 15–64	4.4	28	
6.2.3	Computer software spending, % GDP	0.6	11	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	6.7	52	
6.2.5	High- & medium-high-tech manufactures, %	44.1	11	
6.3	Knowledge diffusion	42.1	21	
6.3.1	Intellectual property receipts, % total trade	1.4	12	
6.3.2	High-tech exports less re-exports, % total trade	6.1	28	
6.3.3	ICT services exports, % total trade	1.9	51	
6.3.4	FDI net outflows, % GDP	2.5	27	
7	**Creative outputs**	**53.3**	**11**	
7.1	Intangible assets	51.6	29	
7.1.1	Trademarks by origin/bn PPP$ GDP	47.6	49	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	6.7	19	
7.1.3	ICTs & business model creation†	69.1	28	
7.1.4	ICTs & organizational model creation†	67.3	23	
7.2	Creative goods & services	45.7	9	
7.2.1	Cultural & creative services exports, % of total trade◴	0.7	18	
7.2.2	National feature films/mn pop. 15–69	17.3	6	
7.2.3	Global ent. & media market/th pop. 15–69	70.6	4	
7.2.4	Printing & publishing manufactures, %	1.2	54	○
7.2.5	Creative goods exports, % total trade	1.6	28	
7.3	Online creativity	64.4	6	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	51.2	15	
7.3.2	Country-code TLDs/th pop. 15–69	100.0	1	●
7.3.3	Wikipedia edits/mn pop. 15–69	5,288.9	23	
7.3.4	Video uploads on YouTube/pop. 15–69	67.4	11	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Dominican Republic

Key indicators

Population (millions)	10.5
GDP (US$ billions)	67.5
GDP per capita, PPP$	14,983.7
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.6**	**76**	
Innovation Output Sub-Index		23.3	82	
Innovation Input Sub-Index		37.8	84	
Innovation Efficiency Ratio		0.6	82	
Global Innovation Index 2015 (out of 141)		30.6	89	
1	**Institutions**	**53.6**	**87**	
1.1	Political environment	47.3	72	
1.1.1	Political stability & safety*	67.5	52	●
1.1.2	Government effectiveness*	27.1	94	
1.2	Regulatory environment	52.4	103	
1.2.1	Regulatory quality*	43.9	73	
1.2.2	Rule of law*	37.6	85	
1.2.3	Cost of redundancy dismissal, salary weeks	26.2	102	
1.3	Business environment	61.0	92	
1.3.1	Ease of starting a business*	83.1	83	
1.3.2	Ease of resolving insolvency*	23.7	123	○
1.3.3	Ease of paying taxes*	76.3	63	
2	**Human capital & research**	**19.0**	**103**	
2.1	Education	30.5	110	
2.1.1	Expenditure on education, % GDP[4]	2.1	114	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	14.6	88	
2.1.3	School life expectancy, years	13.2	70	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	21.4	88	
2.2	Tertiary education	26.5	90	
2.2.1	Tertiary enrolment, % gross	47.5	56	
2.2.2	Graduates in science & engineering, %	14.4	87	
2.2.3	Tertiary inbound mobility, %	2.3	61	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**38.9**	**77**	
3.1	Information & communication technologies (ICTs)	35.7	92	
3.1.1	ICT access*	41.2	98	
3.1.2	ICT use*	29.7	79	
3.1.3	Government's online service*	38.6	83	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	27.6	94	
3.2.1	Electricity output, kWh/cap	1,700.0	80	
3.2.2	Logistics performance*	2.9	66	
3.2.3	Gross capital formation, % GDP	20.3	83	
3.3	Ecological sustainability	53.2	27	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	14.5	5	●
3.3.2	Environmental performance*	75.3	57	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	101	
4	**Market sophistication**	**45.5**	**52**	●
4.1	Credit	23.1	98	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	26.5	101	
4.1.3	Microfinance gross loans, % GDP	1.3	29	●
4.2	Investment	55.0	16	
4.2.1	Ease of protecting minority investors*	55.0	72	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	58.5	74	
4.3.1	Applied tariff rate, weighted mean, %[4]	6.1	91	
4.3.2	Intensity of local competition†	72.3	43	●
4.3.3	Domestic market scale, bn PPP$	138.5	67	
5	**Business sophistication**	**32.1**	**60**	
5.1	Knowledge workers	46.3	38	●
5.1.1	Knowledge-intensive employment, %[4]	17.2	80	
5.1.2	Firms offering formal training, % firms[4]	57.0	14	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[4]	12.5	51	
5.2	Innovation linkages	30.7	63	
5.2.1	University/industry research collaboration†	37.6	88	
5.2.2	State of cluster development†	42.3	77	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	97	
5.3	Knowledge absorption	19.2	106	
5.3.1	Intellectual property payments, % total trade[4]	0.4	65	
5.3.2	High-tech imports less re-imports, % total trade	5.5	87	
5.3.3	ICT services imports, % total trade[4]	0.3	110	○
5.3.4	FDI net inflows, % GDP	3.7	44	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**19.1**	**91**	
6.1	Knowledge creation	0.9	128	○
6.1.1	Patents by origin/bn PPP$ GDP	0.1	104	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	83	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	56	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	0.7	126	○
6.1.5	Citable documents H index	47.0	118	○
6.2	Knowledge impact	36.2	62	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.7	30	●
6.2.2	New businesses/th pop. 15–64	1.2	62	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.3	101	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	20.2	94	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	1.2	61	
6.3.3	ICT services exports, % total trade[4]	1.2	73	
6.3.4	FDI net outflows, % GDP[4]	(0.6)	111	○
7	**Creative outputs**	**27.5**	**71**	
7.1	Intangible assets	41.3	72	
7.1.1	Trademarks by origin/bn PPP$ GDP	44.4	53	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.2	98	○
7.1.3	ICTs & business model creation†	63.3	42	●
7.1.4	ICTs & organizational model creation†	56.4	50	●
7.2	Creative goods & services	23.2	60	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[4]	1.0	76	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	1.5	33	●
7.3	Online creativity	4.2	80	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.8	68	
7.3.2	Country-code TLDs/th pop. 15–69	1.3	78	
7.3.3	Wikipedia edits/mn pop. 15–69	1,155.1	69	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Ecuador

Key indicators

Population (millions)	16.1
GDP (US$ billions)	98.8
GDP per capita, PPP$	11,263.6
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.1**	**100**	
Innovation Output Sub-Index		20.3	97	
Innovation Input Sub-Index		33.9	100	
Innovation Efficiency Ratio		0.6	87	
Global Innovation Index 2015 (out of 141)		26.9	119	
1	**Institutions**	**44.6**	**115**	
1.1	Political environment	43.9	86	
1.1.1	Political stability & safety*	62.6	67	
1.1.2	Government effectiveness*	25.2	99	
1.2	Regulatory environment	36.6	120	○
1.2.1	Regulatory quality*	19.5	122	○
1.2.2	Rule of law*	20.9	123	○
1.2.3	Cost of redundancy dismissal, salary weeks	31.8	119	○
1.3	Business environment	53.3	121	○
1.3.1	Ease of starting a business*	68.5	119	○
1.3.2	Ease of resolving insolvency*	28.4	119	○
1.3.3	Ease of paying taxes*	62.8	97	
2	**Human capital & research**	**21.4**	**98**	
2.1	Education	39.0	90	
2.1.1	Expenditure on education, % GDP	4.2	77	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	6.3	106	○
2.1.3	School life expectancy, years	15.2	41	●
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	18.6	80	
2.2	Tertiary education	23.1	100	
2.2.1	Tertiary enrolment, % gross	40.5	63	
2.2.2	Graduates in science & engineering, %	14.9	86	
2.2.3	Tertiary inbound mobility, % [4]	0.6	87	
2.3	Research & development (R&D)	2.2	89	
2.3.1	Researchers, FTE/mn pop. [4]	180.3	71	
2.3.2	Gross expenditure on R&D, % GDP [4]	0.3	73	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**38.7**	**78**	
3.1	Information & communication technologies (ICTs)	44.5	78	
3.1.1	ICT access*	52.1	76	
3.1.2	ICT use*	29.0	82	
3.1.3	Government's online service*	48.0	66	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	29.5	83	
3.2.1	Electricity output, kWh/cap	1,477.7	84	
3.2.2	Logistics performance*	2.7	81	
3.2.3	Gross capital formation, % GDP	24.7	43	●
3.3	Ecological sustainability	41.9	67	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.6	38	●
3.3.2	Environmental performance*	66.6	87	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.0	62	
4	**Market sophistication**	**40.7**	**82**	
4.1	Credit	37.3	50	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	27.4	98	
4.1.3	Microfinance gross loans, % GDP	4.7	10	●
4.2	Investment	23.7	121	○
4.2.1	Ease of protecting minority investors*	46.7	92	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP [4]	0.2	76	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	80	○
4.3	Trade, competition, & market scale	61.1	63	
4.3.1	Applied tariff rate, weighted mean, % [4]	4.3	78	
4.3.2	Intensity of local competition†	66.2	74	
4.3.3	Domestic market scale, bn PPP$	181.2	60	
5	**Business sophistication**	**24.2**	**103**	
5.1	Knowledge workers	34.0	79	
5.1.1	Knowledge-intensive employment, %	12.3	91	
5.1.2	Firms offering formal training, % firms [4]	65.9	5	●
5.1.3	GERD performed by business, % of GDP [4]	0.2	50	
5.1.4	GERD financed by business, % [4]	0.4	89	○
5.1.5	Females employed w/advanced degrees, % total	10.0	63	
5.2	Innovation linkages	20.9	109	
5.2.1	University/industry research collaboration†	49.1	46	●
5.2.2	State of cluster development†	40.1	89	
5.2.3	GERD financed by abroad, % [4]	4.5	69	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	59	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	76	
5.3	Knowledge absorption	17.8	114	
5.3.1	Intellectual property payments, % total trade	0.4	67	
5.3.2	High-tech imports less re-imports, % total trade	9.0	47	
5.3.3	ICT services imports, % total trade	0.0	122	○
5.3.4	FDI net inflows, % GDP	0.8	103	
5.3.5	Research talent, % in business enterprise [4]	15.0	61	
6	**Knowledge & technology outputs**	**13.2**	**118**	
6.1	Knowledge creation	3.0	111	
6.1.1	Patents by origin/bn PPP$ GDP [4]	0.0	117	○
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	84	
6.1.3	Utility models by origin/bn PPP$ GDP [4]	0.1	49	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.4	102	
6.1.5	Citable documents H index	100.0	79	
6.2	Knowledge impact	34.3	74	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.7	45	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.2	65	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	7.4	46	●
6.2.5	High- & medium-high-tech manufactures, % [4]	14.0	68	
6.3	Knowledge diffusion	2.3	125	○
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.3	90	
6.3.3	ICT services exports, % total trade	0.4	103	
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**27.4**	**72**	
7.1	Intangible assets	42.8	65	
7.1.1	Trademarks by origin/bn PPP$ GDP [4]	63.9	32	●
7.1.2	Industrial designs by origin/bn PPP$ GDP [4]	0.4	85	
7.1.3	ICTs & business model creation†	58.6	63	
7.1.4	ICTs & organizational model creation†	55.1	58	
7.2	Creative goods & services	18.2	74	
7.2.1	Cultural & creative services exports, % of total trade	0.3	30	●
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, % [4]	1.6	32	●
7.2.5	Creative goods exports, % total trade	0.0	97	
7.3	Online creativity	5.7	73	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.3	75	
7.3.2	Country-code TLDs/th pop. 15–69	1.4	77	
7.3.3	Wikipedia edits/mn pop. 15–69	1,804.1	56	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Egypt

Key indicators

Population (millions)	91.5
GDP (US$ billions)	330.8
GDP per capita, PPP$	11,849.6
Income group	Lower-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.0**	**107**	
Innovation Output Sub-Index		20.2	98	
Innovation Input Sub-Index		31.8	107	
Innovation Efficiency Ratio		0.6	74	
Global Innovation Index 2015 (out of 141)		28.9	100	
1	**Institutions**	**39.0**	**123**	○
1.1	Political environment	19.9	124	○
1.1.1	Political stability & safety*	23.5	122	○
1.1.2	Government effectiveness*	16.3	116	
1.2	Regulatory environment	36.0	122	○
1.2.1	Regulatory quality*	26.1	110	
1.2.2	Rule of law*	32.1	96	
1.2.3	Cost of redundancy dismissal, salary weeks	36.8	121	○
1.3	Business environment	61.2	91	
1.3.1	Ease of starting a business*	88.2	58	
1.3.2	Ease of resolving insolvency*	36.4	100	
1.3.3	Ease of paying taxes*	58.9	104	
2	**Human capital & research**	**27.3**	**82**	
2.1	Education	50.2	56	
2.1.1	Expenditure on education, % GDP[d]	3.8	85	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	13.1	72	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	12.1	43	●
2.2	Tertiary education	19.0	103	
2.2.1	Tertiary enrolment, % gross	30.3	77	
2.2.2	Graduates in science & engineering, %	11.8	97	○
2.2.3	Tertiary inbound mobility, %	1.8	69	
2.3	Research & development (R&D)	12.9	52	
2.3.1	Researchers, FTE/mn pop.	681.6	54	
2.3.2	Gross expenditure on R&D, % GDP	0.7	51	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	28.5	46	●
3	**Infrastructure**	**38.3**	**82**	
3.1	Information & communication technologies (ICTs)	48.1	72	
3.1.1	ICT access*	51.2	78	
3.1.2	ICT use*	27.1	84	
3.1.3	Government's online service*	59.1	51	
3.1.4	E-participation*	54.9	54	
3.2	General infrastructure	24.3	111	
3.2.1	Electricity output, kWh/cap	2,045.1	78	
3.2.2	Logistics performance*	3.0	60	
3.2.3	Gross capital formation, % GDP	14.8	113	
3.3	Ecological sustainability	42.5	61	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.1	26	●
3.3.2	Environmental performance*	66.5	88	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	67	
4	**Market sophistication**	**34.2**	**110**	
4.1	Credit	19.8	107	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	25.9	102	
4.1.3	Microfinance gross loans, % GDP	0.1	64	
4.2	Investment	22.2	127	○
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	24.5	57	
4.2.3	Total value of stocks traded, % GDP	9.3	36	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	71	
4.3	Trade, competition, & market scale	60.5	65	
4.3.1	Applied tariff rate, weighted mean, %[d]	8.2	105	
4.3.2	Intensity of local competition†	53.9	117	○
4.3.3	Domestic market scale, bn PPP$	946.6	24	●
5	**Business sophistication**	**20.0**	**122**	○
5.1	Knowledge workers	21.2	109	
5.1.1	Knowledge-intensive employment, %[d]	36.3	31	●
5.1.2	Firms offering formal training, % firms	5.2	92	○
5.1.3	GERD performed by business, % of GDP	0.1	64	
5.1.4	GERD financed by business, %	8.1	73	
5.1.5	Females employed w/advanced degrees, % total[d]	5.5	77	
5.2	Innovation linkages	21.8	105	
5.2.1	University/industry research collaboration†	23.8	120	○
5.2.2	State of cluster development†	54.5	31	●
5.2.3	GERD financed by abroad, %	0.1	98	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	27	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	100	
5.3	Knowledge absorption	16.9	118	
5.3.1	Intellectual property payments, % total trade	0.4	63	
5.3.2	High-tech imports less re-imports, % total trade	7.0	67	
5.3.3	ICT services imports, % total trade	0.7	82	
5.3.4	FDI net inflows, % GDP	1.7	85	
5.3.5	Research talent, % in business enterprise	5.5	71	
6	**Knowledge & technology outputs**	**18.5**	**94**	
6.1	Knowledge creation	8.3	70	
6.1.1	Patents by origin/bn PPP$ GDP	0.8	68	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	74	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	9.4	66	
6.1.5	Citable documents H index	165.0	48	●
6.2	Knowledge impact	26.5	106	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.6	76	
6.2.2	New businesses/th pop. 15–64[d]	0.1	100	○
6.2.3	Computer software spending, % GDP	0.2	59	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.3	84	
6.2.5	High- & medium-high-tech manufactures, %[d]	21.5	54	
6.3	Knowledge diffusion	20.7	91	
6.3.1	Intellectual property receipts, % total trade[d]	0.3	29	●
6.3.2	High-tech exports less re-exports, % total trade	0.3	89	
6.3.3	ICT services exports, % total trade	1.7	55	
6.3.4	FDI net outflows, % GDP	0.1	80	
7	**Creative outputs**	**21.8**	**97**	
7.1	Intangible assets	34.3	100	
7.1.1	Trademarks by origin/bn PPP$ GDP	13.3	91	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	50.3	95	
7.1.4	ICTs & organizational model creation†	45.7	86	
7.2	Creative goods & services	15.6	81	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	0.6	87	
7.2.3	Global ent. & media market/th pop. 15–69	0.7	55	
7.2.4	Printing & publishing manufactures, %[d]	0.6	80	
7.2.5	Creative goods exports, % total trade	1.6	31	●
7.3	Online creativity	3.1	90	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.3	91	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	119	○
7.3.3	Wikipedia edits/mn pop. 15–69	439.1	90	
7.3.4	Video uploads on YouTube/pop. 15–69	7.7	64	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

El Salvador

Key indicators

Population (millions)	6.1
GDP (US$ billions)	25.8
GDP per capita, PPP$	8,302.5
Income group	Lower-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.6**	**104**	
Innovation Output Sub-Index		17.2	110	
Innovation Input Sub-Index		35.9	89	
Innovation Efficiency Ratio		0.5	113	
Global Innovation Index 2015 (out of 141)		29.3	99	
1	**Institutions**	**55.2**	**80**	
1.1	Political environment	48.8	69	
1.1.1	Political stability & safety*	59.1	77	
1.1.2	Government effectiveness*	38.4	71	
1.2	Regulatory environment	57.2	90	
1.2.1	Regulatory quality*	53.3	58	
1.2.2	Rule of law*	34.2	91	
1.2.3	Cost of redundancy dismissal, salary weeks	22.9	97	
1.3	Business environment	59.6	98	
1.3.1	Ease of starting a business*	80.2	94	
1.3.2	Ease of resolving insolvency*	45.9	71	
1.3.3	Ease of paying taxes*	52.7	111	
2	**Human capital & research**	**18.3**	**106**	
2.1	Education	26.6	116	
2.1.1	Expenditure on education, % GDP[d]	3.4	94	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	11.3	96	
2.1.3	School life expectancy, years	13.2	69	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	38.0	110	○
2.2	Tertiary education	28.3	85	
2.2.1	Tertiary enrolment, % gross	29.2	80	
2.2.2	Graduates in science & engineering, %	22.2	40	
2.2.3	Tertiary inbound mobility, %	0.4	91	
2.3	Research & development (R&D)	0.1	113	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	107	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**37.0**	**88**	
3.1	Information & communication technologies (ICTs)	47.2	73	
3.1.1	ICT access*	50.4	79	
3.1.2	ICT use*	24.1	86	
3.1.3	Government's online service*	53.5	59	
3.1.4	E-participation*	60.8	45	●
3.2	General infrastructure	21.7	119	
3.2.1	Electricity output, kWh/cap	920.3	92	
3.2.2	Logistics performance*	3.0	62	
3.2.3	Gross capital formation, % GDP	13.6	117	
3.3	Ecological sustainability	42.2	65	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.0	31	●
3.3.2	Environmental performance*	68.1	85	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	94	
4	**Market sophistication**	**40.5**	**85**	
4.1	Credit	38.6	47	●
4.1.1	Ease of getting credit*	80.0	14	●
4.1.2	Domestic credit to private sector, % GDP	43.9	74	
4.1.3	Microfinance gross loans, % GDP	1.6	24	●
4.2	Investment	24.4	115	
4.2.1	Ease of protecting minority investors*	38.3	115	
4.2.2	Market capitalization, % GDP[d]	45.1	36	
4.2.3	Total value of stocks traded, % GDP[d]	0.2	72	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	58.4	75	
4.3.1	Applied tariff rate, weighted mean, %	2.1	52	
4.3.2	Intensity of local competition†	68.8	60	
4.3.3	Domestic market scale, bn PPP$	51.2	93	
5	**Business sophistication**	**28.6**	**83**	
5.1	Knowledge workers	31.6	84	
5.1.1	Knowledge-intensive employment, %[d]	12.1	92	
5.1.2	Firms offering formal training, % firms[d]	61.0	9	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	0.7	88	○
5.1.5	Females employed w/advanced degrees, % total[d]	0.0	88	○
5.2	Innovation linkages	29.7	71	
5.2.1	University/industry research collaboration†	46.8	52	
5.2.2	State of cluster development†	44.5	66	
5.2.3	GERD financed by abroad, %[d]	16.4	28	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	93	
5.3	Knowledge absorption	24.5	88	
5.3.1	Intellectual property payments, % total trade	0.8	39	●
5.3.2	High-tech imports less re-imports, % total trade	9.7	36	●
5.3.3	ICT services imports, % total trade	0.5	95	
5.3.4	FDI net inflows, % GDP	1.9	81	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**10.7**	**123**	○
6.1	Knowledge creation	1.5	126	○
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	87	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	48	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.3	125	○
6.1.5	Citable documents H index	40.0	122	○
6.2	Knowledge impact	6.3	118	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	0.5	87	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	4.6	66	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	24.4	66	
6.3.1	Intellectual property receipts, % total trade	0.2	30	●
6.3.2	High-tech exports less re-exports, % total trade	2.6	46	●
6.3.3	ICT services exports, % total trade	2.0	49	
6.3.4	FDI net outflows, % GDP	0.8	52	
7	**Creative outputs**	**23.7**	**89**	
7.1	Intangible assets	40.8	75	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.9	68	
7.1.3	ICTs & business model creation†	51.0	92	
7.1.4	ICTs & organizational model creation†	48.7	79	
7.2	Creative goods & services	9.8	92	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.0	84	○
7.2.2	National feature films/mn pop. 15–69[d]	0.3	97	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.7	51	
7.3	Online creativity	3.4	87	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.7	71	
7.3.2	Country-code TLDs/th pop. 15–69	0.7	87	
7.3.3	Wikipedia edits/mn pop. 15–69	921.3	76	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Estonia

Key indicators

Population (millions)	1.3
GDP (US$ billions)	22.7
GDP per capita, PPP$	28,591.8
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**51.7**	**24**	
Innovation Output Sub-Index		49.3	14	
Innovation Input Sub-Index		54.2	27	
Innovation Efficiency Ratio		0.9	6	●
Global Innovation Index 2015 (out of 141)		52.8	23	
1	**Institutions**	**81.2**	**21**	
1.1	Political environment	74.9	28	
1.1.1	Political stability & safety*	81.8	31	
1.1.2	Government effectiveness*	68.1	30	
1.2	Regulatory environment	87.0	18	
1.2.1	Regulatory quality*	86.2	14	
1.2.2	Rule of law*	81.1	23	
1.2.3	Cost of redundancy dismissal, salary weeks	12.9	46	
1.3	Business environment	81.6	24	
1.3.1	Ease of starting a business*	95.1	15	
1.3.2	Ease of resolving insolvency*	65.3	37	
1.3.3	Ease of paying taxes*	84.3	27	
2	**Human capital & research**	**41.2**	**37**	
2.1	Education	59.2	25	
2.1.1	Expenditure on education, % GDP	4.8	58	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	27.1	24	
2.1.3	School life expectancy, years	16.5	21	
2.1.4	PISA scales in reading, maths, & science	526.1	7	
2.1.5	Pupil-teacher ratio, secondary[4]	8.4	12	
2.2	Tertiary education	41.4	39	
2.2.1	Tertiary enrolment, % gross	72.9	22	
2.2.2	Graduates in science & engineering, %[4]	22.1	43	
2.2.3	Tertiary inbound mobility, %	2.9	53	
2.3	Research & development (R&D)	23.0	44	
2.3.1	Researchers, FTE/mn pop.	3,270.8	26	
2.3.2	Gross expenditure on R&D, % GDP	1.4	24	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	19.7	53	
3	**Infrastructure**	**61.6**	**14**	
3.1	Information & communication technologies (ICTs)	77.2	17	
3.1.1	ICT access*	78.6	25	
3.1.2	ICT use*	76.6	13	
3.1.3	Government's online service*	77.2	18	
3.1.4	E-participation*	76.5	22	
3.2	General infrastructure	48.7	26	
3.2.1	Electricity output, kWh/cap	9,427.3	15	
3.2.2	Logistics performance*	3.3	38	
3.2.3	Gross capital formation, % GDP	25.6	38	
3.3	Ecological sustainability	59.0	16	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.3	106	○
3.3.2	Environmental performance*	88.6	8	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	13.4	4	●
4	**Market sophistication**	**46.0**	**49**	
4.1	Credit	35.0	55	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	4.3	126	○
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	42.9	37	
4.2.1	Ease of protecting minority investors*	55.0	72	○
4.2.2	Market capitalization, % GDP[4]	10.1	83	○
4.2.3	Total value of stocks traded, % GDP[4]	0.8	59	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.3	6	●
4.3	Trade, competition, & market scale	60.2	68	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	76.8	19	
4.3.3	Domestic market scale, bn PPP$	36.8	98	○
5	**Business sophistication**	**40.7**	**31**	
5.1	Knowledge workers	51.5	30	
5.1.1	Knowledge-intensive employment, %	42.7	19	
5.1.2	Firms offering formal training, % firms	35.2	44	
5.1.3	GERD performed by business, % of GDP	0.6	30	
5.1.4	GERD financed by business, %	37.0	41	
5.1.5	Females employed w/advanced degrees, % total	25.1	8	●
5.2	Innovation linkages	32.1	58	
5.2.1	University/industry research collaboration†	55.9	33	
5.2.2	State of cluster development†	45.9	59	
5.2.3	GERD financed by abroad, %	12.4	40	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.5	33	
5.3	Knowledge absorption	38.6	27	
5.3.1	Intellectual property payments, % total trade	0.3	74	○
5.3.2	High-tech imports less re-imports, % total trade	12.8	18	
5.3.3	ICT services imports, % total trade	2.0	16	
5.3.4	FDI net inflows, % GDP	5.9	22	
5.3.5	Research talent, % in business enterprise	29.0	44	○
6	**Knowledge & technology outputs**	**43.9**	**18**	
6.1	Knowledge creation	29.4	32	
6.1.1	Patents by origin/bn PPP$ GDP	2.2	45	
6.1.2	PCT patent applications/bn PPP$ GDP	1.0	28	
6.1.3	Utility models by origin/bn PPP$ GDP	1.9	14	
6.1.4	Scientific & technical articles/bn PPP$ GDP	44.1	12	
6.1.5	Citable documents H index	162.0	52	
6.2	Knowledge impact	64.9	1	●
6.2.1	Growth rate of PPP$ GDP/worker, %	1.3	57	
6.2.2	New businesses/th pop. 15–64	16.1	4	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	27.9	11	●
6.2.5	High- & medium-high-tech manufactures, %	38.6	24	
6.3	Knowledge diffusion	37.5	28	
6.3.1	Intellectual property receipts, % total trade	0.0	62	○
6.3.2	High-tech exports less re-exports, % total trade	12.5	17	
6.3.3	ICT services exports, % total trade	2.8	31	
6.3.4	FDI net outflows, % GDP	3.2	18	
7	**Creative outputs**	**54.7**	**8**	●
7.1	Intangible assets	59.5	16	
7.1.1	Trademarks by origin/bn PPP$ GDP	77.4	16	
7.1.2	Industrial designs by origin/bn PPP$ GDP	4.2	30	
7.1.3	ICTs & business model creation†	76.9	11	
7.1.4	ICTs & organizational model creation†	77.3	5	●
7.2	Creative goods & services	53.5	4	●
7.2.1	Cultural & creative services exports, % of total trade[4]	1.1	8	
7.2.2	National feature films/mn pop. 15–69	19.2	1	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	2.2	20	
7.2.5	Creative goods exports, % total trade	1.2	37	
7.3	Online creativity	46.2	20	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	9.9	40	
7.3.2	Country-code TLDs/th pop. 15–69	39.1	16	
7.3.3	Wikipedia edits/mn pop. 15–69	7,671.3	11	●
7.3.4	Video uploads on YouTube/pop. 15–69	79.2	6	●

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Ethiopia

Key indicators

Population (millions)	99.4
GDP (US$ billions)	61.6
GDP per capita, PPP$	1,800.7
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**24.8**	**110**	
Innovation Output Sub-Index		22.5	85	
Innovation Input Sub-Index		27.2	124	
Innovation Efficiency Ratio		0.8	18	●
Global Innovation Index 2015 (out of 141)		24.2	127	
1	**Institutions**	**46.2**	**110**	
1.1	Political environment	29.0	114	
1.1.1	Political stability & safety*	32.0	119	
1.1.2	Government effectiveness*	26.0	97	
1.2	Regulatory environment	53.3	100	
1.2.1	Regulatory quality*	20.5	119	
1.2.2	Rule of law*	36.7	88	
1.2.3	Cost of redundancy dismissal, salary weeks	19.1	81	
1.3	Business environment	56.4	109	
1.3.1	Ease of starting a business*	62.5	125	○
1.3.2	Ease of resolving insolvency*	37.8	98	
1.3.3	Ease of paying taxes*	69.0	84	
2	**Human capital & research**	**14.4**	**118**	
2.1	Education	25.7	120	
2.1.1	Expenditure on education, % GDP	4.5	68	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	22.7	45	●
2.1.3	School life expectancy, years[d]	8.4	112	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	38.8	111	○
2.2	Tertiary education	14.1	110	
2.2.1	Tertiary enrolment, % gross	6.3	112	
2.2.2	Graduates in science & engineering, %[d]	11.2	98	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	3.4	82	
2.3.1	Researchers, FTE/mn pop.[d]	45.1	87	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.6	56	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**27.4**	**108**	
3.1	Information & communication technologies (ICTs)	23.5	109	
3.1.1	ICT access*	19.0	122	○
3.1.2	ICT use*	3.8	116	
3.1.3	Government's online service*	45.7	71	●
3.1.4	E-participation*	25.5	104	
3.2	General infrastructure	40.1	47	●
3.2.1	Electricity output, kWh/cap	92.7	116	
3.2.2	Logistics performance*	2.6	98	
3.2.3	Gross capital formation, % GDP	39.5	6	●
3.3	Ecological sustainability	18.7	126	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	2.3	117	○
3.3.2	Environmental performance*	45.8	117	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.0	126	○
4	**Market sophistication**	**26.3**	**126**	○
4.1	Credit	6.9	127	○
4.1.1	Ease of getting credit*	15.0	121	
4.1.2	Domestic credit to private sector, % GDP[d]	17.7	111	
4.1.3	Microfinance gross loans, % GDP	0.0	70	
4.2	Investment	23.9	120	
4.2.1	Ease of protecting minority investors*	35.0	121	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	78	
4.3	Trade, competition, & market scale	48.2	109	
4.3.1	Applied tariff rate, weighted mean, %[d]	10.0	117	
4.3.2	Intensity of local competition†	54.6	115	
4.3.3	Domestic market scale, bn PPP$	145.1	66	●
5	**Business sophistication**	**21.6**	**115**	
5.1	Knowledge workers	14.1	120	
5.1.1	Knowledge-intensive employment, %[d]	3.8	102	
5.1.2	Firms offering formal training, % firms[d]	30.0	59	
5.1.3	GERD performed by business, % of GDP[d]	0.0	81	
5.1.4	GERD financed by business, %[d]	0.7	87	
5.1.5	Females employed w/advanced degrees, % total[d]	6.0	75	
5.2	Innovation linkages	24.6	85	
5.2.1	University/industry research collaboration†	41.0	75	
5.2.2	State of cluster development†	38.2	94	
5.2.3	GERD financed by abroad, %[d]	2.1	78	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	26.1	77	
5.3.1	Intellectual property payments, % total trade[d]	0.0	108	
5.3.2	High-tech imports less re-imports, % total trade	14.3	14	●
5.3.3	ICT services imports, % total trade[d]	1.6	29	●
5.3.4	FDI net inflows, % GDP	2.2	75	
5.3.5	Research talent, % in business enterprise[d]	0.5	79	
6	**Knowledge & technology outputs**	**17.1**	**107**	
6.1	Knowledge creation	8.0	74	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.7	80	
6.1.5	Citable documents H index	88.0	86	
6.2	Knowledge impact	37.2	58	●
6.2.1	Growth rate of PPP$ GDP/worker, %	5.4	3	●
6.2.2	New businesses/th pop. 15–64[d]	0.0	106	○
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.6	116	
6.2.5	High- & medium-high-tech manufactures, %[d]	10.9	75	
6.3	Knowledge diffusion	6.2	124	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	89	
6.3.2	High-tech exports less re-exports, % total trade	0.2	96	
6.3.3	ICT services exports, % total trade[d]	1.7	60	●
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**27.8**	**69**	●
7.1	Intangible assets	42.7	67	●
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	43.7	113	
7.1.4	ICTs & organizational model creation†	41.8	104	
7.2	Creative goods & services	25.7	52	●
7.2.1	Cultural & creative services exports, % of total trade	0.0	79	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	2.7	10	●
7.2.5	Creative goods exports, % total trade	0.0	104	
7.3	Online creativity	0.0	126	○
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.0	128	○
7.3.2	Country-code TLDs/th pop. 15–69	0.0	125	○
7.3.3	Wikipedia edits/mn pop. 15–69	23.9	118	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Finland

Key indicators

Population (millions)	5.5
GDP (US$ billions)	229.7
GDP per capita, PPP$	41,120.0
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**59.9**	**5**	
Innovation Output Sub-Index		51.3	10	
Innovation Input Sub-Index		68.5	4	
Innovation Efficiency Ratio		0.7	32	
Global Innovation Index 2015 (out of 141)		60.0	6	
1	**Institutions**	**94.3**	**2**	●
1.1	Political environment	94.9	4	
1.1.1	Political stability & safety*	94.8	4	
1.1.2	Government effectiveness*	95.1	3	●
1.2	Regulatory environment	95.9	5	
1.2.1	Regulatory quality*	91.9	4	
1.2.2	Rule of law*	100.0	1	●
1.2.3	Cost of redundancy dismissal, salary weeks	10.1	34	
1.3	Business environment	92.1	1	●
1.3.1	Ease of starting a business*	93.1	31	
1.3.2	Ease of resolving insolvency*	93.8	1	●
1.3.3	Ease of paying taxes*	89.4	16	
2	**Human capital & research**	**68.1**	**1**	●
2.1	Education	72.3	5	
2.1.1	Expenditure on education, % GDP	7.2	9	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	34.7	12	
2.1.3	School life expectancy, years	19.3	3	●
2.1.4	PISA scales in reading, maths, & science	529.4	6	
2.1.5	Pupil-teacher ratio, secondary[d]	12.7	46	○
2.2	Tertiary education	57.2	9	
2.2.1	Tertiary enrolment, % gross	91.1	3	●
2.2.2	Graduates in science & engineering, %	27.9	14	
2.2.3	Tertiary inbound mobility, %	7.1	24	
2.3	Research & development (R&D)	74.9	8	
2.3.1	Researchers, FTE/mn pop.	6,985.9	3	●
2.3.2	Gross expenditure on R&D, % GDP	3.2	4	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	1,278.5	12	
2.3.4	QS university ranking, average score top 3*	60.8	18	
3	**Infrastructure**	**60.0**	**17**	
3.1	Information & communication technologies (ICTs)	77.0	19	
3.1.1	ICT access*	78.1	28	
3.1.2	ICT use*	82.1	7	
3.1.3	Government's online service*	77.2	18	
3.1.4	E-participation*	70.6	24	
3.2	General infrastructure	51.3	16	
3.2.1	Electricity output, kWh/cap	12,460.1	9	
3.2.2	Logistics performance*	3.6	23	
3.2.3	Gross capital formation, % GDP	20.3	82	○
3.3	Ecological sustainability	51.7	31	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.1	96	○
3.3.2	Environmental performance*	90.7	1	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.8	15	
4	**Market sophistication**	**62.7**	**12**	
4.1	Credit	50.6	24	
4.1.1	Ease of getting credit*	65.0	39	○
4.1.2	Domestic credit to private sector, % GDP	93.7	29	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	71.1	8	
4.2.1	Ease of protecting minority investors*	56.7	62	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.5	1	●
4.3	Trade, competition, & market scale	66.5	48	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	62.6	85	○
4.3.3	Domestic market scale, bn PPP$	221.7	58	○
5	**Business sophistication**	**57.3**	**4**	
5.1	Knowledge workers	70.5	4	
5.1.1	Knowledge-intensive employment, %	45.2	12	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	2.1	4	
5.1.4	GERD financed by business, %	53.5	16	
5.1.5	Females employed w/advanced degrees, % total	26.0	7	
5.2	Innovation linkages	51.7	7	
5.2.1	University/industry research collaboration†	82.8	1	●
5.2.2	State of cluster development†	65.1	16	
5.2.3	GERD financed by abroad, %	17.3	26	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	23	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	8.4	3	●
5.3	Knowledge absorption	49.8	10	
5.3.1	Intellectual property payments, % total trade[d]	1.9	9	
5.3.2	High-tech imports less re-imports, % total trade	7.6	63	○
5.3.3	ICT services imports, % total trade[d]	3.2	7	
5.3.4	FDI net inflows, % GDP	5.4	26	
5.3.5	Research talent, % in business enterprise	55.8	17	
6	**Knowledge & technology outputs**	**52.1**	**7**	
6.1	Knowledge creation	64.3	8	
6.1.1	Patents by origin/bn PPP$ GDP	16.3	7	
6.1.2	PCT patent applications/bn PPP$ GDP	7.1	6	
6.1.3	Utility models by origin/bn PPP$ GDP	1.9	15	
6.1.4	Scientific & technical articles/bn PPP$ GDP	54.2	5	
6.1.5	Citable documents H index	443.0	18	
6.2	Knowledge impact	41.7	41	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.4	80	○
6.2.2	New businesses/th pop. 15–64	3.4	34	
6.2.3	Computer software spending, % GDP	0.6	18	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	12.0	32	
6.2.5	High- & medium-high-tech manufactures, %	34.9	29	
6.3	Knowledge diffusion	50.2	10	
6.3.1	Intellectual property receipts, % total trade[d]	3.2	1	●
6.3.2	High-tech exports less re-exports, % total trade	5.0	33	
6.3.3	ICT services exports, % total trade[d]	5.7	8	
6.3.4	FDI net outflows, % GDP[d]	(0.1)	102	○
7	**Creative outputs**	**50.6**	**14**	
7.1	Intangible assets	58.7	17	
7.1.1	Trademarks by origin/bn PPP$ GDP	52.3	40	
7.1.2	Industrial designs by origin/bn PPP$ GDP	5.7	25	
7.1.3	ICTs & business model creation†	82.5	1	●
7.1.4	ICTs & organizational model creation†	79.2	3	●
7.2	Creative goods & services	34.2	30	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.3	32	
7.2.2	National feature films/mn pop. 15–69	12.6	8	
7.2.3	Global ent. & media market/th pop. 15–69	57.9	9	
7.2.4	Printing & publishing manufactures, %	1.4	42	○
7.2.5	Creative goods exports, % total trade	0.7	50	
7.3	Online creativity	50.6	17	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	31.1	21	
7.3.2	Country-code TLDs/th pop. 15–69	34.9	19	
7.3.3	Wikipedia edits/mn pop. 15–69	8,836.0	7	
7.3.4	Video uploads on YouTube/pop. 15–69	71.1	9	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

France

Key indicators

Population (millions)	64.4
GDP (US$ billions)	2,421.6
GDP per capita, PPP$	41,180.7
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**54.0**	**18**	
Innovation Output Sub-Index		45.5	19	
Innovation Input Sub-Index		62.6	15	
Innovation Efficiency Ratio		0.7	44	
Global Innovation Index 2015 (out of 141)		53.6	21	
1	**Institutions**	**80.4**	**26**	
1.1	Political environment	74.9	29	
1.1.1	Political stability & safety*	71.7	46	
1.1.2	Government effectiveness*	78.0	21	
1.2	Regulatory environment	85.0	21	
1.2.1	Regulatory quality*	71.6	29	
1.2.2	Rule of law*	83.7	21	
1.2.3	Cost of redundancy dismissal, salary weeks	11.8	44	
1.3	Business environment	81.2	25	
1.3.1	Ease of starting a business*	93.1	30	
1.3.2	Ease of resolving insolvency*	76.1	22	
1.3.3	Ease of paying taxes*	74.3	68	○
2	**Human capital & research**	**58.9**	**11**	●
2.1	Education	57.7	31	
2.1.1	Expenditure on education, % GDP	5.5	35	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	26.9	26	
2.1.3	School life expectancy, years	16.2	28	
2.1.4	PISA scales in reading, maths, & science	499.8	20	
2.1.5	Pupil-teacher ratio, secondary[d]	12.9	48	
2.2	Tertiary education	51.1	16	
2.2.1	Tertiary enrolment, % gross	62.1	39	
2.2.2	Graduates in science & engineering, %	24.5	31	
2.2.3	Tertiary inbound mobility, %	10.2	13	
2.3	Research & development (R&D)	67.9	11	●
2.3.1	Researchers, FTE/mn pop.	4,201.1	18	
2.3.2	Gross expenditure on R&D, % GDP	2.3	13	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	3,032.3	6	●
2.3.4	QS university ranking, average score top 3*	78.7	10	●
3	**Infrastructure**	**63.7**	**8**	●
3.1	Information & communication technologies (ICTs)	89.0	5	●
3.1.1	ICT access*	87.7	12	
3.1.2	ICT use*	72.3	19	
3.1.3	Government's online service*	100.0	1	●
3.1.4	E-participation*	96.1	4	●
3.2	General infrastructure	50.3	23	
3.2.1	Electricity output, kWh/cap	8,418.4	19	
3.2.2	Logistics performance*	3.8	13	
3.2.3	Gross capital formation, % GDP	21.7	69	○
3.3	Ecological sustainability	51.6	34	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.5	48	
3.3.2	Environmental performance*	88.2	10	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.2	28	
4	**Market sophistication**	**61.9**	**15**	
4.1	Credit	43.3	38	
4.1.1	Ease of getting credit*	50.0	69	○
4.1.2	Domestic credit to private sector, % GDP	94.9	28	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	60.0	14	
4.2.1	Ease of protecting minority investors*	65.0	28	
4.2.2	Market capitalization, % GDP	73.7	22	
4.2.3	Total value of stocks traded, % GDP	41.5	19	
4.2.4	Venture capital deals/bn PPP$ GDP	0.3	1	●
4.3	Trade, competition, & market scale	82.3	6	●
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	75.3	28	
4.3.3	Domestic market scale, bn PPP$	2,591.2	9	●
5	**Business sophistication**	**48.0**	**16**	
5.1	Knowledge workers	62.8	14	
5.1.1	Knowledge-intensive employment, %	44.0	15	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.5	14	
5.1.4	GERD financed by business, %[d]	55.0	14	
5.1.5	Females employed w/advanced degrees, % total	20.4	23	
5.2	Innovation linkages	37.6	39	
5.2.1	University/industry research collaboration†	59.7	28	
5.2.2	State of cluster development†	57.6	25	
5.2.3	GERD financed by abroad, %[d]	8.0	49	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	39	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	3.5	11	
5.3	Knowledge absorption	43.6	17	
5.3.1	Intellectual property payments, % total trade	1.2	21	
5.3.2	High-tech imports less re-imports, % total trade	11.1	25	
5.3.3	ICT services imports, % total trade	2.3	12	
5.3.4	FDI net inflows, % GDP	0.3	118	○
5.3.5	Research talent, % in business enterprise	60.4	11	
6	**Knowledge & technology outputs**	**41.3**	**21**	
6.1	Knowledge creation	36.7	24	
6.1.1	Patents by origin/bn PPP$ GDP	9.7	15	
6.1.2	PCT patent applications/bn PPP$ GDP	3.2	13	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	55	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	25.3	32	
6.1.5	Citable documents H index	811.0	4	●
6.2	Knowledge impact	42.2	39	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.1)	90	○
6.2.2	New businesses/th pop. 15–64	2.3	46	○
6.2.3	Computer software spending, % GDP	0.6	12	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	11.2	33	
6.2.5	High- & medium-high-tech manufactures, %	43.9	13	
6.3	Knowledge diffusion	45.0	17	
6.3.1	Intellectual property receipts, % total trade	1.4	13	
6.3.2	High-tech exports less re-exports, % total trade	13.9	12	
6.3.3	ICT services exports, % total trade	2.1	44	
6.3.4	FDI net outflows, % GDP	1.1	47	
7	**Creative outputs**	**49.8**	**15**	
7.1	Intangible assets	61.7	12	
7.1.1	Trademarks by origin/bn PPP$ GDP	106.5	10	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	8.3	16	
7.1.3	ICTs & business model creation†	69.2	27	
7.1.4	ICTs & organizational model creation†	65.4	25	
7.2	Creative goods & services	38.0	22	
7.2.1	Cultural & creative services exports, % of total trade[d]	1.1	7	●
7.2.2	National feature films/mn pop. 15–69	6.2	29	
7.2.3	Global ent. & media market/th pop. 15–69	53.0	13	
7.2.4	Printing & publishing manufactures, %	1.1	58	○
7.2.5	Creative goods exports, % total trade	1.6	29	
7.3	Online creativity	37.6	25	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	43.9	18	
7.3.2	Country-code TLDs/th pop. 15–69	23.9	27	
7.3.3	Wikipedia edits/mn pop. 15–69	4,814.5	27	
7.3.4	Video uploads on YouTube/pop. 15–69	46.9	22	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Georgia

Key indicators

Population (millions)	4.0
GDP (US$ billions)	14.0
GDP per capita, PPP$	9,630.0
Income group	Lower-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.9**	**64**	
Innovation Output Sub-Index		26.7	60	
Innovation Input Sub-Index		41.0	67	
Innovation Efficiency Ratio		0.7	67	
Global Innovation Index 2015 (out of 141)		33.8	73	
1	**Institutions**	**69.2**	**44**	
1.1	Political environment	54.8	54	
1.1.1	Political stability & safety*	57.1	81	
1.1.2	Government effectiveness*	52.5	43	
1.2	Regulatory environment	79.3	30	
1.2.1	Regulatory quality*	67.7	34	
1.2.2	Rule of law*	52.2	52	
1.2.3	Cost of redundancy dismissal, salary weeks	8.6	19	●
1.3	Business environment	73.6	56	
1.3.1	Ease of starting a business*	97.8	6	●
1.3.2	Ease of resolving insolvency*	40.2	89	
1.3.3	Ease of paying taxes*	82.8	35	
2	**Human capital & research**	**23.2**	**91**	
2.1	Education	39.9	88	
2.1.1	Expenditure on education, % GDP	2.0	115	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	15.5	78	
2.1.3	School life expectancy, years	14.9	48	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	7.2	1	●
2.2	Tertiary education	27.7	88	
2.2.1	Tertiary enrolment, % gross	39.2	65	
2.2.2	Graduates in science & engineering, %	16.7	75	
2.2.3	Tertiary inbound mobility, %	2.8	56	
2.3	Research & development (R&D)	2.1	91	
2.3.1	Researchers, FTE/mn pop.	585.4	58	
2.3.2	Gross expenditure on R&D, % GDP	0.1	103	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**41.7**	**69**	
3.1	Information & communication technologies (ICTs)	52.8	58	
3.1.1	ICT access*	62.0	63	
3.1.2	ICT use*	30.3	77	
3.1.3	Government's online service*	59.8	49	
3.1.4	E-participation*	58.8	49	
3.2	General infrastructure	35.0	64	
3.2.1	Electricity output, kWh/cap	2,240.3	75	
3.2.2	Logistics performance*	2.5	106	
3.2.3	Gross capital formation, % GDP	32.3	12	●
3.3	Ecological sustainability	37.5	87	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.1	69	
3.3.2	Environmental performance*	65.0	94	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.7	49	
4	**Market sophistication**	**44.3**	**55**	
4.1	Credit	41.5	41	
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	45.2	72	
4.1.3	Microfinance gross loans, % GDP	1.9	17	
4.2	Investment	34.7	72	
4.2.1	Ease of protecting minority investors*	68.3	20	●
4.2.2	Market capitalization, % GDP◴	6.0	86	○
4.2.3	Total value of stocks traded, % GDP◴	0.0	82	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	56.8	80	
4.3.1	Applied tariff rate, weighted mean, %◴	0.7	5	●
4.3.2	Intensity of local competition†	62.3	87	
4.3.3	Domestic market scale, bn PPP$	34.3	101	
5	**Business sophistication**	**26.5**	**90**	
5.1	Knowledge workers	26.5	95	
5.1.1	Knowledge-intensive employment, %◴	22.2	62	
5.1.2	Firms offering formal training, % firms	10.5	91	○
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	14.8	42	
5.2	Innovation linkages	22.2	102	
5.2.1	University/industry research collaboration†	27.3	117	○
5.2.2	State of cluster development†	33.7	109	○
5.2.3	GERD financed by abroad, %	14.3	30	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	70	
5.3	Knowledge absorption	31.0	52	
5.3.1	Intellectual property payments, % total trade	0.2	79	
5.3.2	High-tech imports less re-imports, % total trade	7.6	62	
5.3.3	ICT services imports, % total trade	0.5	92	
5.3.4	FDI net inflows, % GDP	10.0	10	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**26.8**	**56**	
6.1	Knowledge creation	18.1	48	
6.1.1	Patents by origin/bn PPP$ GDP	3.2	35	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	53	
6.1.3	Utility models by origin/bn PPP$ GDP	1.5	19	
6.1.4	Scientific & technical articles/bn PPP$ GDP	16.8	45	
6.1.5	Citable documents H index	101.0	78	
6.2	Knowledge impact	43.6	33	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.8	8	●
6.2.2	New businesses/th pop. 15–64	5.7	22	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.4	72	
6.2.5	High- & medium-high-tech manufactures, %	12.1	72	
6.3	Knowledge diffusion	18.9	102	
6.3.1	Intellectual property receipts, % total trade	0.0	79	
6.3.2	High-tech exports less re-exports, % total trade	0.3	87	
6.3.3	ICT services exports, % total trade	0.7	89	
6.3.4	FDI net outflows, % GDP	1.2	42	
7	**Creative outputs**	**26.6**	**76**	
7.1	Intangible assets	34.7	99	
7.1.1	Trademarks by origin/bn PPP$ GDP	45.4	52	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.5	46	
7.1.3	ICTs & business model creation†	49.5	98	
7.1.4	ICTs & organizational model creation†	40.3	107	○
7.2	Creative goods & services	31.5	39	
7.2.1	Cultural & creative services exports, % of total trade	0.1	50	
7.2.2	National feature films/mn pop. 15–69	3.1	47	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	3.5	4	●
7.2.5	Creative goods exports, % total trade	0.0	103	
7.3	Online creativity	5.4	74	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.9	83	
7.3.2	Country-code TLDs/th pop. 15–69	2.5	64	
7.3.3	Wikipedia edits/mn pop. 15–69	1,586.9	60	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Germany

Key indicators

Population (millions)	80.7
GDP (US$ billions)	3,357.6
GDP per capita, PPP$	46,893.2
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**57.9**	**10**	
Innovation Output Sub-Index		54.0	8	
Innovation Input Sub-Index		61.9	18	
Innovation Efficiency Ratio		0.9	9	
Global Innovation Index 2015 (out of 141)		57.1	12	
1	**Institutions**	**84.1**	**18**	
1.1	Political environment	86.6	15	
1.1.1	Political stability & safety*	86.1	24	
1.1.2	Government effectiveness*	87.2	12	
1.2	Regulatory environment	81.6	24	
1.2.1	Regulatory quality*	86.7	13	
1.2.2	Rule of law*	93.3	15	
1.2.3	Cost of redundancy dismissal, salary weeks	21.6	90	○
1.3	Business environment	84.1	19	
1.3.1	Ease of starting a business*	83.4	81	○
1.3.2	Ease of resolving insolvency*	91.9	3	●
1.3.3	Ease of paying taxes*	77.0	59	
2	**Human capital & research**	**58.9**	**10**	
2.1	Education	56.9	35	
2.1.1	Expenditure on education, % GDP	4.9	52	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	23.2	40	
2.1.3	School life expectancy, years	17.0	16	
2.1.4	PISA scales in reading, maths, & science	515.1	13	
2.1.5	Pupil-teacher ratio, secondary[d]	12.6	44	
2.2	Tertiary education	46.0	29	
2.2.1	Tertiary enrolment, % gross	61.1	42	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	7.1	25	
2.3	Research & development (R&D)	74.0	9	
2.3.1	Researchers, FTE/mn pop.	4,459.5	16	
2.3.2	Gross expenditure on R&D, % GDP	2.8	9	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	7,304.7	1	●
2.3.4	QS university ranking, average score top 3*	76.0	11	
3	**Infrastructure**	**58.5**	**22**	
3.1	Information & communication technologies (ICTs)	74.9	21	
3.1.1	ICT access*	92.2	5	●
3.1.2	ICT use*	69.8	21	
3.1.3	Government's online service*	66.9	34	
3.1.4	E-participation*	70.6	24	
3.2	General infrastructure	49.8	24	
3.2.1	Electricity output, kWh/cap	7,389.6	24	
3.2.2	Logistics performance*	4.1	1	●
3.2.3	Gross capital formation, % GDP	18.8	93	○
3.3	Ecological sustainability	50.8	39	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.8	36	
3.3.2	Environmental performance*	84.3	30	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.1	45	
4	**Market sophistication**	**59.7**	**16**	
4.1	Credit	50.2	25	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	79.6	36	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	42.8	38	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	44.9	37	
4.2.3	Total value of stocks traded, % GDP	34.8	22	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	17	
4.3	Trade, competition, & market scale	86.0	4	●
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	82.8	6	
4.3.3	Domestic market scale, bn PPP$	3,748.1	5	●
5	**Business sophistication**	**48.3**	**15**	
5.1	Knowledge workers	63.2	11	
5.1.1	Knowledge-intensive employment, %	43.5	17	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.9	9	
5.1.4	GERD financed by business, %[d]	65.4	6	
5.1.5	Females employed w/advanced degrees, % total	12.4	53	○
5.2	Innovation linkages	44.8	20	
5.2.1	University/industry research collaboration†	72.3	10	
5.2.2	State of cluster development†	74.4	3	●
5.2.3	GERD financed by abroad, %[d]	5.2	65	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	47	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	5.9	7	
5.3	Knowledge absorption	36.9	31	
5.3.1	Intellectual property payments, % total trade	0.5	56	
5.3.2	High-tech imports less re-imports, % total trade	10.9	26	
5.3.3	ICT services imports, % total trade	1.6	30	
5.3.4	FDI net inflows, % GDP	0.2	121	○
5.3.5	Research talent, % in business enterprise	56.8	15	
6	**Knowledge & technology outputs**	**51.6**	**8**	
6.1	Knowledge creation	66.4	6	
6.1.1	Patents by origin/bn PPP$ GDP	19.7	1	●
6.1.2	PCT patent applications/bn PPP$ GDP	4.7	10	
6.1.3	Utility models by origin/bn PPP$ GDP	2.9	9	
6.1.4	Scientific & technical articles/bn PPP$ GDP	25.7	31	
6.1.5	Citable documents H index	887.0	3	●
6.2	Knowledge impact	45.7	26	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.8	71	○
6.2.2	New businesses/th pop. 15–64[d]	1.3	60	○
6.2.3	Computer software spending, % GDP	0.5	19	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	14.8	27	
6.2.5	High- & medium-high-tech manufactures, %	54.7	7	
6.3	Knowledge diffusion	42.7	19	
6.3.1	Intellectual property receipts, % total trade	0.8	14	
6.3.2	High-tech exports less re-exports, % total trade	13.0	15	
6.3.3	ICT services exports, % total trade	1.8	54	
6.3.4	FDI net outflows, % GDP	3.1	20	
7	**Creative outputs**	**56.3**	**7**	
7.1	Intangible assets	65.1	8	
7.1.1	Trademarks by origin/bn PPP$ GDP	65.3	28	
7.1.2	Industrial designs by origin/bn PPP$ GDP	18.1	5	●
7.1.3	ICTs & business model creation†	73.0	21	
7.1.4	ICTs & organizational model creation†	70.1	18	
7.2	Creative goods & services	34.4	29	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.6	21	
7.2.2	National feature films/mn pop. 15–69	3.9	41	
7.2.3	Global ent. & media market/th pop. 15–69	57.0	10	
7.2.4	Printing & publishing manufactures, %	1.2	52	○
7.2.5	Creative goods exports, % total trade	2.0	24	
7.3	Online creativity	60.5	10	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	59.1	13	
7.3.2	Country-code TLDs/th pop. 15–69	100.0	1	●
7.3.3	Wikipedia edits/mn pop. 15–69	5,952.1	19	
7.3.4	Video uploads on YouTube/pop. 15–69	38.8	28	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Ghana

Key indicators

Population (millions)	27.4
GDP (US$ billions)	36.0
GDP per capita, PPP$	4,266.2
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.7**	**102**	
Innovation Output Sub-Index		19.9	100	
Innovation Input Sub-Index		33.4	103	
Innovation Efficiency Ratio		0.6	88	
Global Innovation Index 2015 (out of 141)		28.0	108	
1	**Institutions**	**45.3**	**114**	
1.1	Political environment	45.5	78	
1.1.1	Political stability & safety*	59.6	76	
1.1.2	Government effectiveness*	31.5	83	
1.2	Regulatory environment	31.5	123	○
1.2.1	Regulatory quality*	43.8	74	
1.2.2	Rule of law*	47.6	60	
1.2.3	Cost of redundancy dismissal, salary weeks	49.8	123	○
1.3	Business environment	59.0	101	
1.3.1	Ease of starting a business*	83.7	77	
1.3.2	Ease of resolving insolvency*	21.9	124	○
1.3.3	Ease of paying taxes*	71.2	80	
2	**Human capital & research**	**25.7**	**85**	
2.1	Education	49.8	58	
2.1.1	Expenditure on education, % GDP	5.9	27	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	31.6	15	●
2.1.3	School life expectancy, years	11.4	93	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	15.8	70	
2.2	Tertiary education	24.7	93	
2.2.1	Tertiary enrolment, % gross	15.6	98	
2.2.2	Graduates in science & engineering, %	17.6	68	
2.2.3	Tertiary inbound mobility, %	3.9	43	●
2.3	Research & development (R&D)	2.6	86	
2.3.1	Researchers, FTE/mn pop.[4]	38.7	89	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.4	69	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	2.3	72	
3	**Infrastructure**	**33.3**	**96**	
3.1	Information & communication technologies (ICTs)	35.6	93	
3.1.1	ICT access*	45.1	86	
3.1.2	ICT use*	26.4	85	
3.1.3	Government's online service*	31.5	94	
3.1.4	E-participation*	39.2	80	
3.2	General infrastructure	26.3	98	
3.2.1	Electricity output, kWh/cap	496.8	104	
3.2.2	Logistics performance*	2.6	95	
3.2.3	Gross capital formation, % GDP	23.8	52	●
3.3	Ecological sustainability	38.1	86	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.9	33	●
3.3.2	Environmental performance*	58.9	103	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	108	
4	**Market sophistication**	**36.3**	**101**	
4.1	Credit	30.1	76	
4.1.1	Ease of getting credit*	65.0	39	●
4.1.2	Domestic credit to private sector, % GDP	19.9	109	
4.1.3	Microfinance gross loans, % GDP	1.5	25	●
4.2	Investment	30.0	92	
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP[4]	10.3	82	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	70	
4.3	Trade, competition, & market scale	48.8	108	
4.3.1	Applied tariff rate, weighted mean, %	10.0	117	
4.3.2	Intensity of local competition†	63.1	84	
4.3.3	Domestic market scale, bn PPP$	108.5	73	
5	**Business sophistication**	**26.2**	**92**	
5.1	Knowledge workers	20.9	111	
5.1.1	Knowledge-intensive employment, %[4]	9.6	95	
5.1.2	Firms offering formal training, % firms	40.1	39	●
5.1.3	GERD performed by business, % of GDP[4]	0.0	85	○
5.1.4	GERD financed by business, %[4]	0.1	92	○
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	31.3	62	
5.2.1	University/industry research collaboration†	41.0	74	
5.2.2	State of cluster development†	43.7	71	
5.2.3	GERD financed by abroad, %[4]	31.2	14	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	48	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[4]	0.0	104	
5.3	Knowledge absorption	26.3	76	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade[4]	5.1	96	
5.3.3	ICT services imports, % total trade	n/a	n/a	
5.3.4	FDI net inflows, % GDP	8.7	13	●
5.3.5	Research talent, % in business enterprise[4]	1.0	75	
6	**Knowledge & technology outputs**	**20.3**	**87**	
6.1	Knowledge creation	6.2	84	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	93	○
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	8.1	70	
6.1.5	Citable documents H index	92.0	84	
6.2	Knowledge impact	30.4	89	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.1	62	
6.2.2	New businesses/th pop. 15–64[4]	0.9	76	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.5	119	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	24.1	69	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade[4]	0.3	86	
6.3.3	ICT services exports, % total trade	n/a	n/a	
6.3.4	FDI net outflows, % GDP[4]	0.0	93	
7	**Creative outputs**	**19.6**	**104**	
7.1	Intangible assets	37.8	86	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP[4]	0.0	108	○
7.1.3	ICTs & business model creation†	51.9	85	
7.1.4	ICTs & organizational model creation†	42.6	96	
7.2	Creative goods & services	2.4	114	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade[4]	0.1	88	
7.3	Online creativity	0.5	108	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	101	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	128	○
7.3.3	Wikipedia edits/mn pop. 15–69	101.7	108	
7.3.4	Video uploads on YouTube/pop. 15–69	0.6	72	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Greece

Key indicators

Population (millions)	11.0
GDP (US$ billions)	195.3
GDP per capita, PPP$	26,448.7
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**39.8**	**40**	
Innovation Output Sub-Index		30.1	49	
Innovation Input Sub-Index		49.4	37	
Innovation Efficiency Ratio		0.6	84	
Global Innovation Index 2015 (out of 141)		40.3	45	
1	**Institutions**	**67.1**	**51**	
1.1	Political environment	56.7	49	
1.1.1	Political stability & safety*	63.5	65	
1.1.2	Government effectiveness*	50.0	46	
1.2	Regulatory environment	69.4	52	
1.2.1	Regulatory quality*	53.3	57	
1.2.2	Rule of law*	55.7	48	
1.2.3	Cost of redundancy dismissal, salary weeks	15.9	68	
1.3	Business environment	75.1	49	
1.3.1	Ease of starting a business*	90.7	44	
1.3.2	Ease of resolving insolvency*	56.3	51	
1.3.3	Ease of paying taxes*	78.5	56	
2	**Human capital & research**	**55.3**	**18**	●
2.1	Education	76.8	3	●
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	17.2	14	●
2.1.4	PISA scales in reading, maths, & science	465.6	39	
2.1.5	Pupil-teacher ratio, secondary[d]	7.9	5	●
2.2	Tertiary education	58.7	7	●
2.2.1	Tertiary enrolment, % gross	110.2	1	●
2.2.2	Graduates in science & engineering, %[d]	28.7	9	●
2.2.3	Tertiary inbound mobility, %	4.2	36	
2.3	Research & development (R&D)	30.3	36	
2.3.1	Researchers, FTE/mn pop.	2,699.3	31	
2.3.2	Gross expenditure on R&D, % GDP	0.8	39	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	30.3	43	
2.3.4	QS university ranking, average score top 3*	31.5	43	
3	**Infrastructure**	**48.6**	**46**	
3.1	Information & communication technologies (ICTs)	67.2	33	
3.1.1	ICT access*	77.1	33	
3.1.2	ICT use*	50.5	49	
3.1.3	Government's online service*	60.6	47	
3.1.4	E-participation*	80.4	17	●
3.2	General infrastructure	24.9	105	○
3.2.1	Electricity output, kWh/cap	4,329.5	47	
3.2.2	Logistics performance*	3.2	42	
3.2.3	Gross capital formation, % GDP	9.0	124	○
3.3	Ecological sustainability	53.7	25	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.1	26	
3.3.2	Environmental performance*	85.8	21	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.2	29	
4	**Market sophistication**	**49.0**	**41**	
4.1	Credit	47.8	28	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	116.9	20	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	30.1	91	
4.2.1	Ease of protecting minority investors*	61.7	45	
4.2.2	Market capitalization, % GDP	23.4	59	
4.2.3	Total value of stocks traded, % GDP	14.3	30	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	59	
4.3	Trade, competition, & market scale	69.1	39	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	67.8	66	
4.3.3	Domestic market scale, bn PPP$	285.3	50	
5	**Business sophistication**	**27.2**	**87**	
5.1	Knowledge workers	38.5	63	
5.1.1	Knowledge-intensive employment, %	30.6	45	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.3	46	
5.1.4	GERD financed by business, %	30.0	51	
5.1.5	Females employed w/advanced degrees, % total	16.5	34	
5.2	Innovation linkages	22.4	98	○
5.2.1	University/industry research collaboration†	34.4	101	○
5.2.2	State of cluster development†	32.5	114	○
5.2.3	GERD financed by abroad, %	13.3	33	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	41	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.4	38	
5.3	Knowledge absorption	20.6	97	○
5.3.1	Intellectual property payments, % total trade	0.6	45	
5.3.2	High-tech imports less re-imports, % total trade	5.7	85	
5.3.3	ICT services imports, % total trade	1.2	50	
5.3.4	FDI net inflows, % GDP	0.7	107	○
5.3.5	Research talent, % in business enterprise	16.6	58	
6	**Knowledge & technology outputs**	**24.9**	**62**	
6.1	Knowledge creation	17.6	49	
6.1.1	Patents by origin/bn PPP$ GDP	2.6	41	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	39	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	53	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	33.6	21	●
6.1.5	Citable documents H index	326.0	29	
6.2	Knowledge impact	35.8	65	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.0	89	○
6.2.2	New businesses/th pop. 15–64[d]	0.8	79	○
6.2.3	Computer software spending, % GDP	0.6	13	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	19.1	19	●
6.2.5	High- & medium-high-tech manufactures, %	12.1	71	○
6.3	Knowledge diffusion	21.4	84	
6.3.1	Intellectual property receipts, % total trade	0.2	41	
6.3.2	High-tech exports less re-exports, % total trade	1.9	52	
6.3.3	ICT services exports, % total trade	1.6	63	
6.3.4	FDI net outflows, % GDP	0.4	67	
7	**Creative outputs**	**35.3**	**45**	
7.1	Intangible assets	42.2	68	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	4.3	29	
7.1.3	ICTs & business model creation†	50.5	93	○
7.1.4	ICTs & organizational model creation†	43.5	94	○
7.2	Creative goods & services	29.1	46	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.6	19	
7.2.2	National feature films/mn pop. 15–69	8.9	16	●
7.2.3	Global ent. & media market/th pop. 15–69	16.6	28	
7.2.4	Printing & publishing manufactures, %	1.3	50	
7.2.5	Creative goods exports, % total trade	1.0	38	
7.3	Online creativity	27.6	33	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	13.1	36	
7.3.2	Country-code TLDs/th pop. 15–69	19.5	32	
7.3.3	Wikipedia edits/mn pop. 15–69	4,568.8	31	
7.3.4	Video uploads on YouTube/pop. 15–69	44.1	26	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Guatemala

Key indicators

Population (millions)	16.3
GDP (US$ billions)	63.9
GDP per capita, PPP$	7,737.6
Income group	Lower-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.3**	**97**	
Innovation Output Sub-Index		20.9	93	
Innovation Input Sub-Index		33.7	101	
Innovation Efficiency Ratio		0.6	79	
Global Innovation Index 2015 (out of 141)		28.8	101	
1	**Institutions**	**48.0**	**102**	
1.1	Political environment	33.0	106	
1.1.1	Political stability & safety*	46.9	95	
1.1.2	Government effectiveness*	19.2	107	
1.2	Regulatory environment	46.9	110	
1.2.1	Regulatory quality*	40.1	80	
1.2.2	Rule of law*	22.5	121	○
1.2.3	Cost of redundancy dismissal, salary weeks	27.0	103	
1.3	Business environment	64.1	82	
1.3.1	Ease of starting a business*	83.9	76	
1.3.2	Ease of resolving insolvency*	27.3	121	○
1.3.3	Ease of paying taxes*	81.2	44	●
2	**Human capital & research**	**18.0**	**108**	
2.1	Education	28.2	112	
2.1.1	Expenditure on education, % GDP	2.8	104	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	5.4	108	○
2.1.3	School life expectancy, years	10.7	100	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	12.7	45	
2.2	Tertiary education	25.8	91	
2.2.1	Tertiary enrolment, % gross	18.3	94	
2.2.2	Graduates in science & engineering, %[4]	16.8	74	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	0.0	114	
2.3.1	Researchers, FTE/mn pop.[4]	26.7	95	○
2.3.2	Gross expenditure on R&D, % GDP[4]	0.0	108	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**26.5**	**113**	
3.1	Information & communication technologies (ICTs)	22.1	110	
3.1.1	ICT access*	41.6	95	
3.1.2	ICT use*	12.3	104	
3.1.3	Government's online service*	15.0	116	
3.1.4	E-participation*	19.6	112	
3.2	General infrastructure	18.4	124	○
3.2.1	Electricity output, kWh/cap	641.2	99	
3.2.2	Logistics performance*	2.8	74	
3.2.3	Gross capital formation, % GDP	12.7	120	○
3.3	Ecological sustainability	39.0	83	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.1	54	
3.3.2	Environmental performance*	69.6	79	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	109	
4	**Market sophistication**	**43.5**	**60**	
4.1	Credit	31.9	71	
4.1.1	Ease of getting credit*	80.0	14	●
4.1.2	Domestic credit to private sector, % GDP	32.9	89	
4.1.3	Microfinance gross loans, % GDP	0.3	44	
4.2	Investment	33.3	78	
4.2.1	Ease of protecting minority investors*	33.3	126	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	65.3	50	
4.3.1	Applied tariff rate, weighted mean, %	1.8	46	
4.3.2	Intensity of local competition†	75.5	27	●
4.3.3	Domestic market scale, bn PPP$	119.8	72	
5	**Business sophistication**	**32.4**	**55**	
5.1	Knowledge workers	28.5	91	
5.1.1	Knowledge-intensive employment, %	10.9	93	
5.1.2	Firms offering formal training, % firms[4]	51.9	21	●
5.1.3	GERD performed by business, % of GDP[4]	0.0	87	○
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[4]	3.5	81	
5.2	Innovation linkages	44.0	23	●
5.2.1	University/industry research collaboration†	43.6	66	
5.2.2	State of cluster development†	47.2	55	
5.2.3	GERD financed by abroad, %[4]	49.0	4	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	106	
5.3	Knowledge absorption	24.6	86	
5.3.1	Intellectual property payments, % total trade	1.0	29	●
5.3.2	High-tech imports less re-imports, % total trade	9.5	40	●
5.3.3	ICT services imports, % total trade	0.4	104	
5.3.4	FDI net inflows, % GDP	2.0	79	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.9**	**98**	
6.1	Knowledge creation	1.5	125	○
6.1.1	Patents by origin/bn PPP$ GDP	0.1	106	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	89	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	52	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.3	124	○
6.1.5	Citable documents H index	63.0	107	
6.2	Knowledge impact	31.8	84	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.5	48	
6.2.2	New businesses/th pop. 15–64[4]	0.5	87	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.8	91	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	20.3	93	
6.3.1	Intellectual property receipts, % total trade	0.1	52	
6.3.2	High-tech exports less re-exports, % total trade	1.4	58	
6.3.3	ICT services exports, % total trade	2.2	42	●
6.3.4	FDI net outflows, % GDP	(0.3)	108	
7	**Creative outputs**	**24.0**	**88**	
7.1	Intangible assets	42.8	66	
7.1.1	Trademarks by origin/bn PPP$ GDP[4]	39.3	58	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.5	77	
7.1.3	ICTs & business model creation†	66.1	35	●
7.1.4	ICTs & organizational model creation†	60.9	33	●
7.2	Creative goods & services	6.6	103	
7.2.1	Cultural & creative services exports, % of total trade	0.0	69	
7.2.2	National feature films/mn pop. 15–69[4]	1.2	67	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.3	64	
7.3	Online creativity	3.6	84	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	4.6	58	
7.3.2	Country-code TLDs/th pop. 15–69	0.6	90	
7.3.3	Wikipedia edits/mn pop. 15–69	774.9	84	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Guinea

Key indicators

Population (millions)	12.6
GDP (US$ billions)	6.7
GDP per capita, PPP$	1,213.6
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**17.2**	**127**	○
Innovation Output Sub-Index		11.3	124	
Innovation Input Sub-Index		23.2	127	○
Innovation Efficiency Ratio		0.5	112	
Global Innovation Index 2015 (out of 141)		18.5	139	
1	**Institutions**	**42.4**	**121**	
1.1	Political environment	22.5	122	
1.1.1	Political stability & safety*	39.7	109	
1.1.2	Government effectiveness*	5.3	124	
1.2	Regulatory environment	55.5	93	
1.2.1	Regulatory quality*	17.5	125	
1.2.2	Rule of law*	12.8	127	○
1.2.3	Cost of redundancy dismissal, salary weeks	10.1	33	●
1.3	Business environment	49.0	125	
1.3.1	Ease of starting a business*	80.0	95	
1.3.2	Ease of resolving insolvency*	38.8	95	
1.3.3	Ease of paying taxes*	28.3	126	
2	**Human capital & research**	**9.0**	**127**	○
2.1	Education	20.0	126	
2.1.1	Expenditure on education, % GDP	3.5	90	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	9.9	99	
2.1.3	School life expectancy, years	8.7	110	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	33.1	107	
2.2	Tertiary education	6.9	118	
2.2.1	Tertiary enrolment, % gross	10.8	103	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	0.9	82	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**18.6**	**126**	
3.1	Information & communication technologies (ICTs)	1.0	128	○
3.1.1	ICT access*	n/a	n/a	
3.1.2	ICT use*	n/a	n/a	
3.1.3	Government's online service*	0.0	127	○
3.1.4	E-participation*	2.0	127	○
3.2	General infrastructure	17.4	125	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.5	111	
3.2.3	Gross capital formation, % GDP	12.5	121	
3.3	Ecological sustainability	37.4	88	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	55.4	109	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	104	
4	**Market sophistication**	**24.8**	**128**	○
4.1	Credit	11.7	123	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP[d]	9.1	124	
4.1.3	Microfinance gross loans, % GDP[d]	0.2	49	●
4.2	Investment	31.4	88	
4.2.1	Ease of protecting minority investors*	35.0	121	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	29	●
4.3	Trade, competition, & market scale	31.5	124	
4.3.1	Applied tariff rate, weighted mean, %[d]	11.9	123	
4.3.2	Intensity of local competition†	53.3	118	
4.3.3	Domestic market scale, bn PPP$	15.1	122	
5	**Business sophistication**	**21.1**	**119**	
5.1	Knowledge workers	11.7	122	
5.1.1	Knowledge-intensive employment, %[d]	0.7	106	○
5.1.2	Firms offering formal training, % firms[d]	21.1	79	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	22.5	96	
5.2.1	University/industry research collaboration†	19.7	123	○
5.2.2	State of cluster development†	33.7	108	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.1	62	●
5.3	Knowledge absorption	29.2	60	●
5.3.1	Intellectual property payments, % total trade[d]	0.1	102	
5.3.2	High-tech imports less re-imports, % total trade	4.6	104	
5.3.3	ICT services imports, % total trade[d]	1.5	34	●
5.3.4	FDI net inflows, % GDP	8.5	15	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**8.6**	**126**	
6.1	Knowledge creation	4.6	96	
6.1.1	Patents by origin/bn PPP$ GDP[d]	0.1	100	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.9	72	●
6.1.5	Citable documents H index	41.0	121	
6.2	Knowledge impact	1.0	[127]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	0.1	99	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.6	115	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	20.2	95	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	87	
6.3.2	High-tech exports less re-exports, % total trade	0.1	102	
6.3.3	ICT services exports, % total trade[d]	2.7	33	●
6.3.4	FDI net outflows, % GDP[d]	(0.0)	96	
7	**Creative outputs**	**14.0**	**123**	
7.1	Intangible assets	23.5	123	
7.1.1	Trademarks by origin/bn PPP$ GDP	12.1	94	
7.1.2	Industrial designs by origin/bn PPP$ GDP	4.3	28	●
7.1.3	ICTs & business model creation†	35.9	122	○
7.1.4	ICTs & organizational model creation†	28.6	122	○
7.2	Creative goods & services	9.1	96	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.5	25	●
7.2.2	National feature films/mn pop. 15–69[d]	0.8	80	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	112	
7.3	Online creativity	0.0	128	○
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.1	124	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	115	
7.3.3	Wikipedia edits/mn pop. 15–69	5.6	127	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Honduras

Key indicators

Population (millions)	8.1
GDP (US$ billions)	20.3
GDP per capita, PPP$	4,868.6
Income group	Lower-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.9**	**101**	
Innovation Output Sub-Index		18.6	106	
Innovation Input Sub-Index		35.3	93	
Innovation Efficiency Ratio		0.5	105	
Global Innovation Index 2015 (out of 141)		27.5	113	
1	**Institutions**	**43.5**	**117**	○
1.1	Political environment	33.5	104	
1.1.1	Political stability & safety*	50.1	90	
1.1.2	Government effectiveness*	17.0	115	○
1.2	Regulatory environment	42.5	116	○
1.2.1	Regulatory quality*	35.4	93	
1.2.2	Rule of law*	22.9	120	○
1.2.3	Cost of redundancy dismissal, salary weeks	30.3	116	○
1.3	Business environment	54.6	114	
1.3.1	Ease of starting a business*	74.9	111	
1.3.2	Ease of resolving insolvency*	31.7	111	
1.3.3	Ease of paying taxes*	57.3	107	
2	**Human capital & research**	**21.0**	**101**	
2.1	Education	46.8	67	
2.1.1	Expenditure on education, % GDP	5.9	29	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	18.7	62	
2.1.3	School life expectancy, years	11.2	97	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	8.6	13	●
2.2	Tertiary education	16.1	105	
2.2.1	Tertiary enrolment, % gross	21.2	90	
2.2.2	Graduates in science & engineering, %	12.4	94	○
2.2.3	Tertiary inbound mobility, %	0.7	84	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**31.0**	**104**	
3.1	Information & communication technologies (ICTs)	31.6	97	
3.1.1	ICT access*	40.5	99	
3.1.2	ICT use*	12.6	103	
3.1.3	Government's online service*	40.2	79	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	24.9	106	
3.2.1	Electricity output, kWh/cap	996.8	90	
3.2.2	Logistics performance*	2.6	97	
3.2.3	Gross capital formation, % GDP	21.8	67	
3.3	Ecological sustainability	36.6	91	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.2	88	
3.3.2	Environmental performance*	69.6	79	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	65	
4	**Market sophistication**	**44.9**	**54**	
4.1	Credit	42.4	39	●
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	55.3	54	
4.1.3	Microfinance gross loans, % GDP	1.8	20	●
4.2	Investment	43.3	35	
4.2.1	Ease of protecting minority investors*	43.3	104	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	49.1	105	
4.3.1	Applied tariff rate, weighted mean, %[d]	6.7	98	
4.3.2	Intensity of local competition†	66.5	72	
4.3.3	Domestic market scale, bn PPP$	39.2	96	
5	**Business sophistication**	**36.2**	**44**	●
5.1	Knowledge workers	42.7	47	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	35.8	43	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	37.5	40	●
5.2.1	University/industry research collaboration†	49.0	47	●
5.2.2	State of cluster development†	49.5	47	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.1	73	
5.3	Knowledge absorption	28.3	65	
5.3.1	Intellectual property payments, % total trade	0.5	57	
5.3.2	High-tech imports less re-imports, % total trade	7.4	65	
5.3.3	ICT services imports, % total trade	0.8	76	
5.3.4	FDI net inflows, % GDP	6.7	19	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**14.4**	**117**	○
6.1	Knowledge creation	2.3	121	○
6.1.1	Patents by origin/bn PPP$ GDP[d]	0.2	98	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP[d]	0.2	42	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.8	119	○
6.1.5	Citable documents H index	48.0	115	○
6.2	Knowledge impact	13.9	[116]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.3	50	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	4.6	64	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	27.0	51	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.5	74	
6.3.3	ICT services exports, % total trade	3.0	22	●
6.3.4	FDI net outflows, % GDP[d]	0.2	76	
7	**Creative outputs**	**22.7**	**92**	
7.1	Intangible assets	43.2	62	
7.1.1	Trademarks by origin/bn PPP$ GDP	49.9	45	
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	0.2	96	
7.1.3	ICTs & business model creation†	62.6	47	●
7.1.4	ICTs & organizational model creation†	60.8	34	●
7.2	Creative goods & services	2.1	116	○
7.2.1	Cultural & creative services exports, % of total trade	(0.0)	85	○
7.2.2	National feature films/mn pop. 15–69[d]	0.4	92	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.1	86	
7.3	Online creativity	2.3	95	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	104	
7.3.2	Country-code TLDs/th pop. 15–69	0.5	91	
7.3.3	Wikipedia edits/mn pop. 15–69	777.8	83	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Hong Kong (China)

Key indicators

Population (millions)	7.3
GDP (US$ billions)	309.9
GDP per capita, PPP$	56,700.8
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**55.7**	**14**	
Innovation Output Sub-Index		42.2	25	
Innovation Input Sub-Index		69.1	2	●
Innovation Efficiency Ratio		0.6	83	○
Global Innovation Index 2015 (out of 141)		57.2	11	
1	**Institutions**	**92.8**	**4**	
1.1	Political environment	90.5	6	
1.1.1	Political stability & safety*	90.9	10	
1.1.2	Government effectiveness*	90.2	5	
1.2	Regulatory environment	97.2	3	●
1.2.1	Regulatory quality*	95.6	2	●
1.2.2	Rule of law*	93.4	14	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	90.6	3	●
1.3.1	Ease of starting a business*	98.1	4	
1.3.2	Ease of resolving insolvency*	75.1	24	
1.3.3	Ease of paying taxes*	98.7	4	
2	**Human capital & research**	**55.2**	**19**	
2.1	Education	51.9	52	
2.1.1	Expenditure on education, % GDP	3.6	89	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.3	60	○
2.1.3	School life expectancy, years	16.4	23	
2.1.4	PISA scales in reading, maths, & science	553.6	3	●
2.1.5	Pupil-teacher ratio, secondary	13.6	53	
2.2	Tertiary education	63.1	3	●
2.2.1	Tertiary enrolment, % gross	68.8	27	
2.2.2	Graduates in science & engineering, %④	34.7	5	
2.2.3	Tertiary inbound mobility, %	9.8	17	
2.3	Research & development (R&D)	50.6	21	
2.3.1	Researchers, FTE/mn pop.④	3,136.0	27	
2.3.2	Gross expenditure on R&D, % GDP④	0.7	46	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	267.1	23	
2.3.4	QS university ranking, average score top 3*	85.6	4	
3	**Infrastructure**	**67.5**	**2**	●
3.1	Information & communication technologies (ICTs)	84.4	9	
3.1.1	ICT access*	93.2	3	●
3.1.2	ICT use*	75.5	18	
3.1.3	Government's online service*	n/a	n/a	
3.1.4	E-participation*	n/a	n/a	
3.2	General infrastructure	47.6	27	
3.2.1	Electricity output, kWh/cap	5,445.8	37	
3.2.2	Logistics performance*	3.8	15	
3.2.3	Gross capital formation, % GDP	23.2	56	
3.3	Ecological sustainability	70.5	1	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	23.8	1	●
3.3.2	Environmental performance*	n/a	n/a	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.6	51	
4	**Market sophistication**	**80.0**	**2**	●
4.1	Credit	83.9	2	●
4.1.1	Ease of getting credit*	75.0	18	
4.1.2	Domestic credit to private sector, % GDP	233.7	2	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	79.2	2	●
4.2.1	Ease of protecting minority investors*	83.3	1	●
4.2.2	Market capitalization, % GDP	1,111.4	1	●
4.2.3	Total value of stocks traded, % GDP	522.9	1	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	27	
4.3	Trade, competition, & market scale	77.0	14	
4.3.1	Applied tariff rate, weighted mean, %	0.0	1	●
4.3.2	Intensity of local competition†	86.0	2	●
4.3.3	Domestic market scale, bn PPP$	400.4	42	
5	**Business sophistication**	**50.2**	**12**	
5.1	Knowledge workers	45.8	40	
5.1.1	Knowledge-intensive employment, %	37.9	27	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP④	0.3	41	
5.1.4	GERD financed by business, %④	47.6	23	
5.1.5	Females employed w/advanced degrees, % total	12.7	49	○
5.2	Innovation linkages	47.5	11	
5.2.1	University/industry research collaboration†	59.8	27	
5.2.2	State of cluster development†	67.3	14	
5.2.3	GERD financed by abroad, %④	6.8	58	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	1	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.8	27	
5.3	Knowledge absorption	57.1	2	●
5.3.1	Intellectual property payments, % total trade④	0.3	69	○
5.3.2	High-tech imports less re-imports, % total trade	43.8	1	●
5.3.3	ICT services imports, % total trade④	0.3	114	○
5.3.4	FDI net inflows, % GDP	39.9	1	●
5.3.5	Research talent, % in business enterprise④	39.9	30	
6	**Knowledge & technology outputs**	**35.9**	**30**	
6.1	Knowledge creation	17.2	50	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	78	○
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.9	28	
6.1.4	Scientific & technical articles/bn PPP$ GDP	n/a	n/a	
6.1.5	Citable documents H index	359.0	25	
6.2	Knowledge impact	48.5	21	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.5	50	
6.2.2	New businesses/th pop. 15–64	31.3	1	●
6.2.3	Computer software spending, % GDP	0.4	22	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.7	56	
6.2.5	High- & medium-high-tech manufactures, %	22.0	52	
6.3	Knowledge diffusion	41.8	23	
6.3.1	Intellectual property receipts, % total trade④	0.1	51	
6.3.2	High-tech exports less re-exports, % total trade④	0.1	107	○
6.3.3	ICT services exports, % total trade④	0.4	99	○
6.3.4	FDI net outflows, % GDP	53.4	1	●
7	**Creative outputs**	**48.6**	**17**	
7.1	Intangible assets	55.0	24	
7.1.1	Trademarks by origin/bn PPP$ GDP	73.6	19	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.7	33	
7.1.3	ICTs & business model creation†	70.7	25	
7.1.4	ICTs & organizational model creation†	71.2	16	
7.2	Creative goods & services	22.1	67	
7.2.1	Cultural & creative services exports, % of total trade④	0.2	41	
7.2.2	National feature films/mn pop. 15–69	7.5	21	
7.2.3	Global ent. & media market/th pop. 15–69	46.6	17	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade④	0.2	72	○
7.3	Online creativity	62.3	7	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	74.1	7	
7.3.2	Country-code TLDs/th pop. 15–69	8.9	42	
7.3.3	Wikipedia edits/mn pop. 15–69	11,073.5	2	●
7.3.4	Video uploads on YouTube/pop. 15–69	84.5	3	●

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Hungary

Key indicators

Population (millions)	9.9
GDP (US$ billions)	120.6
GDP per capita, PPP$	26,222.0
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**44.7**	**33**	
Innovation Output Sub-Index		40.5	30	
Innovation Input Sub-Index		48.9	38	
Innovation Efficiency Ratio		0.8	17	●
Global Innovation Index 2015 (out of 141)		43.0	35	
1	**Institutions**	**71.3**	**40**	
1.1	Political environment	67.1	43	
1.1.1	Political stability & safety*	80.3	34	
1.1.2	Government effectiveness*	53.8	42	
1.2	Regulatory environment	75.4	36	
1.2.1	Regulatory quality*	63.7	39	
1.2.2	Rule of law*	59.5	43	
1.2.3	Cost of redundancy dismissal, salary weeks	13.4	54	
1.3	Business environment	71.4	60	
1.3.1	Ease of starting a business*	90.6	45	
1.3.2	Ease of resolving insolvency*	50.6	60	
1.3.3	Ease of paying taxes*	73.1	74	
2	**Human capital & research**	**41.2**	**36**	
2.1	Education	52.1	51	
2.1.1	Expenditure on education, % GDP[4]	4.6	62	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.7	57	
2.1.3	School life expectancy, years	15.8	34	
2.1.4	PISA scales in reading, maths, & science	486.6	30	
2.1.5	Pupil-teacher ratio, secondary[4]	10.5	30	
2.2	Tertiary education	35.8	61	
2.2.1	Tertiary enrolment, % gross	57.0	44	
2.2.2	Graduates in science & engineering, %[4]	16.8	72	○
2.2.3	Tertiary inbound mobility, %	5.8	30	
2.3	Research & development (R&D)	35.9	32	
2.3.1	Researchers, FTE/mn pop.	2,650.6	32	
2.3.2	Gross expenditure on R&D, % GDP	1.4	25	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	141.1	26	
2.3.4	QS university ranking, average score top 3*	24.8	48	
3	**Infrastructure**	**51.1**	**41**	
3.1	Information & communication technologies (ICTs)	57.1	49	
3.1.1	ICT access*	75.4	35	
3.1.2	ICT use*	51.9	45	
3.1.3	Government's online service*	55.9	53	
3.1.4	E-participation*	45.1	73	
3.2	General infrastructure	38.2	59	
3.2.1	Electricity output, kWh/cap	2,970.4	62	
3.2.2	Logistics performance*	3.5	32	
3.2.3	Gross capital formation, % GDP	21.5	71	
3.3	Ecological sustainability	58.0	19	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.1	54	
3.3.2	Environmental performance*	84.6	28	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	9.0	9	●
4	**Market sophistication**	**41.0**	**80**	○
4.1	Credit	30.3	75	
4.1.1	Ease of getting credit*	75.0	18	
4.1.2	Domestic credit to private sector, % GDP	43.5	77	○
4.1.3	Microfinance gross loans, % GDP[4]	0.0	80	○
4.2	Investment	24.2	118	○
4.2.1	Ease of protecting minority investors*	55.0	72	
4.2.2	Market capitalization, % GDP	10.5	81	○
4.2.3	Total value of stocks traded, % GDP	5.1	44	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	72	○
4.3	Trade, competition, & market scale	68.6	40	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	68.7	61	
4.3.3	Domestic market scale, bn PPP$	247.1	56	
5	**Business sophistication**	**40.1**	**34**	
5.1	Knowledge workers	40.0	57	
5.1.1	Knowledge-intensive employment, %	35.3	37	
5.1.2	Firms offering formal training, % firms	15.8	87	○
5.1.3	GERD performed by business, % of GDP	1.0	22	
5.1.4	GERD financed by business, %	48.3	22	
5.1.5	Females employed w/advanced degrees, % total	14.9	41	
5.2	Innovation linkages	29.7	69	
5.2.1	University/industry research collaboration†	54.6	35	
5.2.2	State of cluster development†	43.8	70	
5.2.3	GERD financed by abroad, %	17.5	25	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	54	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.5	31	
5.3	Knowledge absorption	50.5	7	●
5.3.1	Intellectual property payments, % total trade	1.4	18	
5.3.2	High-tech imports less re-imports, % total trade	12.8	19	●
5.3.3	ICT services imports, % total trade	1.2	46	
5.3.4	FDI net inflows, % GDP	9.0	12	●
5.3.5	Research talent, % in business enterprise	59.4	14	
6	**Knowledge & technology outputs**	**44.4**	**15**	●
6.1	Knowledge creation	20.9	43	
6.1.1	Patents by origin/bn PPP$ GDP	2.7	39	
6.1.2	PCT patent applications/bn PPP$ GDP	0.6	32	
6.1.3	Utility models by origin/bn PPP$ GDP	1.0	25	
6.1.4	Scientific & technical articles/bn PPP$ GDP	25.1	33	
6.1.5	Citable documents H index	301.0	30	
6.2	Knowledge impact	47.9	23	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.5	78	○
6.2.2	New businesses/th pop. 15–64	3.7	33	
6.2.3	Computer software spending, % GDP	0.3	45	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	28.0	10	●
6.2.5	High- & medium-high-tech manufactures, %	56.2	6	●
6.3	Knowledge diffusion	64.4	3	●
6.3.1	Intellectual property receipts, % total trade	1.8	10	●
6.3.2	High-tech exports less re-exports, % total trade	13.2	13	●
6.3.3	ICT services exports, % total trade	1.6	62	
6.3.4	FDI net outflows, % GDP	8.4	8	●
7	**Creative outputs**	**36.5**	**40**	
7.1	Intangible assets	41.1	74	
7.1.1	Trademarks by origin/bn PPP$ GDP	40.0	57	
7.1.2	Industrial designs by origin/bn PPP$ GDP	4.0	31	
7.1.3	ICTs & business model creation†	60.2	58	
7.1.4	ICTs & organizational model creation†	50.8	72	
7.2	Creative goods & services	35.1	26	
7.2.1	Cultural & creative services exports, % of total trade[4]	0.6	20	
7.2.2	National feature films/mn pop. 15–69	5.2	36	
7.2.3	Global ent. & media market/th pop. 15–69	12.1	30	
7.2.4	Printing & publishing manufactures, %	0.8	70	○
7.2.5	Creative goods exports, % total trade	5.9	7	●
7.3	Online creativity	28.9	32	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	11.0	39	
7.3.2	Country-code TLDs/th pop. 15–69	33.6	20	●
7.3.3	Wikipedia edits/mn pop. 15–69	2,890.9	45	
7.3.4	Video uploads on YouTube/pop. 15–69	49.6	21	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Iceland

Key indicators

Population (millions)	0.3
GDP (US$ billions)	16.7
GDP per capita, PPP$	46,097.0
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**56.0**	**13**	
Innovation Output Sub-Index		55.3	6	●
Innovation Input Sub-Index		56.6	24	
Innovation Efficiency Ratio		1.0	3	●
Global Innovation Index 2015 (out of 141)		57.0	13	
1	**Institutions**	**86.4**	**16**	
1.1	Political environment	87.2	14	
1.1.1	Political stability & safety*	93.7	6	●
1.1.2	Government effectiveness*	80.6	18	
1.2	Regulatory environment	86.2	20	
1.2.1	Regulatory quality*	74.7	20	
1.2.2	Rule of law*	90.0	17	
1.2.3	Cost of redundancy dismissal, salary weeks	13.0	48	
1.3	Business environment	85.9	17	
1.3.1	Ease of starting a business*	92.4	35	
1.3.2	Ease of resolving insolvency*	81.7	14	
1.3.3	Ease of paying taxes*	83.7	32	
2	**Human capital & research**	**47.3**	**30**	
2.1	Education	60.7	22	
2.1.1	Expenditure on education, % GDP[d]	7.0	11	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	20.2	54	
2.1.3	School life expectancy, years[d]	19.0	6	
2.1.4	PISA scales in reading, maths, & science	484.5	31	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	40.8	41	
2.2.1	Tertiary enrolment, % gross[d]	82.2	11	
2.2.2	Graduates in science & engineering, %[d]	15.6	81	○
2.2.3	Tertiary inbound mobility, %[d]	6.2	27	
2.3	Research & development (R&D)	40.3	29	
2.3.1	Researchers, FTE/mn pop.[d]	5,993.1	7	
2.3.2	Gross expenditure on R&D, % GDP	1.9	19	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	53.7	35	
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**55.9**	**26**	
3.1	Information & communication technologies (ICTs)	71.3	26	
3.1.1	ICT access*	93.7	2	●
3.1.2	ICT use*	81.1	8	
3.1.3	Government's online service*	61.4	43	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	55.9	12	
3.2.1	Electricity output, kWh/cap	54,915.2	1	●
3.2.2	Logistics performance*	3.4	36	
3.2.3	Gross capital formation, % GDP	18.8	94	○
3.3	Ecological sustainability	40.6	75	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	2.2	119	○
3.3.2	Environmental performance*	90.5	2	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.0	32	
4	**Market sophistication**	**48.2**	**45**	
4.1	Credit	49.1	26	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	98.8	27	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	44.8	33	
4.2.1	Ease of protecting minority investors*	68.3	20	
4.2.2	Market capitalization, % GDP[d]	19.9	66	○
4.2.3	Total value of stocks traded, % GDP[d]	4.8	45	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	10	
4.3	Trade, competition, & market scale	50.7	102	○
4.3.1	Applied tariff rate, weighted mean, %	1.1	36	
4.3.2	Intensity of local competition†	63.8	82	
4.3.3	Domestic market scale, bn PPP$	14.3	123	○
5	**Business sophistication**	**45.3**	**22**	
5.1	Knowledge workers	59.8	21	
5.1.1	Knowledge-intensive employment, %	48.2	6	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.1	21	
5.1.4	GERD financed by business, %[d]	39.2	37	
5.1.5	Females employed w/advanced degrees, % total	21.5	19	
5.2	Innovation linkages	41.4	29	
5.2.1	University/industry research collaboration†	60.3	24	
5.2.2	State of cluster development†	49.6	46	
5.2.3	GERD financed by abroad, %[d]	20.1	20	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.9	19	
5.3	Knowledge absorption	34.8	37	
5.3.1	Intellectual property payments, % total trade	1.3	20	
5.3.2	High-tech imports less re-imports, % total trade	5.3	90	○
5.3.3	ICT services imports, % total trade	1.9	20	
5.3.4	FDI net inflows, % GDP	4.4	34	
5.3.5	Research talent, % in business enterprise[d]	37.7	34	
6	**Knowledge & technology outputs**	**41.2**	**22**	
6.1	Knowledge creation	49.1	15	
6.1.1	Patents by origin/bn PPP$ GDP	6.4	20	
6.1.2	PCT patent applications/bn PPP$ GDP	3.0	15	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	64.8	1	●
6.1.5	Citable documents H index	198.0	39	
6.2	Knowledge impact	35.8	64	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.3	84	○
6.2.2	New businesses/th pop. 15–64	9.5	12	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	4.7	63	
6.2.5	High- & medium-high-tech manufactures, %[d]	7.1	85	○
6.3	Knowledge diffusion	38.7	27	
6.3.1	Intellectual property receipts, % total trade	1.9	9	
6.3.2	High-tech exports less re-exports, % total trade	1.4	57	
6.3.3	ICT services exports, % total trade	2.4	40	
6.3.4	FDI net outflows, % GDP	0.2	77	
7	**Creative outputs**	**69.5**	**1**	●
7.1	Intangible assets	60.8	15	
7.1.1	Trademarks by origin/bn PPP$ GDP	105.8	11	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.7	45	
7.1.3	ICTs & business model creation†	73.0	22	
7.1.4	ICTs & organizational model creation†	73.7	13	
7.2	Creative goods & services	61.1	1	●
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	30.5	1	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	6.4	1	●
7.2.5	Creative goods exports, % total trade	0.1	87	○
7.3	Online creativity	95.3	1	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	100.0	1	●
7.3.2	Country-code TLDs/th pop. 15–69	86.0	6	●
7.3.3	Wikipedia edits/mn pop. 15–69	13,529.2	1	●
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

India

Key indicators

Population (millions)	1,311.1
GDP (US$ billions)	2,090.7
GDP per capita, PPP$	6,161.6
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.6**	**66**	
Innovation Output Sub-Index		26.7	59	
Innovation Input Sub-Index		40.5	72	
Innovation Efficiency Ratio		0.7	63	
Global Innovation Index 2015 (out of 141)		31.7	81	
1	**Institutions**	**50.7**	**96**	
1.1	Political environment	36.2	98	
1.1.1	Political stability & safety*	38.9	113	○
1.1.2	Government effectiveness*	33.4	82	
1.2	Regulatory environment	61.9	77	
1.2.1	Regulatory quality*	33.6	99	
1.2.2	Rule of law*	44.9	66	
1.2.3	Cost of redundancy dismissal, salary weeks	15.8	67	
1.3	Business environment	54.1	117	○
1.3.1	Ease of starting a business*	73.6	114	○
1.3.2	Ease of resolving insolvency*	32.6	110	
1.3.3	Ease of paying taxes*	56.1	109	
2	**Human capital & research**	**32.2**	**63**	
2.1	Education	26.0	118	○
2.1.1	Expenditure on education, % GDP	3.8	83	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	15.2	83	
2.1.3	School life expectancy, years	11.6	92	
2.1.4	PISA scales in reading, maths, & science[d]	336.0	62	○
2.1.5	Pupil-teacher ratio, secondary[d]	30.8	103	○
2.2	Tertiary education	34.1	67	
2.2.1	Tertiary enrolment, % gross	23.9	87	
2.2.2	Graduates in science & engineering, %	29.1	8	●
2.2.3	Tertiary inbound mobility, %	0.1	99	○
2.3	Research & development (R&D)	36.4	31	
2.3.1	Researchers, FTE/mn pop.[d]	156.6	77	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.8	40	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	433.9	20	●
2.3.4	QS university ranking, average score top 3*	57.1	20	●
3	**Infrastructure**	**37.0**	**87**	
3.1	Information & communication technologies (ICTs)	39.2	86	
3.1.1	ICT access*	31.3	108	
3.1.2	ICT use*	8.5	107	
3.1.3	Government's online service*	54.3	57	
3.1.4	E-participation*	62.7	40	
3.2	General infrastructure	39.3	52	
3.2.1	Electricity output, kWh/cap	954.8	91	
3.2.2	Logistics performance*	3.1	52	
3.2.3	Gross capital formation, % GDP	30.7	18	●
3.3	Ecological sustainability	32.6	109	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.5	63	
3.3.2	Environmental performance*	53.6	110	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	66	
4	**Market sophistication**	**50.3**	**33**	
4.1	Credit	29.4	78	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	51.6	62	
4.1.3	Microfinance gross loans, % GDP	0.3	43	
4.2	Investment	46.6	30	
4.2.1	Ease of protecting minority investors*	73.3	8	●
4.2.2	Market capitalization, % GDP	76.1	21	
4.2.3	Total value of stocks traded, % GDP	35.7	21	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	32	
4.3	Trade, competition, & market scale	74.9	20	●
4.3.1	Applied tariff rate, weighted mean, %[d]	6.8	99	
4.3.2	Intensity of local competition†	60.6	96	
4.3.3	Domestic market scale, bn PPP$	7,411.1	3	●
5	**Business sophistication**	**32.2**	**57**	
5.1	Knowledge workers	31.4	86	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	35.9	42	
5.1.3	GERD performed by business, % of GDP[d]	0.3	45	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	37.0	43	
5.2.1	University/industry research collaboration†	47.8	49	
5.2.2	State of cluster development†	56.0	28	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	37	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.4	37	
5.3	Knowledge absorption	28.2	66	
5.3.1	Intellectual property payments, % total trade	0.9	32	
5.3.2	High-tech imports less re-imports, % total trade	7.1	66	
5.3.3	ICT services imports, % total trade	0.8	70	
5.3.4	FDI net inflows, % GDP	1.7	86	
5.3.5	Research talent, % in business enterprise[d]	38.7	31	
6	**Knowledge & technology outputs**	**31.0**	**43**	
6.1	Knowledge creation	14.4	57	
6.1.1	Patents by origin/bn PPP$ GDP	1.6	54	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	51	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.0	77	
6.1.5	Citable documents H index	383.0	22	●
6.2	Knowledge impact	39.3	48	
6.2.1	Growth rate of PPP$ GDP/worker, %	5.0	6	●
6.2.2	New businesses/th pop. 15–64	0.1	101	○
6.2.3	Computer software spending, % GDP	0.2	62	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.5	59	
6.2.5	High- & medium-high-tech manufactures, %[d]	31.7	36	
6.3	Knowledge diffusion	39.2	26	
6.3.1	Intellectual property receipts, % total trade	0.1	45	
6.3.2	High-tech exports less re-exports, % total trade	3.5	37	
6.3.3	ICT services exports, % total trade	10.7	1	●
6.3.4	FDI net outflows, % GDP	0.5	60	
7	**Creative outputs**	**22.5**	**94**	
7.1	Intangible assets	34.8	98	
7.1.1	Trademarks by origin/bn PPP$ GDP	27.0	72	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.8	72	
7.1.3	ICTs & business model creation†	51.5	87	
7.1.4	ICTs & organizational model creation†	53.7	64	
7.2	Creative goods & services	19.1	72	
7.2.1	Cultural & creative services exports, % of total trade	0.1	45	
7.2.2	National feature films/mn pop. 15–69	2.0	54	
7.2.3	Global ent. & media market/th pop. 15–69	0.1	59	○
7.2.4	Printing & publishing manufactures, %[d]	0.6	84	○
7.2.5	Creative goods exports, % total trade	2.9	16	●
7.3	Online creativity	1.3	101	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.0	98	
7.3.2	Country-code TLDs/th pop. 15–69	0.7	84	
7.3.3	Wikipedia edits/mn pop. 15–69	264.6	96	
7.3.4	Video uploads on YouTube/pop. 15–69	1.5	68	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Indonesia

Key indicators

Population (millions)	257.6
GDP (US$ billions)	859.0
GDP per capita, PPP$	11,125.9
Income group	Lower-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
	Global Innovation Index (out of 128)	**29.1**	**88**	
	Innovation Output Sub-Index	24.1	76	
	Innovation Input Sub-Index	34.0	99	
	Innovation Efficiency Ratio	0.7	52	
	Global Innovation Index 2015 (out of 141)	29.8	97	
1	**Institutions**	**41.6**	**122**	○
1.1	Political environment	46.2	74	
1.1.1	Political stability & safety*	53.7	86	
1.1.2	Government effectiveness*	38.7	69	
1.2	Regulatory environment	20.9	126	○
1.2.1	Regulatory quality*	42.2	78	
1.2.2	Rule of law*	38.5	82	
1.2.3	Cost of redundancy dismissal, salary weeks	57.8	125	○
1.3	Business environment	57.7	105	
1.3.1	Ease of starting a business*	66.0	122	○
1.3.2	Ease of resolving insolvency*	46.5	69	
1.3.3	Ease of paying taxes*	60.5	101	
2	**Human capital & research**	**23.1**	**92**	
2.1	Education	32.9	103	
2.1.1	Expenditure on education, % GDP	3.4	95	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	9.8	100	
2.1.3	School life expectancy, years	12.9	76	
2.1.4	PISA scales in reading, maths, & science	384.4	59	○
2.1.5	Pupil-teacher ratio, secondary[d]	15.4	66	
2.2	Tertiary education	27.8	87	
2.2.1	Tertiary enrolment, % gross	31.3	75	
2.2.2	Graduates in science & engineering, %[d]	21.7	46	
2.2.3	Tertiary inbound mobility, %[d]	0.1	100	○
2.3	Research & development (R&D)	8.6	62	
2.3.1	Researchers, FTE/mn pop.[d]	89.5	83	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	105	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	32.3	41	●
3	**Infrastructure**	**38.5**	**80**	
3.1	Information & communication technologies (ICTs)	32.4	95	
3.1.1	ICT access*	46.0	84	
3.1.2	ICT use*	17.9	95	
3.1.3	Government's online service*	36.2	88	
3.1.4	E-participation*	29.4	99	
3.2	General infrastructure	42.2	38	●
3.2.1	Electricity output, kWh/cap	862.4	94	
3.2.2	Logistics performance*	3.1	51	
3.2.3	Gross capital formation, % GDP	34.0	7	●
3.3	Ecological sustainability	41.0	74	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.6	38	●
3.3.2	Environmental performance*	65.9	90	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.6	76	
4	**Market sophistication**	**43.3**	**62**	
4.1	Credit	22.7	101	
4.1.1	Ease of getting credit*	55.0	63	
4.1.2	Domestic credit to private sector, % GDP	36.5	82	
4.1.3	Microfinance gross loans, % GDP	0.0	76	
4.2	Investment	28.2	100	
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP	47.5	34	
4.2.3	Total value of stocks traded, % GDP	10.2	35	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	63	
4.3	Trade, competition, & market scale	78.8	10	●
4.3.1	Applied tariff rate, weighted mean, %	2.3	54	
4.3.2	Intensity of local competition†	68.5	63	
4.3.3	Domestic market scale, bn PPP$	2,685.9	8	●
5	**Business sophistication**	**23.7**	**106**	
5.1	Knowledge workers	7.0	125	○
5.1.1	Knowledge-intensive employment, %[d]	8.9	96	
5.1.2	Firms offering formal training, % firms[d]	4.7	93	○
5.1.3	GERD performed by business, % of GDP[d]	0.0	75	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[d]	3.9	80	
5.2	Innovation linkages	34.9	47	
5.2.1	University/industry research collaboration†	59.1	29	●
5.2.2	State of cluster development†	56.1	27	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	64	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	112	○
5.3	Knowledge absorption	29.4	59	
5.3.1	Intellectual property payments, % total trade	0.9	33	●
5.3.2	High-tech imports less re-imports, % total trade	7.8	60	
5.3.3	ICT services imports, % total trade	0.8	73	
5.3.4	FDI net inflows, % GDP	3.0	59	
5.3.5	Research talent, % in business enterprise[d]	35.5	37	
6	**Knowledge & technology outputs**	**23.0**	**71**	
6.1	Knowledge creation	2.6	119	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	90	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	96	○
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	54	
6.1.4	Scientific & technical articles/bn PPP$ GDP	0.6	127	○
6.1.5	Citable documents H index	140.0	56	
6.2	Knowledge impact	45.7	28	●
6.2.1	Growth rate of PPP$ GDP/worker, %	7.8	1	●
6.2.2	New businesses/th pop. 15–64[d]	0.3	92	
6.2.3	Computer software spending, % GDP	0.3	32	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.8	80	
6.2.5	High- & medium-high-tech manufactures, %[d]	30.9	38	
6.3	Knowledge diffusion	20.9	89	
6.3.1	Intellectual property receipts, % total trade	0.0	71	
6.3.2	High-tech exports less re-exports, % total trade	3.3	41	
6.3.3	ICT services exports, % total trade	0.6	92	
6.3.4	FDI net outflows, % GDP	1.2	44	
7	**Creative outputs**	**25.2**	**85**	
7.1	Intangible assets	37.6	87	
7.1.1	Trademarks by origin/bn PPP$ GDP	12.9	93	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.9	67	
7.1.3	ICTs & business model creation†	62.7	46	
7.1.4	ICTs & organizational model creation†	59.8	38	●
7.2	Creative goods & services	22.7	64	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	0.5	90	
7.2.3	Global ent. & media market/th pop. 15–69	1.1	54	
7.2.4	Printing & publishing manufactures, %[d]	0.9	68	
7.2.5	Creative goods exports, % total trade	2.8	17	●
7.3	Online creativity	2.8	94	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.7	88	
7.3.2	Country-code TLDs/th pop. 15–69	0.3	100	
7.3.3	Wikipedia edits/mn pop. 15–69	260.6	97	
7.3.4	Video uploads on YouTube/pop. 15–69	7.4	65	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Iran, Islamic Republic of

Key indicators

Population (millions)	79.1
GDP (US$ billions)	387.6
GDP per capita, PPP$	17,251.3
Income group	Upper-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.5**	**78**	
Innovation Output Sub-Index		25.3	72	
Innovation Input Sub-Index		35.7	90	
Innovation Efficiency Ratio		0.7	51	●
Global Innovation Index 2015 (out of 141)		28.4	106	
1	**Institutions**	**45.9**	**112**	
1.1	Political environment	34.0	102	
1.1.1	Political stability & safety*	40.3	106	
1.1.2	Government effectiveness*	27.6	92	
1.2	Regulatory environment	42.5	115	
1.2.1	Regulatory quality*	8.5	127	○
1.2.2	Rule of law*	21.4	122	○
1.2.3	Cost of redundancy dismissal, salary weeks	23.1	98	
1.3	Business environment	61.4	90	
1.3.1	Ease of starting a business*	85.7	68	
1.3.2	Ease of resolving insolvency*	31.6	112	
1.3.3	Ease of paying taxes*	66.8	88	
2	**Human capital & research**	**36.9**	**48**	●
2.1	Education	39.3	89	
2.1.1	Expenditure on education, % GDP	3.1	98	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	16.2	74	
2.1.3	School life expectancy, years	14.8	52	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	17.5	76	
2.2	Tertiary education	62.9	4	●
2.2.1	Tertiary enrolment, % gross	66.0	31	●
2.2.2	Graduates in science & engineering, %	46.6	2	●
2.2.3	Tertiary inbound mobility, %	0.2	97	○
2.3	Research & development (R&D)	8.5	63	
2.3.1	Researchers, FTE/mn pop.◴	691.4	53	
2.3.2	Gross expenditure on R&D, % GDP◴	0.3	74	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	19.1	54	
3	**Infrastructure**	**36.7**	**91**	
3.1	Information & communication technologies (ICTs)	37.0	88	
3.1.1	ICT access*	59.7	67	
3.1.2	ICT use*	21.9	91	
3.1.3	Government's online service*	37.0	85	
3.1.4	E-participation*	29.4	99	
3.2	General infrastructure	41.4	41	●
3.2.1	Electricity output, kWh/cap	3,490.9	54	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	30.8	17	●
3.3	Ecological sustainability	31.8	110	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.6	103	
3.3.2	Environmental performance*	66.3	89	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.6	78	
4	**Market sophistication**	**36.2**	**102**	
4.1	Credit	32.6	67	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	54.4	58	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	24.3	117	○
4.2.1	Ease of protecting minority investors*	40.0	112	
4.2.2	Market capitalization, % GDP	27.4	54	
4.2.3	Total value of stocks traded, % GDP	5.5	42	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	51.8	96	
4.3.1	Applied tariff rate, weighted mean, %◴	15.2	125	○
4.3.2	Intensity of local competition†	55.7	112	○
4.3.3	Domestic market scale, bn PPP$	1,357.0	18	●
5	**Business sophistication**	**22.8**	**111**	
5.1	Knowledge workers	23.8	102	
5.1.1	Knowledge-intensive employment, %	17.1	81	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP◴	0.1	61	
5.1.4	GERD financed by business, %◴	30.9	49	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	30.4	65	
5.2.1	University/industry research collaboration†	36.3	94	
5.2.2	State of cluster development†	42.7	76	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	113	○
5.3	Knowledge absorption	14.3	125	○
5.3.1	Intellectual property payments, % total trade◴	0.2	86	
5.3.2	High-tech imports less re-imports, % total trade◴	4.0	109	○
5.3.3	ICT services imports, % total trade◴	0.6	85	
5.3.4	FDI net inflows, % GDP	0.5	115	
5.3.5	Research talent, % in business enterprise◴	15.0	60	
6	**Knowledge & technology outputs**	**24.0**	**65**	
6.1	Knowledge creation	34.5	26	●
6.1.1	Patents by origin/bn PPP$ GDP	10.1	14	●
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	20.1	37	●
6.1.5	Citable documents H index	180.0	41	●
6.2	Knowledge impact	36.1	63	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.0	64	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.2	64	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.0	87	
6.2.5	High- & medium-high-tech manufactures, %◴	33.8	33	●
6.3	Knowledge diffusion	1.4	127	○
6.3.1	Intellectual property receipts, % total trade◴	0.0	83	
6.3.2	High-tech exports less re-exports, % total trade◴	0.5	72	
6.3.3	ICT services exports, % total trade◴	0.2	115	○
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**26.7**	**75**	
7.1	Intangible assets	45.8	55	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	6.5	20	●
7.1.3	ICTs & business model creation†	54.7	77	
7.1.4	ICTs & organizational model creation†	42.3	101	
7.2	Creative goods & services	7.8	101	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	1.5	62	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %◴	0.2	93	○
7.2.5	Creative goods exports, % total trade◴	0.5	58	
7.3	Online creativity	7.3	67	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.9	82	
7.3.2	Country-code TLDs/th pop. 15–69	4.5	55	
7.3.3	Wikipedia edits/mn pop. 15–69	2,091.4	51	●
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Ireland

Key indicators

Population (millions)	4.7
GDP (US$ billions)	238.0
GDP per capita, PPP$	55,532.9
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**59.0**	**7**	●
Innovation Output Sub-Index		55.6	5	●
Innovation Input Sub-Index		62.4	16	
Innovation Efficiency Ratio		0.9	8	
Global Innovation Index 2015 (out of 141)		59.1	8	
1	**Institutions**	**88.1**	**12**	
1.1	Political environment	86.4	17	
1.1.1	Political stability & safety*	89.4	14	
1.1.2	Government effectiveness*	83.5	15	
1.2	Regulatory environment	88.8	16	
1.2.1	Regulatory quality*	88.2	11	
1.2.2	Rule of law*	92.0	16	
1.2.3	Cost of redundancy dismissal, salary weeks	14.3	58	○
1.3	Business environment	89.2	9	
1.3.1	Ease of starting a business*	94.2	24	
1.3.2	Ease of resolving insolvency*	78.4	19	
1.3.3	Ease of paying taxes*	95.0	6	●
2	**Human capital & research**	**54.0**	**20**	
2.1	Education	60.7	21	
2.1.1	Expenditure on education, % GDP	5.8	30	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	26.3	27	
2.1.3	School life expectancy, years	18.8	7	
2.1.4	PISA scales in reading, maths, & science	515.6	12	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	47.9	22	
2.2.1	Tertiary enrolment, % gross	73.2	21	
2.2.2	Graduates in science & engineering, %[4]	23.8	33	
2.2.3	Tertiary inbound mobility, %	6.4	26	
2.3	Research & development (R&D)	53.4	20	
2.3.1	Researchers, FTE/mn pop.	3,732.1	23	
2.3.2	Gross expenditure on R&D, % GDP	1.5	23	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	624.8	16	
2.3.4	QS university ranking, average score top 3*	61.3	17	
3	**Infrastructure**	**59.4**	**19**	
3.1	Information & communication technologies (ICTs)	70.8	28	
3.1.1	ICT access*	82.4	18	
3.1.2	ICT use*	68.5	23	
3.1.3	Government's online service*	67.7	31	
3.1.4	E-participation*	64.7	33	
3.2	General infrastructure	46.2	31	
3.2.1	Electricity output, kWh/cap	5,621.4	34	
3.2.2	Logistics performance*	3.9	11	
3.2.3	Gross capital formation, % GDP	20.8	75	○
3.3	Ecological sustainability	61.2	12	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	14.3	7	●
3.3.2	Environmental performance*	86.6	19	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.8	37	
4	**Market sophistication**	**56.9**	**19**	
4.1	Credit	51.0	22	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	83.2	35	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	51.7	20	
4.2.1	Ease of protecting minority investors*	73.3	8	
4.2.2	Market capitalization, % GDP	57.2	31	
4.2.3	Total value of stocks traded, % GDP	6.6	40	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	9	
4.3	Trade, competition, & market scale	68.2	42	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	68.1	65	○
4.3.3	Domestic market scale, bn PPP$	236.4	57	○
5	**Business sophistication**	**53.8**	**8**	
5.1	Knowledge workers	60.3	19	
5.1.1	Knowledge-intensive employment, %	40.3	23	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.1	18	
5.1.4	GERD financed by business, %	53.6	15	
5.1.5	Females employed w/advanced degrees, % total	24.2	9	
5.2	Innovation linkages	44.3	22	
5.2.1	University/industry research collaboration†	70.7	13	
5.2.2	State of cluster development†	64.8	17	
5.2.3	GERD financed by abroad, %	19.3	23	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	20	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.7	22	
5.3	Knowledge absorption	56.7	3	●
5.3.1	Intellectual property payments, % total trade	24.7	1	●
5.3.2	High-tech imports less re-imports, % total trade	4.7	100	○
5.3.3	ICT services imports, % total trade	0.7	80	○
5.3.4	FDI net inflows, % GDP	34.6	1	●
5.3.5	Research talent, % in business enterprise	64.5	7	
6	**Knowledge & technology outputs**	**57.9**	**3**	●
6.1	Knowledge creation	30.1	31	
6.1.1	Patents by origin/bn PPP$ GDP	3.7	32	
6.1.2	PCT patent applications/bn PPP$ GDP	1.8	21	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	27.9	27	
6.1.5	Citable documents H index	332.0	28	
6.2	Knowledge impact	56.8	3	●
6.2.1	Growth rate of PPP$ GDP/worker, %	3.0	27	
6.2.2	New businesses/th pop. 15–64	5.8	21	
6.2.3	Computer software spending, % GDP	0.7	4	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	8.7	42	
6.2.5	High- & medium-high-tech manufactures, %[4]	57.6	4	●
6.3	Knowledge diffusion	86.8	1	●
6.3.1	Intellectual property receipts, % total trade	2.1	1	●
6.3.2	High-tech exports less re-exports, % total trade	9.1	22	
6.3.3	ICT services exports, % total trade	23.2	1	●
6.3.4	FDI net outflows, % GDP[4]	15.8	1	●
7	**Creative outputs**	**53.4**	**10**	
7.1	Intangible assets	62.0	10	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP[4]	1.9	52	○
7.1.3	ICTs & business model creation†	76.6	12	
7.1.4	ICTs & organizational model creation†	73.3	14	
7.2	Creative goods & services	33.0	36	
7.2.1	Cultural & creative services exports, % of total trade[4]	0.2	38	○
7.2.2	National feature films/mn pop. 15–69	10.3	12	
7.2.3	Global ent. & media market/th pop. 15–69	46.0	18	
7.2.4	Printing & publishing manufactures, %[4]	0.9	66	○
7.2.5	Creative goods exports, % total trade	2.1	22	
7.3	Online creativity	56.6	15	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	65.8	10	
7.3.2	Country-code TLDs/th pop. 15–69	23.2	28	
7.3.3	Wikipedia edits/mn pop. 15–69	9,744.5	3	●
7.3.4	Video uploads on YouTube/pop. 15–69	65.3	13	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Israel

Key indicators

Population (millions)	8.1
GDP (US$ billions)	296.1
GDP per capita, PPP$	33,656.1
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**52.3**	**21**	
Innovation Output Sub-Index		46.8	16	
Innovation Input Sub-Index		57.8	21	
Innovation Efficiency Ratio		0.8	23	
Global Innovation Index 2015 (out of 141)		53.5	22	
1	**Institutions**	**67.0**	**52**	
1.1	Political environment	54.7	55	
1.1.1	Political stability & safety*	38.1	114	○
1.1.2	Government effectiveness*	71.2	24	
1.2	Regulatory environment	68.1	58	
1.2.1	Regulatory quality*	74.7	21	
1.2.2	Rule of law*	74.7	27	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	110	○
1.3	Business environment	78.2	37	
1.3.1	Ease of starting a business*	90.6	46	
1.3.2	Ease of resolving insolvency*	72.5	27	
1.3.3	Ease of paying taxes*	71.7	78	○
2	**Human capital & research**	**55.4**	**16**	
2.1	Education	53.3	45	
2.1.1	Expenditure on education, % GDP[d]	5.6	33	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	15.5	79	○
2.1.3	School life expectancy, years	16.0	31	
2.1.4	PISA scales in reading, maths, & science	474.1	36	
2.1.5	Pupil-teacher ratio, secondary[d]	9.8	24	
2.2	Tertiary education	33.0	73	
2.2.1	Tertiary enrolment, % gross	66.3	29	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	1.2	77	○
2.3	Research & development (R&D)	80.1	3	●
2.3.1	Researchers, FTE/mn pop.[d]	8,255.4	1	●
2.3.2	Gross expenditure on R&D, % GDP	4.1	2	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	440.5	19	
2.3.4	QS university ranking, average score top 3*	56.1	22	
3	**Infrastructure**	**56.1**	**25**	
3.1	Information & communication technologies (ICTs)	77.3	16	
3.1.1	ICT access*	79.8	23	
3.1.2	ICT use*	55.7	38	
3.1.3	Government's online service*	87.4	13	
3.1.4	E-participation*	86.3	12	
3.2	General infrastructure	40.0	48	
3.2.1	Electricity output, kWh/cap	7,003.3	27	
3.2.2	Logistics performance*	3.3	39	
3.2.3	Gross capital formation, % GDP	20.7	77	○
3.3	Ecological sustainability	50.9	37	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.4	25	
3.3.2	Environmental performance*	78.1	48	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.0	31	
4	**Market sophistication**	**56.5**	**22**	
4.1	Credit	45.2	34	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	66.9	46	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	58.1	15	
4.2.1	Ease of protecting minority investors*	73.3	8	
4.2.2	Market capitalization, % GDP	65.6	28	
4.2.3	Total value of stocks traded, % GDP	15.5	28	
4.2.4	Venture capital deals/bn PPP$ GDP	0.5	1	●
4.3	Trade, competition, & market scale	66.3	49	
4.3.1	Applied tariff rate, weighted mean, %[d]	0.9	8	
4.3.2	Intensity of local competition†	57.2	109	○
4.3.3	Domestic market scale, bn PPP$	272.1	53	
5	**Business sophistication**	**53.9**	**6**	●
5.1	Knowledge workers	60.5	18	
5.1.1	Knowledge-intensive employment, %	47.7	7	
5.1.2	Firms offering formal training, % firms	18.6	82	○
5.1.3	GERD performed by business, % of GDP	3.5	1	●
5.1.4	GERD financed by business, %[d]	36.5	43	
5.1.5	Females employed w/advanced degrees, % total[d]	28.4	3	●
5.2	Innovation linkages	57.4	3	●
5.2.1	University/industry research collaboration†	75.1	7	●
5.2.2	State of cluster development†	55.7	29	
5.2.3	GERD financed by abroad, %[d]	48.8	5	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	22	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	5.3	8	
5.3	Knowledge absorption	43.7	16	
5.3.1	Intellectual property payments, % total trade[d]	0.5	53	
5.3.2	High-tech imports less re-imports, % total trade	9.8	33	
5.3.3	ICT services imports, % total trade[d]	1.2	52	
5.3.4	FDI net inflows, % GDP	2.2	72	
5.3.5	Research talent, % in business enterprise[d]	83.7	1	●
6	**Knowledge & technology outputs**	**47.8**	**12**	
6.1	Knowledge creation	56.4	10	
6.1.1	Patents by origin/bn PPP$ GDP	4.1	29	
6.1.2	PCT patent applications/bn PPP$ GDP	6.0	7	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	45.8	10	
6.1.5	Citable documents H index	496.0	15	
6.2	Knowledge impact	40.8	45	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.3)	93	○
6.2.2	New businesses/th pop. 15–64	3.1	36	
6.2.3	Computer software spending, % GDP	0.3	42	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	32.6	6	●
6.2.5	High- & medium-high-tech manufactures, %[d]	29.0	41	
6.3	Knowledge diffusion	46.2	14	
6.3.1	Intellectual property receipts, % total trade[d]	0.6	22	
6.3.2	High-tech exports less re-exports, % total trade	12.9	16	
6.3.3	ICT services exports, % total trade[d]	6.5	7	●
6.3.4	FDI net outflows, % GDP	1.2	41	
7	**Creative outputs**	**45.8**	**26**	
7.1	Intangible assets	50.3	34	
7.1.1	Trademarks by origin/bn PPP$ GDP	13.5	90	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	75.3	15	
7.1.4	ICTs & organizational model creation†	68.7	20	
7.2	Creative goods & services	38.5	19	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.9	12	
7.2.2	National feature films/mn pop. 15–69	10.8	10	
7.2.3	Global ent. & media market/th pop. 15–69	32.3	22	
7.2.4	Printing & publishing manufactures, %[d]	1.3	48	
7.2.5	Creative goods exports, % total trade	1.7	25	
7.3	Online creativity	43.9	21	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	24.7	24	
7.3.2	Country-code TLDs/th pop. 15–69	16.0	34	
7.3.3	Wikipedia edits/mn pop. 15–69	7,906.3	8	
7.3.4	Video uploads on YouTube/pop. 15–69	76.7	7	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Italy

Key indicators

Population (millions)	59.8
GDP (US$ billions)	1,815.8
GDP per capita, PPP$	35,708.3
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**47.2**	**29**	
Innovation Output Sub-Index		40.3	31	
Innovation Input Sub-Index		54.1	28	
Innovation Efficiency Ratio		0.7	33	
Global Innovation Index 2015 (out of 141)		46.4	31	
1	**Institutions**	**72.8**	**38**	
1.1	Political environment	62.4	46	
1.1.1	Political stability & safety*	75.2	42	
1.1.2	Government effectiveness*	49.5	48	
1.2	Regulatory environment	79.2	31	
1.2.1	Regulatory quality*	61.1	43	
1.2.2	Rule of law*	55.5	49	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	76.8	42	
1.3.1	Ease of starting a business*	91.1	42	
1.3.2	Ease of resolving insolvency*	76.1	21	
1.3.3	Ease of paying taxes*	63.0	95	○
2	**Human capital & research**	**46.5**	**31**	
2.1	Education	52.3	48	
2.1.1	Expenditure on education, % GDP④	4.1	80	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	22.8	42	
2.1.3	School life expectancy, years	16.3	26	
2.1.4	PISA scales in reading, maths, & science	489.5	28	
2.1.5	Pupil-teacher ratio, secondary④	11.4	39	
2.2	Tertiary education	39.1	48	
2.2.1	Tertiary enrolment, % gross	63.5	34	
2.2.2	Graduates in science & engineering, %④	20.2	54	
2.2.3	Tertiary inbound mobility, %	4.4	34	
2.3	Research & development (R&D)	48.0	23	
2.3.1	Researchers, FTE/mn pop.	2,006.7	36	
2.3.2	Gross expenditure on R&D, % GDP	1.3	26	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	2,029.0	10	●
2.3.4	QS university ranking, average score top 3*	52.9	24	
3	**Infrastructure**	**59.7**	**18**	●
3.1	Information & communication technologies (ICTs)	71.9	25	
3.1.1	ICT access*	77.1	32	
3.1.2	ICT use*	57.4	36	
3.1.3	Government's online service*	74.8	23	
3.1.4	E-participation*	78.4	19	
3.2	General infrastructure	38.3	57	
3.2.1	Electricity output, kWh/cap	4,542.9	46	
3.2.2	Logistics performance*	3.7	19	
3.2.3	Gross capital formation, % GDP	16.3	109	○
3.3	Ecological sustainability	69.0	2	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.1	20	
3.3.2	Environmental performance*	84.5	29	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	12.7	5	●
4	**Market sophistication**	**53.6**	**25**	
4.1	Credit	39.7	45	
4.1.1	Ease of getting credit*	45.0	81	○
4.1.2	Domestic credit to private sector, % GDP	89.4	31	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	40.8	45	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP④	21.8	62	○
4.2.3	Total value of stocks traded, % GDP④	59.9	13	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	36	
4.3	Trade, competition, & market scale	80.2	7	●
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	71.0	51	
4.3.3	Domestic market scale, bn PPP$	2,135.4	12	●
5	**Business sophistication**	**37.8**	**36**	
5.1	Knowledge workers	45.0	44	
5.1.1	Knowledge-intensive employment, %	35.6	36	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.7	25	
5.1.4	GERD financed by business, %④	45.2	28	
5.1.5	Females employed w/advanced degrees, % total	11.1	60	○
5.2	Innovation linkages	37.8	38	
5.2.1	University/industry research collaboration†	45.5	57	
5.2.2	State of cluster development†	74.3	4	●
5.2.3	GERD financed by abroad, %④	9.7	45	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	45	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.7	23	
5.3	Knowledge absorption	30.6	53	
5.3.1	Intellectual property payments, % total trade	0.9	34	
5.3.2	High-tech imports less re-imports, % total trade	7.4	64	
5.3.3	ICT services imports, % total trade	1.7	28	
5.3.4	FDI net inflows, % GDP	0.6	111	○
5.3.5	Research talent, % in business enterprise	38.3	32	
6	**Knowledge & technology outputs**	**38.7**	**25**	
6.1	Knowledge creation	33.9	27	
6.1.1	Patents by origin/bn PPP$ GDP	5.7	22	
6.1.2	PCT patent applications/bn PPP$ GDP	1.4	26	
6.1.3	Utility models by origin/bn PPP$ GDP	1.1	23	
6.1.4	Scientific & technical articles/bn PPP$ GDP	27.3	28	
6.1.5	Citable documents H index	713.0	7	●
6.2	Knowledge impact	52.3	14	●
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.5)	97	○
6.2.2	New businesses/th pop. 15–64	2.3	44	
6.2.3	Computer software spending, % GDP	0.6	16	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	79.1	1	●
6.2.5	High- & medium-high-tech manufactures, %	37.6	25	
6.3	Knowledge diffusion	30.0	40	
6.3.1	Intellectual property receipts, % total trade	0.6	19	
6.3.2	High-tech exports less re-exports, % total trade	5.5	31	
6.3.3	ICT services exports, % total trade	1.4	69	
6.3.4	FDI net outflows, % GDP	1.2	40	
7	**Creative outputs**	**41.8**	**32**	
7.1	Intangible assets	51.8	28	
7.1.1	Trademarks by origin/bn PPP$ GDP	49.8	46	
7.1.2	Industrial designs by origin/bn PPP$ GDP	18.5	1	●
7.1.3	ICTs & business model creation†	56.7	70	
7.1.4	ICTs & organizational model creation†	47.4	82	○
7.2	Creative goods & services	29.4	45	
7.2.1	Cultural & creative services exports, % of total trade④	0.3	35	
7.2.2	National feature films/mn pop. 15–69	4.0	40	
7.2.3	Global ent. & media market/th pop. 15–69	27.8	24	
7.2.4	Printing & publishing manufactures, %	1.3	44	
7.2.5	Creative goods exports, % total trade	2.3	21	
7.3	Online creativity	34.2	28	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	24.4	25	
7.3.2	Country-code TLDs/th pop. 15–69	24.5	26	
7.3.3	Wikipedia edits/mn pop. 15–69	7,569.6	13	●
7.3.4	Video uploads on YouTube/pop. 15–69	32.1	38	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Jamaica

Key indicators

Population (millions)	2.8
GDP (US$ billions)	13.9
GDP per capita, PPP$	8,758.5
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.0**	**89**	
Innovation Output Sub-Index		20.0	99	
Innovation Input Sub-Index		38.0	83	
Innovation Efficiency Ratio		0.5	104	
Global Innovation Index 2015 (out of 141)		29.9	96	
1	**Institutions**	**65.3**	**57**	
1.1	Political environment	54.0	58	
1.1.1	Political stability & safety*	65.0	59	
1.1.2	Government effectiveness*	42.9	61	
1.2	Regulatory environment	66.1	68	
1.2.1	Regulatory quality*	48.8	64	
1.2.2	Rule of law*	39.4	77	
1.2.3	Cost of redundancy dismissal, salary weeks	14.0	56	
1.3	Business environment	75.8	46	●
1.3.1	Ease of starting a business*	97.3	9	●
1.3.2	Ease of resolving insolvency*	69.1	32	●
1.3.3	Ease of paying taxes*	61.0	100	
2	**Human capital & research**	**24.2**	**88**	
2.1	Education	48.2	62	
2.1.1	Expenditure on education, % GDP	6.0	25	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	22.8	43	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	16.5	73	
2.2	Tertiary education	24.4	95	
2.2.1	Tertiary enrolment, % gross	27.4	83	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**31.2**	**102**	
3.1	Information & communication technologies (ICTs)	31.1	99	
3.1.1	ICT access*	45.7	85	
3.1.2	ICT use*	27.6	83	
3.1.3	Government's online service*	31.5	94	
3.1.4	E-participation*	19.6	112	○
3.2	General infrastructure	23.2	113	○
3.2.1	Electricity output, kWh/cap	1,527.6	82	
3.2.2	Logistics performance*	2.8	67	
3.2.3	Gross capital formation, % GDP	16.0	111	○
3.3	Ecological sustainability	39.3	82	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.4	84	
3.3.2	Environmental performance*	77.0	53	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.5	82	
4	**Market sophistication**	**40.3**	**86**	
4.1	Credit	32.0	69	
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	29.3	96	
4.1.3	Microfinance gross loans, % GDP	0.1	62	
4.2	Investment	42.0	42	●
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP	21.1	63	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	46.9	111	○
4.3.1	Applied tariff rate, weighted mean, %◴	7.3	101	
4.3.2	Intensity of local competition†	73.3	38	●
4.3.3	Domestic market scale, bn PPP$	24.1	112	○
5	**Business sophistication**	**28.8**	**80**	
5.1	Knowledge workers	30.6	89	
5.1.1	Knowledge-intensive employment, %◴	20.1	69	
5.1.2	Firms offering formal training, % firms◴	25.9	68	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	32.8	56	
5.2.1	University/industry research collaboration†	46.6	55	
5.2.2	State of cluster development†	40.9	84	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	61	
5.3	Knowledge absorption	23.1	92	
5.3.1	Intellectual property payments, % total trade	1.1	24	●
5.3.2	High-tech imports less re-imports, % total trade	4.8	99	○
5.3.3	ICT services imports, % total trade	0.6	86	
5.3.4	FDI net inflows, % GDP	4.3	35	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.3**	**110**	○
6.1	Knowledge creation	6.8	79	
6.1.1	Patents by origin/bn PPP$ GDP	1.4	59	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.7	89	
6.1.5	Citable documents H index	71.0	97	
6.2	Knowledge impact	23.7	110	○
6.2.1	Growth rate of PPP$ GDP/worker, %	(1.3)	104	○
6.2.2	New businesses/th pop. 15–64	1.0	70	
6.2.3	Computer software spending, % GDP	0.3	26	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.9	106	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	18.5	106	○
6.3.1	Intellectual property receipts, % total trade	0.1	47	
6.3.2	High-tech exports less re-exports, % total trade	0.1	113	○
6.3.3	ICT services exports, % total trade	1.5	65	
6.3.4	FDI net outflows, % GDP	(0.0)	98	○
7	**Creative outputs**	**23.6**	**91**	
7.1	Intangible assets	44.9	58	
7.1.1	Trademarks by origin/bn PPP$ GDP	75.1	18	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.0	40	●
7.1.3	ICTs & business model creation†	57.5	67	
7.1.4	ICTs & organizational model creation†	50.1	76	
7.2	Creative goods & services	1.6	[119]	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	96	
7.3	Online creativity	3.0	91	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.1	79	
7.3.2	Country-code TLDs/th pop. 15–69	1.2	80	
7.3.3	Wikipedia edits/mn pop. 15–69	779.8	82	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Japan

Key indicators

Population (millions)	126.6
GDP (US$ billions)	4,123.3
GDP per capita, PPP$	38,054.2
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**54.5**	**16**	
Innovation Output Sub-Index		43.0	24	
Innovation Input Sub-Index		66.0	9	
Innovation Efficiency Ratio		0.7	65	
Global Innovation Index 2015 (out of 141)		54.0	19	
1	**Institutions**	**87.1**	**15**	
1.1	Political environment	88.9	11	
1.1.1	Political stability & safety*	88.2	18	
1.1.2	Government effectiveness*	89.6	7	
1.2	Regulatory environment	90.0	15	
1.2.1	Regulatory quality*	72.9	25	
1.2.2	Rule of law*	87.0	19	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	82.4	23	
1.3.1	Ease of starting a business*	86.3	62	
1.3.2	Ease of resolving insolvency*	93.8	2	●
1.3.3	Ease of paying taxes*	67.2	86	○
2	**Human capital & research**	**57.5**	**13**	
2.1	Education	53.4	44	
2.1.1	Expenditure on education, % GDP	3.8	84	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	25.7	32	
2.1.3	School life expectancy, years	15.3	38	
2.1.4	PISA scales in reading, maths, & science	540.4	5	
2.1.5	Pupil-teacher ratio, secondary◴	11.7	41	
2.2	Tertiary education	37.4	55	
2.2.1	Tertiary enrolment, % gross	62.4	38	
2.2.2	Graduates in science & engineering, %	19.9	58	○
2.2.3	Tertiary inbound mobility, %	3.5	49	
2.3	Research & development (R&D)	81.6	2	●
2.3.1	Researchers, FTE/mn pop.	5,386.2	9	
2.3.2	Gross expenditure on R&D, % GDP	3.6	3	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	4,694.6	4	●
2.3.4	QS university ranking, average score top 3*	83.0	8	
3	**Infrastructure**	**64.4**	**7**	
3.1	Information & communication technologies (ICTs)	89.7	4	●
3.1.1	ICT access*	88.5	11	
3.1.2	ICT use*	79.8	10	
3.1.3	Government's online service*	94.5	4	
3.1.4	E-participation*	96.1	4	
3.2	General infrastructure	50.8	20	
3.2.1	Electricity output, kWh/cap	8,020.1	22	
3.2.2	Logistics performance*	3.9	10	
3.2.3	Gross capital formation, % GDP	21.8	66	
3.3	Ecological sustainability	52.6	29	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.3	42	
3.3.2	Environmental performance*	80.6	39	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	5.0	21	
4	**Market sophistication**	**68.3**	**8**	
4.1	Credit	62.1	13	
4.1.1	Ease of getting credit*	50.0	69	○
4.1.2	Domestic credit to private sector, % GDP	187.6	4	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	54.3	18	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP	95.1	13	
4.2.3	Total value of stocks traded, % GDP	105.3	4	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	44	
4.3	Trade, competition, & market scale	88.5	2	●
4.3.1	Applied tariff rate, weighted mean, %◴	1.2	39	
4.3.2	Intensity of local competition†	88.9	1	●
4.3.3	Domestic market scale, bn PPP$	4,767.2	4	●
5	**Business sophistication**	**52.8**	**10**	
5.1	Knowledge workers	63.0	13	
5.1.1	Knowledge-intensive employment, %	24.4	57	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	2.8	3	●
5.1.4	GERD financed by business, %	77.3	1	●
5.1.5	Females employed w/advanced degrees, % total	19.7	24	
5.2	Innovation linkages	46.7	13	
5.2.1	University/industry research collaboration†	66.7	15	
5.2.2	State of cluster development†	71.3	9	
5.2.3	GERD financed by abroad, %	0.4	95	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	32	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	15.4	1	●
5.3	Knowledge absorption	48.5	11	
5.3.1	Intellectual property payments, % total trade	2.3	7	
5.3.2	High-tech imports less re-imports, % total trade	13.7	16	
5.3.3	ICT services imports, % total trade	1.2	49	
5.3.4	FDI net inflows, % GDP	0.2	122	○
5.3.5	Research talent, % in business enterprise	74.1	3	●
6	**Knowledge & technology outputs**	**46.9**	**13**	
6.1	Knowledge creation	56.1	11	
6.1.1	Patents by origin/bn PPP$ GDP	55.8	1	●
6.1.2	PCT patent applications/bn PPP$ GDP	9.1	1	●
6.1.3	Utility models by origin/bn PPP$ GDP	1.1	22	
6.1.4	Scientific & technical articles/bn PPP$ GDP	15.0	47	
6.1.5	Citable documents H index	745.0	6	
6.2	Knowledge impact	34.8	72	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.7)	100	○
6.2.2	New businesses/th pop. 15–64	0.2	97	○
6.2.3	Computer software spending, % GDP	0.3	37	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	9.6	39	
6.2.5	High- & medium-high-tech manufactures, %	51.8	8	
6.3	Knowledge diffusion	49.8	11	
6.3.1	Intellectual property receipts, % total trade	4.0	1	●
6.3.2	High-tech exports less re-exports, % total trade	11.6	18	
6.3.3	ICT services exports, % total trade	0.3	104	○
6.3.4	FDI net outflows, % GDP	2.6	24	
7	**Creative outputs**	**39.2**	**36**	
7.1	Intangible assets	48.5	43	
7.1.1	Trademarks by origin/bn PPP$ GDP	40.3	56	
7.1.2	Industrial designs by origin/bn PPP$ GDP	5.2	26	
7.1.3	ICTs & business model creation†	71.8	23	
7.1.4	ICTs & organizational model creation†	61.9	32	
7.2	Creative goods & services	38.3	20	
7.2.1	Cultural & creative services exports, % of total trade	0.0	60	○
7.2.2	National feature films/mn pop. 15–69	6.7	26	
7.2.3	Global ent. & media market/th pop. 15–69	54.7	11	
7.2.4	Printing & publishing manufactures, %	2.1	22	
7.2.5	Creative goods exports, % total trade	2.1	23	
7.3	Online creativity	21.6	40	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	16.4	31	
7.3.2	Country-code TLDs/th pop. 15–69	5.8	49	
7.3.3	Wikipedia edits/mn pop. 15–69	3,292.1	40	
7.3.4	Video uploads on YouTube/pop. 15–69	39.8	27	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Jordan

Key indicators

Population (millions)	7.6
GDP (US$ billions)	37.6
GDP per capita, PPP$	12,122.9
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.0**	**82**	
Innovation Output Sub-Index		24.1	77	
Innovation Input Sub-Index		36.0	88	
Innovation Efficiency Ratio		0.7	58	
Global Innovation Index 2015 (out of 141)		33.8	75	
1	**Institutions**	**62.6**	**63**	
1.1	Political environment	45.9	76	
1.1.1	Political stability & safety*	48.9	94	
1.1.2	Government effectiveness*	42.8	62	
1.2	Regulatory environment	76.5	34	●
1.2.1	Regulatory quality*	46.7	67	
1.2.2	Rule of law*	59.1	44	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	65.6	78	
1.3.1	Ease of starting a business*	85.7	69	
1.3.2	Ease of resolving insolvency*	30.2	117	○
1.3.3	Ease of paying taxes*	81.0	46	●
2	**Human capital & research**	**25.4**	**86**	
2.1	Education	30.7	109	○
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	15.1	85	○
2.1.3	School life expectancy, years[d]	12.8	80	
2.1.4	PISA scales in reading, maths, & science	398.0	54	○
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	37.2	57	
2.2.1	Tertiary enrolment, % gross[d]	47.6	55	
2.2.2	Graduates in science & engineering, %[d]	16.1	78	
2.2.3	Tertiary inbound mobility, %[d]	9.1	19	●
2.3	Research & development (R&D)	8.3	64	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.4	65	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	15.9	58	
3	**Infrastructure**	**38.5**	**79**	
3.1	Information & communication technologies (ICTs)	44.9	77	
3.1.1	ICT access*	56.9	70	
3.1.2	ICT use*	23.6	88	
3.1.3	Government's online service*	52.0	62	
3.1.4	E-participation*	47.1	70	
3.2	General infrastructure	29.1	84	
3.2.1	Electricity output, kWh/cap	2,672.3	66	
3.2.2	Logistics performance*	2.9	65	
3.2.3	Gross capital formation, % GDP	20.3	79	
3.3	Ecological sustainability	41.6	71	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.5	48	
3.3.2	Environmental performance*	72.2	68	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.7	72	
4	**Market sophistication**	**32.0**	**115**	○
4.1	Credit	10.5	125	○
4.1.1	Ease of getting credit*	0.0	127	○
4.1.2	Domestic credit to private sector, % GDP	70.2	41	●
4.1.3	Microfinance gross loans, % GDP	0.4	41	
4.2	Investment	29.0	97	
4.2.1	Ease of protecting minority investors*	36.7	120	○
4.2.2	Market capitalization, % GDP	71.3	24	●
4.2.3	Total value of stocks traded, % GDP	8.6	37	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	24	●
4.3	Trade, competition, & market scale	56.5	82	
4.3.1	Applied tariff rate, weighted mean, %[d]	5.1	86	
4.3.2	Intensity of local competition†	70.2	55	
4.3.3	Domestic market scale, bn PPP$	79.9	79	
5	**Business sophistication**	**21.5**	**116**	○
5.1	Knowledge workers	0.0	[127]	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	3.4	94	○
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	34.6	48	
5.2.1	University/industry research collaboration†	47.1	51	
5.2.2	State of cluster development†	54.6	30	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	36	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	67	
5.3	Knowledge absorption	29.8	57	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	5.1	94	
5.3.3	ICT services imports, % total trade	n/a	n/a	
5.3.4	FDI net inflows, % GDP	4.9	30	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**21.7**	**79**	
6.1	Knowledge creation	10.9	60	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	75	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	14.8	48	
6.1.5	Citable documents H index	102.0	77	
6.2	Knowledge impact	29.8	92	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.3	53	
6.2.2	New businesses/th pop. 15–64	1.0	71	
6.2.3	Computer software spending, % GDP	0.3	49	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.7	68	
6.2.5	High- & medium-high-tech manufactures, %	20.4	57	
6.3	Knowledge diffusion	24.4	64	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.5	78	
6.3.3	ICT services exports, % total trade	n/a	n/a	
6.3.4	FDI net outflows, % GDP[d]	0.0	85	
7	**Creative outputs**	**26.4**	**78**	
7.1	Intangible assets	38.6	82	
7.1.1	Trademarks by origin/bn PPP$ GDP	31.9	64	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.2	97	○
7.1.3	ICTs & business model creation†	61.5	49	
7.1.4	ICTs & organizational model creation†	56.0	55	
7.2	Creative goods & services	21.5	68	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	1.7	52	○
7.2.4	Printing & publishing manufactures, %	1.4	40	
7.2.5	Creative goods exports, % total trade	0.9	39	●
7.3	Online creativity	6.9	69	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.1	47	
7.3.2	Country-code TLDs/th pop. 15–69	0.4	97	
7.3.3	Wikipedia edits/mn pop. 15–69	1,037.9	70	
7.3.4	Video uploads on YouTube/pop. 15–69	12.4	59	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Kazakhstan

Key indicators

Population (millions)	17.6
GDP (US$ billions)	173.2
GDP per capita, PPP$	24,267.9
Income group	Upper-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**31.5**	**75**	
Innovation Output Sub-Index		21.3	90	
Innovation Input Sub-Index		41.7	65	
Innovation Efficiency Ratio		0.5	108	
Global Innovation Index 2015 (out of 141)		31.2	82	
1	**Institutions**	**66.5**	**54**	
1.1	Political environment	51.4	61	
1.1.1	Political stability & safety*	64.2	63	
1.1.2	Government effectiveness*	38.6	70	
1.2	Regulatory environment	67.2	64	
1.2.1	Regulatory quality*	38.1	85	
1.2.2	Rule of law*	33.5	93	
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	●
1.3	Business environment	80.9	27	●
1.3.1	Ease of starting a business*	94.4	21	●
1.3.2	Ease of resolving insolvency*	59.0	44	
1.3.3	Ease of paying taxes*	89.2	17	●
2	**Human capital & research**	**31.4**	**66**	
2.1	Education	43.0	79	
2.1.1	Expenditure on education, % GDP	2.9	102	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	20.4	51	
2.1.3	School life expectancy, years	15.0	47	
2.1.4	PISA scales in reading, maths, & science	416.4	48	
2.1.5	Pupil-teacher ratio, secondary	8.7	15	●
2.2	Tertiary education	39.4	47	
2.2.1	Tertiary enrolment, % gross	48.5	54	
2.2.2	Graduates in science & engineering, %	25.7	25	
2.2.3	Tertiary inbound mobility, %	2.7	58	
2.3	Research & development (R&D)	12.0	53	
2.3.1	Researchers, FTE/mn pop.④	734.1	51	
2.3.2	Gross expenditure on R&D, % GDP④	0.2	92	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	36.1	37	
3	**Infrastructure**	**46.8**	**54**	
3.1	Information & communication technologies (ICTs)	66.5	37	
3.1.1	ICT access*	69.2	49	
3.1.2	ICT use*	45.4	58	
3.1.3	Government's online service*	74.8	23	●
3.1.4	E-participation*	76.5	22	●
3.2	General infrastructure	40.4	42	
3.2.1	Electricity output, kWh/cap	5,596.7	35	
3.2.2	Logistics performance*	2.7	83	
3.2.3	Gross capital formation, % GDP	30.8	16	●
3.3	Ecological sustainability	33.6	103	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.2	109	○
3.3.2	Environmental performance*	73.3	64	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	89	
4	**Market sophistication**	**38.6**	**92**	
4.1	Credit	22.8	100	
4.1.1	Ease of getting credit*	55.0	63	
4.1.2	Domestic credit to private sector, % GDP	34.1	86	
4.1.3	Microfinance gross loans, % GDP	0.1	60	
4.2	Investment	27.6	104	
4.2.1	Ease of protecting minority investors*	66.7	25	●
4.2.2	Market capitalization, % GDP	10.5	79	
4.2.3	Total value of stocks traded, % GDP	0.4	65	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	85	○
4.3	Trade, competition, & market scale	65.3	51	
4.3.1	Applied tariff rate, weighted mean, %	3.8	68	
4.3.2	Intensity of local competition†	62.1	89	
4.3.3	Domestic market scale, bn PPP$	420.0	40	
5	**Business sophistication**	**25.4**	**96**	
5.1	Knowledge workers	37.0	68	
5.1.1	Knowledge-intensive employment, %④	32.3	41	
5.1.2	Firms offering formal training, % firms	28.4	61	
5.1.3	GERD performed by business, % of GDP④	0.1	65	
5.1.4	GERD financed by business, %④	28.9	53	
5.1.5	Females employed w/advanced degrees, % total④	17.6	29	
5.2	Innovation linkages	18.7	114	○
5.2.1	University/industry research collaboration†	38.2	82	
5.2.2	State of cluster development†	35.2	105	
5.2.3	GERD financed by abroad, %④	0.8	91	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	31	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	56	
5.3	Knowledge absorption	20.5	98	
5.3.1	Intellectual property payments, % total trade	0.2	77	
5.3.2	High-tech imports less re-imports, % total trade	6.8	71	
5.3.3	ICT services imports, % total trade	0.5	97	
5.3.4	FDI net inflows, % GDP	3.5	47	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**21.2**	**83**	
6.1	Knowledge creation	7.1	75	
6.1.1	Patents by origin/bn PPP$ GDP	4.3	28	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	77	
6.1.3	Utility models by origin/bn PPP$ GDP	0.3	37	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.7	121	○
6.1.5	Citable documents H index	64.0	106	
6.2	Knowledge impact	36.3	61	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.6	16	●
6.2.2	New businesses/th pop. 15–64④	1.7	50	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.2	102	
6.2.5	High- & medium-high-tech manufactures, %	16.5	63	
6.3	Knowledge diffusion	20.2	96	
6.3.1	Intellectual property receipts, % total trade	0.0	92	○
6.3.2	High-tech exports less re-exports, % total trade	4.8	34	
6.3.3	ICT services exports, % total trade	0.2	112	○
6.3.4	FDI net outflows, % GDP④	0.8	51	
7	**Creative outputs**	**21.4**	**99**	
7.1	Intangible assets	33.8	102	
7.1.1	Trademarks by origin/bn PPP$ GDP④	17.8	85	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	94	○
7.1.3	ICTs & business model creation†	56.6	71	
7.1.4	ICTs & organizational model creation†	51.8	69	
7.2	Creative goods & services	14.2	83	
7.2.1	Cultural & creative services exports, % of total trade	0.0	70	
7.2.2	National feature films/mn pop. 15–69	2.9	48	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	0.9	67	
7.2.5	Creative goods exports, % total trade	0.6	57	
7.3	Online creativity	3.6	86	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.4	113	○
7.3.2	Country-code TLDs/th pop. 15–69	3.6	58	
7.3.3	Wikipedia edits/mn pop. 15–69	919.7	77	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Kenya

Key indicators

Population (millions)	46.1
GDP (US$ billions)	61.4
GDP per capita, PPP$	3,207.7
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.4**	**80**	
Innovation Output Sub-Index		26.3	65	
Innovation Input Sub-Index		34.4	97	
Innovation Efficiency Ratio		0.8	30	●
Global Innovation Index 2015 (out of 141)		30.2	92	
1	**Institutions**	**52.7**	**90**	
1.1	Political environment	31.0	109	
1.1.1	Political stability & safety*	31.3	121	○
1.1.2	Government effectiveness*	30.6	85	
1.2	Regulatory environment	68.1	59	
1.2.1	Regulatory quality*	36.4	89	
1.2.2	Rule of law*	35.9	90	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	59.0	100	
1.3.1	Ease of starting a business*	74.5	112	
1.3.2	Ease of resolving insolvency*	30.6	115	
1.3.3	Ease of paying taxes*	72.0	76	
2	**Human capital & research**	**13.9**	**120**	○
2.1	Education	32.6	104	
2.1.1	Expenditure on education, % GDP◴	5.5	37	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	21.2	49	
2.1.3	School life expectancy, years◴	11.1	98	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary◴	41.1	112	○
2.2	Tertiary education	3.0	[122]	
2.2.1	Tertiary enrolment, % gross◴	4.0	118	○
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	6.2	73	
2.3.1	Researchers, FTE/mn pop.◴	230.7	68	
2.3.2	Gross expenditure on R&D, % GDP◴	0.8	42	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	4.6	69	
3	**Infrastructure**	**32.8**	**98**	
3.1	Information & communication technologies (ICTs)	39.5	85	
3.1.1	ICT access*	33.0	106	
3.1.2	ICT use*	17.6	97	
3.1.3	Government's online service*	42.5	76	
3.1.4	E-participation*	64.7	33	
3.2	General infrastructure	28.4	90	
3.2.1	Electricity output, kWh/cap	200.1	111	○
3.2.2	Logistics performance*	2.8	71	
3.2.3	Gross capital formation, % GDP	23.8	50	
3.3	Ecological sustainability	30.7	113	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.0	99	
3.3.2	Environmental performance*	62.5	100	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	93	
4	**Market sophistication**	**41.2**	**79**	
4.1	Credit	33.5	62	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	34.4	83	
4.1.3	Microfinance gross loans, % GDP	1.5	26	
4.2	Investment	36.4	66	
4.2.1	Ease of protecting minority investors*	46.7	92	
4.2.2	Market capitalization, % GDP◴	40.5	40	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	23	●
4.3	Trade, competition, & market scale	53.6	92	
4.3.1	Applied tariff rate, weighted mean, %	9.7	115	○
4.3.2	Intensity of local competition†	76.0	22	●
4.3.3	Domestic market scale, bn PPP$	133.0	68	
5	**Business sophistication**	**31.6**	**64**	
5.1	Knowledge workers	26.4	96	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	40.6	38	
5.1.3	GERD performed by business, % of GDP◴	0.1	63	
5.1.4	GERD financed by business, %◴	4.3	80	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	46.4	14	●
5.2.1	University/industry research collaboration†	53.6	36	
5.2.2	State of cluster development†	51.3	36	
5.2.3	GERD financed by abroad, %◴	47.1	7	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	80	
5.3	Knowledge absorption	21.9	95	
5.3.1	Intellectual property payments, % total trade	1.0	31	●
5.3.2	High-tech imports less re-imports, % total trade◴	10.8	27	●
5.3.3	ICT services imports, % total trade	0.1	117	○
5.3.4	FDI net inflows, % GDP	1.5	91	
5.3.5	Research talent, % in business enterprise◴	11.4	63	
6	**Knowledge & technology outputs**	**22.1**	**77**	
6.1	Knowledge creation	9.9	65	
6.1.1	Patents by origin/bn PPP$ GDP	1.0	65	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	65	
6.1.3	Utility models by origin/bn PPP$ GDP	0.6	31	
6.1.4	Scientific & technical articles/bn PPP$ GDP	10.9	63	
6.1.5	Citable documents H index	165.0	48	
6.2	Knowledge impact	29.0	94	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.5	31	●
6.2.2	New businesses/th pop. 15–64	1.8	49	
6.2.3	Computer software spending, % GDP	0.2	68	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	4.2	67	
6.2.5	High- & medium-high-tech manufactures, %	8.8	82	
6.3	Knowledge diffusion	27.3	48	
6.3.1	Intellectual property receipts, % total trade	0.4	26	●
6.3.2	High-tech exports less re-exports, % total trade◴	0.6	71	
6.3.3	ICT services exports, % total trade	4.3	13	●
6.3.4	FDI net outflows, % GDP	(0.1)	105	
7	**Creative outputs**	**30.5**	**60**	
7.1	Intangible assets	49.1	41	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.6	76	
7.1.3	ICTs & business model creation†	64.8	39	
7.1.4	ICTs & organizational model creation†	56.3	51	
7.2	Creative goods & services	23.0	62	
7.2.1	Cultural & creative services exports, % of total trade	0.0	83	○
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	1.4	53	
7.2.4	Printing & publishing manufactures, %	2.6	13	●
7.2.5	Creative goods exports, % total trade◴	0.3	70	
7.3	Online creativity	0.9	104	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.1	95	
7.3.2	Country-code TLDs/th pop. 15–69	0.7	85	
7.3.3	Wikipedia edits/mn pop. 15–69	107.0	107	
7.3.4	Video uploads on YouTube/pop. 15–69	0.9	70	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Korea, Republic of

Key indicators

Population (millions)	50.3
GDP (US$ billions)	1,376.9
GDP per capita, PPP$	36,511.0
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**57.1**	**11**	
Innovation Output Sub-Index		50.8	11	
Innovation Input Sub-Index		63.5	13	
Innovation Efficiency Ratio		0.8	24	
Global Innovation Index 2015 (out of 141)		56.3	14	
1	**Institutions**	**75.4**	**31**	
1.1	Political environment	69.6	39	
1.1.1	Political stability & safety*	67.5	53	
1.1.2	Government effectiveness*	71.7	23	
1.2	Regulatory environment	66.7	66	
1.2.1	Regulatory quality*	72.2	26	
1.2.2	Rule of law*	71.6	30	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	107	○
1.3	Business environment	89.7	6	
1.3.1	Ease of starting a business*	94.4	22	
1.3.2	Ease of resolving insolvency*	90.3	4	●
1.3.3	Ease of paying taxes*	84.5	26	
2	**Human capital & research**	**66.9**	**3**	●
2.1	Education	55.6	38	
2.1.1	Expenditure on education, % GDP	4.6	63	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	23.4	39	
2.1.3	School life expectancy, years	16.6	19	
2.1.4	PISA scales in reading, maths, & science	542.4	4	
2.1.5	Pupil-teacher ratio, secondary	15.6	69	
2.2	Tertiary education	55.5	12	
2.2.1	Tertiary enrolment, % gross	95.3	2	●
2.2.2	Graduates in science & engineering, % ◴	31.9	7	
2.2.3	Tertiary inbound mobility, %	1.7	72	○
2.3	Research & development (R&D)	89.5	1	●
2.3.1	Researchers, FTE/mn pop.	6,899.0	4	
2.3.2	Gross expenditure on R&D, % GDP	4.3	1	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	4,465.7	5	
2.3.4	QS university ranking, average score top 3*	80.0	9	
3	**Infrastructure**	**63.3**	**9**	
3.1	Information & communication technologies (ICTs)	92.9	1	●
3.1.1	ICT access*	90.0	9	
3.1.2	ICT use*	84.2	4	●
3.1.3	Government's online service*	97.6	3	●
3.1.4	E-participation*	100.0	1	●
3.2	General infrastructure	57.4	9	
3.2.1	Electricity output, kWh/cap	10,724.9	11	
3.2.2	Logistics performance*	3.7	20	
3.2.3	Gross capital formation, % GDP	28.6	27	
3.3	Ecological sustainability	39.6	80	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.1	90	○
3.3.2	Environmental performance*	70.6	73	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.8	36	
4	**Market sophistication**	**62.0**	**14**	
4.1	Credit	59.6	15	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	138.5	12	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	54.4	17	
4.2.1	Ease of protecting minority investors*	73.3	8	
4.2.2	Market capitalization, % GDP	86.0	20	
4.2.3	Total value of stocks traded, % GDP	91.8	7	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	54	○
4.3	Trade, competition, & market scale	72.0	29	
4.3.1	Applied tariff rate, weighted mean, % ◴	7.2	100	○
4.3.2	Intensity of local competition†	80.4	12	
4.3.3	Domestic market scale, bn PPP$	1,784.0	13	
5	**Business sophistication**	**50.1**	**13**	
5.1	Knowledge workers	65.5	8	
5.1.1	Knowledge-intensive employment, %	21.6	64	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	3.4	2	●
5.1.4	GERD financed by business, %	75.3	3	●
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	41.8	27	
5.2.1	University/industry research collaboration†	60.3	25	
5.2.2	State of cluster development†	58.8	22	
5.2.3	GERD financed by abroad, %	0.7	92	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	30	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	13.7	2	●
5.3	Knowledge absorption	43.1	18	
5.3.1	Intellectual property payments, % total trade	1.5	16	
5.3.2	High-tech imports less re-imports, % total trade	12.6	20	
5.3.3	ICT services imports, % total trade	0.3	112	○
5.3.4	FDI net inflows, % GDP	0.7	109	○
5.3.5	Research talent, % in business enterprise	79.5	2	●
6	**Knowledge & technology outputs**	**54.1**	**5**	
6.1	Knowledge creation	77.6	3	●
6.1.1	Patents by origin/bn PPP$ GDP	92.0	1	●
6.1.2	PCT patent applications/bn PPP$ GDP	7.9	1	●
6.1.3	Utility models by origin/bn PPP$ GDP	4.9	5	
6.1.4	Scientific & technical articles/bn PPP$ GDP	29.7	25	
6.1.5	Citable documents H index	424.0	19	
6.2	Knowledge impact	41.2	43	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.2	61	
6.2.2	New businesses/th pop. 15–64	2.3	45	
6.2.3	Computer software spending, % GDP	0.3	35	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	6.6	53	
6.2.5	High- & medium-high-tech manufactures, %	57.2	5	
6.3	Knowledge diffusion	43.5	18	
6.3.1	Intellectual property receipts, % total trade	0.8	16	
6.3.2	High-tech exports less re-exports, % total trade	21.8	5	
6.3.3	ICT services exports, % total trade	0.4	100	○
6.3.4	FDI net outflows, % GDP	2.2	29	
7	**Creative outputs**	**47.4**	**21**	
7.1	Intangible assets	68.7	2	●
7.1.1	Trademarks by origin/bn PPP$ GDP	92.1	15	
7.1.2	Industrial designs by origin/bn PPP$ GDP	35.4	1	●
7.1.3	ICTs & business model creation†	74.8	17	
7.1.4	ICTs & organizational model creation†	64.6	27	
7.2	Creative goods & services	26.1	50	
7.2.1	Cultural & creative services exports, % of total trade	0.3	34	
7.2.2	National feature films/mn pop. 15–69	5.4	33	
7.2.3	Global ent. & media market/th pop. 15–69	40.3	19	
7.2.4	Printing & publishing manufactures, %	0.3	92	○
7.2.5	Creative goods exports, % total trade	2.7	18	
7.3	Online creativity	26.1	35	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	8.7	44	
7.3.2	Country-code TLDs/th pop. 15–69	9.3	41	
7.3.3	Wikipedia edits/mn pop. 15–69	4,407.7	33	
7.3.4	Video uploads on YouTube/pop. 15–69	54.0	17	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Kuwait

Key indicators

Population (millions)	3.9
GDP (US$ billions)	120.7
GDP per capita, PPP$	70,166.0
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.6**	**67**	
Innovation Output Sub-Index		28.4	56	
Innovation Input Sub-Index		38.8	78	
Innovation Efficiency Ratio		0.7	42	
Global Innovation Index 2015 (out of 141)		33.2	77	
1	**Institutions**	**57.0**	**75**	
1.1	Political environment	50.6	63	
1.1.1	Political stability & safety*	66.2	55	
1.1.2	Government effectiveness*	34.9	78	
1.2	Regulatory environment	52.5	102	
1.2.1	Regulatory quality*	41.5	79	
1.2.2	Rule of law*	48.4	58	
1.2.3	Cost of redundancy dismissal, salary weeks	28.1	112	○
1.3	Business environment	67.9	72	
1.3.1	Ease of starting a business*	75.4	109	
1.3.2	Ease of resolving insolvency*	36.0	102	
1.3.3	Ease of paying taxes*	92.5	11	●
2	**Human capital & research**	**30.2**	**72**	
2.1	Education	44.5	72	
2.1.1	Expenditure on education, % GDP[d]	3.8	86	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	21.8	48	
2.1.3	School life expectancy, years	13.0	75	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	8.2	9	●
2.2	Tertiary education	42.9	37	●
2.2.1	Tertiary enrolment, % gross	27.0	84	
2.2.2	Graduates in science & engineering, %	26.7	20	●
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	3.2	84	
2.3.1	Researchers, FTE/mn pop.[d]	128.4	79	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.3	77	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	5.2	68	
3	**Infrastructure**	**48.1**	**48**	
3.1	Information & communication technologies (ICTs)	58.5	47	
3.1.1	ICT access*	73.1	39	●
3.1.2	ICT use*	60.3	32	●
3.1.3	Government's online service*	57.5	52	
3.1.4	E-participation*	43.1	74	
3.2	General infrastructure	51.1	17	●
3.2.1	Electricity output, kWh/cap	18,095.5	4	●
3.2.2	Logistics performance*	3.0	54	
3.2.3	Gross capital formation, % GDP	20.8	74	
3.3	Ecological sustainability	34.8	97	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.8	77	
3.3.2	Environmental performance*	64.4	95	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	98	
4	**Market sophistication**	**46.0**	**50**	
4.1	Credit	32.7	66	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	67.2	44	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	40.7	46	
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP[d]	105.4	10	●
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	82	○
4.3	Trade, competition, & market scale	64.4	53	
4.3.1	Applied tariff rate, weighted mean, %	3.9	70	
4.3.2	Intensity of local competition†	67.5	67	
4.3.3	Domestic market scale, bn PPP$	282.6	51	
5	**Business sophistication**	**12.9**	**127**	○
5.1	Knowledge workers	1.7	[126]	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	1.4	85	○
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	22.8	94	
5.2.1	University/industry research collaboration†	35.1	98	
5.2.2	State of cluster development†	46.3	57	
5.2.3	GERD financed by abroad, %[d]	1.2	86	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	15	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	99	
5.3	Knowledge absorption	14.1	126	○
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	4.5	105	
5.3.3	ICT services imports, % total trade	0.5	100	
5.3.4	FDI net inflows, % GDP	0.3	117	○
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**27.6**	**51**	
6.1	Knowledge creation	3.4	107	
6.1.1	Patents by origin/bn PPP$ GDP	0.0	118	○
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.3	115	○
6.1.5	Citable documents H index	100.0	79	
6.2	Knowledge impact	27.1	105	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.9)	101	○
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.3	30	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.1	104	
6.2.5	High- & medium-high-tech manufactures, %	14.3	67	
6.3	Knowledge diffusion	52.2	8	●
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.0	117	○
6.3.3	ICT services exports, % total trade	3.8	16	●
6.3.4	FDI net outflows, % GDP	8.0	9	●
7	**Creative outputs**	**29.1**	**64**	
7.1	Intangible assets	46.8	50	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	49.9	97	
7.1.4	ICTs & organizational model creation†	43.7	92	
7.2	Creative goods & services	10.4	91	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	17.8	27	
7.2.4	Printing & publishing manufactures, %	0.6	83	○
7.2.5	Creative goods exports, % total trade	0.2	73	
7.3	Online creativity	12.6	55	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	8.8	43	
7.3.2	Country-code TLDs/th pop. 15–69	0.5	93	
7.3.3	Wikipedia edits/mn pop. 15–69	1,452.2	66	
7.3.4	Video uploads on YouTube/pop. 15–69	30.4	39	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Kyrgyzstan

Key indicators

Population (millions)	5.9
GDP (US$ billions)	6.7
GDP per capita, PPP$	3,362.6
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.6**	**103**	
Innovation Output Sub-Index		17.6	109	
Innovation Input Sub-Index		35.6	92	
Innovation Efficiency Ratio		0.5	110	
Global Innovation Index 2015 (out of 141)		28.0	109	
1	**Institutions**	**49.4**	**97**	
1.1	Political environment	29.6	111	
1.1.1	Political stability & safety*	43.3	100	
1.1.2	Government effectiveness*	15.8	119	
1.2	Regulatory environment	55.3	94	
1.2.1	Regulatory quality*	34.2	98	
1.2.2	Rule of law*	23.8	118	
1.2.3	Cost of redundancy dismissal, salary weeks	17.3	73	
1.3	Business environment	63.5	84	
1.3.1	Ease of starting a business*	92.9	32	●
1.3.2	Ease of resolving insolvency*	34.7	105	
1.3.3	Ease of paying taxes*	62.9	96	
2	**Human capital & research**	**30.2**	**71**	
2.1	Education	57.1	33	●
2.1.1	Expenditure on education, % GDP	6.8	14	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	33.2	13	●
2.1.3	School life expectancy, years	12.8	79	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	13.0	49	
2.2	Tertiary education	32.8	75	
2.2.1	Tertiary enrolment, % gross	47.3	57	
2.2.2	Graduates in science & engineering, %	18.3	66	
2.2.3	Tertiary inbound mobility, %	4.0	39	
2.3	Research & development (R&D)	0.6	108	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	0.1	98	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**32.2**	**100**	
3.1	Information & communication technologies (ICTs)	36.2	91	
3.1.1	ICT access*	41.6	96	
3.1.2	ICT use*	34.6	69	
3.1.3	Government's online service*	27.6	104	
3.1.4	E-participation*	41.2	77	
3.2	General infrastructure	27.6	95	
3.2.1	Electricity output, kWh/cap	2,449.5	71	
3.2.2	Logistics performance*	2.2	122	○
3.2.3	Gross capital formation, % GDP	28.2	29	●
3.3	Ecological sustainability	32.7	106	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.0	111	
3.3.2	Environmental performance*	73.1	65	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	122	○
4	**Market sophistication**	**42.9**	**65**	
4.1	Credit	47.8	29	●
4.1.1	Ease of getting credit*	70.0	27	●
4.1.2	Domestic credit to private sector, % GDP	21.2	107	
4.1.3	Microfinance gross loans, % GDP	5.4	7	●
4.2	Investment	31.8	84	
4.2.1	Ease of protecting minority investors*	63.3	35	●
4.2.2	Market capitalization, % GDP◴	2.5	92	○
4.2.3	Total value of stocks traded, % GDP◴	0.1	78	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	49.1	106	
4.3.1	Applied tariff rate, weighted mean, %	2.5	56	
4.3.2	Intensity of local competition†	57.3	108	
4.3.3	Domestic market scale, bn PPP$	19.2	118	
5	**Business sophistication**	**23.3**	**109**	
5.1	Knowledge workers	36.3	72	
5.1.1	Knowledge-intensive employment, %	17.9	78	
5.1.2	Firms offering formal training, % firms	62.7	8	●
5.1.3	GERD performed by business, % of GDP	0.0	78	
5.1.4	GERD financed by business, %	7.4	75	
5.1.5	Females employed w/advanced degrees, % total◴	10.8	61	
5.2	Innovation linkages	15.5	124	○
5.2.1	University/industry research collaboration†	26.2	118	○
5.2.2	State of cluster development†	31.2	116	
5.2.3	GERD financed by abroad, %	1.0	89	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	72	
5.3	Knowledge absorption	18.2	110	
5.3.1	Intellectual property payments, % total trade	0.1	94	
5.3.2	High-tech imports less re-imports, % total trade◴	5.5	88	
5.3.3	ICT services imports, % total trade	0.6	84	
5.3.4	FDI net inflows, % GDP	2.8	60	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**18.2**	**96**	
6.1	Knowledge creation	10.6	62	
6.1.1	Patents by origin/bn PPP$ GDP	7.1	17	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	78	
6.1.3	Utility models by origin/bn PPP$ GDP	0.4	35	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.7	99	
6.1.5	Citable documents H index	40.0	122	○
6.2	Knowledge impact	28.3	99	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.4	33	●
6.2.2	New businesses/th pop. 15–64	1.1	67	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.2	124	○
6.2.5	High- & medium-high-tech manufactures, %◴	3.3	94	○
6.3	Knowledge diffusion	15.6	117	
6.3.1	Intellectual property receipts, % total trade	0.0	68	
6.3.2	High-tech exports less re-exports, % total trade◴	0.4	83	
6.3.3	ICT services exports, % total trade	0.4	98	
6.3.4	FDI net outflows, % GDP	(0.0)	95	
7	**Creative outputs**	**17.1**	**111**	
7.1	Intangible assets	28.9	113	
7.1.1	Trademarks by origin/bn PPP$ GDP	19.3	83	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.5	47	
7.1.3	ICTs & business model creation†	42.0	118	○
7.1.4	ICTs & organizational model creation†	42.1	102	
7.2	Creative goods & services	9.6	94	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	0.5	89	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %◴	1.0	65	
7.2.5	Creative goods exports, % total trade◴	0.1	95	
7.3	Online creativity	1.0	102	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	115	
7.3.2	Country-code TLDs/th pop. 15–69	0.5	92	
7.3.3	Wikipedia edits/mn pop. 15–69	332.1	94	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Latvia

Key indicators

Population (millions)	2.0
GDP (US$ billions)	27.0
GDP per capita, PPP$	24,712.2
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**44.3**	**34**	
Innovation Output Sub-Index		38.9	34	
Innovation Input Sub-Index		49.7	36	
Innovation Efficiency Ratio		0.8	28	
Global Innovation Index 2015 (out of 141)		45.5	33	
1	**Institutions**	**77.7**	**29**	
1.1	Political environment	71.4	35	
1.1.1	Political stability & safety*	76.7	41	
1.1.2	Government effectiveness*	66.1	37	
1.2	Regulatory environment	80.7	27	
1.2.1	Regulatory quality*	73.7	24	
1.2.2	Rule of law*	68.7	35	
1.2.3	Cost of redundancy dismissal, salary weeks	13.0	49	
1.3	Business environment	81.1	26	
1.3.1	Ease of starting a business*	94.2	26	
1.3.2	Ease of resolving insolvency*	63.4	40	
1.3.3	Ease of paying taxes*	85.8	24	
2	**Human capital & research**	**31.4**	**67**	
2.1	Education	48.3	61	
2.1.1	Expenditure on education, % GDP	3.2	97	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	17.2	70	
2.1.3	School life expectancy, years	16.0	30	
2.1.4	PISA scales in reading, maths, & science	493.8	24	
2.1.5	Pupil-teacher ratio, secondary[4]	8.3	11	●
2.2	Tertiary education	36.5	59	
2.2.1	Tertiary enrolment, % gross	67.0	28	
2.2.2	Graduates in science & engineering, %	17.9	67	
2.2.3	Tertiary inbound mobility, %	3.7	45	
2.3	Research & development (R&D)	9.5	60	
2.3.1	Researchers, FTE/mn pop.	1,884.0	37	
2.3.2	Gross expenditure on R&D, % GDP	0.7	49	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**54.3**	**30**	
3.1	Information & communication technologies (ICTs)	69.0	31	
3.1.1	ICT access*	72.3	43	
3.1.2	ICT use*	62.9	28	
3.1.3	Government's online service*	70.1	28	
3.1.4	E-participation*	70.6	24	
3.2	General infrastructure	39.4	51	
3.2.1	Electricity output, kWh/cap	3,089.1	61	
3.2.2	Logistics performance*	3.4	35	
3.2.3	Gross capital formation, % GDP	23.5	55	
3.3	Ecological sustainability	54.6	24	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.7	59	
3.3.2	Environmental performance*	85.7	22	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.9	13	●
4	**Market sophistication**	**48.6**	**43**	
4.1	Credit	51.4	20	
4.1.1	Ease of getting credit*	75.0	18	
4.1.2	Domestic credit to private sector, % GDP	73.2	40	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	33.3	80	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP[4]	4.0	89	○
4.2.3	Total value of stocks traded, % GDP[4]	0.1	77	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	15	
4.3	Trade, competition, & market scale	61.0	64	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	73.4	37	
4.3.3	Domestic market scale, bn PPP$	48.4	95	○
5	**Business sophistication**	**36.6**	**40**	
5.1	Knowledge workers	41.9	51	
5.1.1	Knowledge-intensive employment, %	39.6	24	
5.1.2	Firms offering formal training, % firms	25.2	72	○
5.1.3	GERD performed by business, % of GDP	0.2	47	
5.1.4	GERD financed by business, %	27.8	55	
5.1.5	Females employed w/advanced degrees, % total	22.5	16	
5.2	Innovation linkages	42.1	26	
5.2.1	University/industry research collaboration†	44.5	61	
5.2.2	State of cluster development†	43.3	73	
5.2.3	GERD financed by abroad, %	44.2	8	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	45	
5.3	Knowledge absorption	25.9	79	
5.3.1	Intellectual property payments, % total trade	0.2	75	○
5.3.2	High-tech imports less re-imports, % total trade	9.2	45	
5.3.3	ICT services imports, % total trade	1.2	53	
5.3.4	FDI net inflows, % GDP	2.8	63	
5.3.5	Research talent, % in business enterprise	20.7	55	○
6	**Knowledge & technology outputs**	**31.6**	**41**	
6.1	Knowledge creation	12.3	58	
6.1.1	Patents by origin/bn PPP$ GDP	2.3	43	
6.1.2	PCT patent applications/bn PPP$ GDP	0.6	33	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	13.7	51	
6.1.5	Citable documents H index	104.0	76	
6.2	Knowledge impact	55.0	10	●
6.2.1	Growth rate of PPP$ GDP/worker, %	3.8	14	●
6.2.2	New businesses/th pop. 15–64	10.6	10	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	20.7	18	●
6.2.5	High- & medium-high-tech manufactures, %	15.6	64	
6.3	Knowledge diffusion	27.6	46	
6.3.1	Intellectual property receipts, % total trade	0.0	73	○
6.3.2	High-tech exports less re-exports, % total trade	7.0	25	
6.3.3	ICT services exports, % total trade	2.0	48	
6.3.4	FDI net outflows, % GDP	1.5	37	
7	**Creative outputs**	**46.2**	**25**	
7.1	Intangible assets	46.4	53	
7.1.1	Trademarks by origin/bn PPP$ GDP	55.0	38	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.1	37	
7.1.3	ICTs & business model creation†	62.9	45	
7.1.4	ICTs & organizational model creation†	60.7	35	
7.2	Creative goods & services	56.4	3	●
7.2.1	Cultural & creative services exports, % of total trade[4]	1.4	6	●
7.2.2	National feature films/mn pop. 15–69	6.9	24	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	2.5	14	●
7.2.5	Creative goods exports, % total trade	3.4	13	●
7.3	Online creativity	35.7	27	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	9.9	41	
7.3.2	Country-code TLDs/th pop. 15–69	30.7	22	
7.3.3	Wikipedia edits/mn pop. 15–69	3,087.0	44	
7.3.4	Video uploads on YouTube/pop. 15–69	79.3	5	●

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Lebanon

Key indicators

Population (millions)	5.9
GDP (US$ billions)	51.2
GDP per capita, PPP$	18,239.8
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**32.7**	**70**	
Innovation Output Sub-Index		27.6	57	
Innovation Input Sub-Index		37.8	85	
Innovation Efficiency Ratio		0.7	41	
Global Innovation Index 2015 (out of 141)		33.8	74	
1	**Institutions**	**52.1**	**91**	
1.1	Political environment	24.3	120	○
1.1.1	Political stability & safety*	20.0	123	○
1.1.2	Government effectiveness*	28.6	87	
1.2	Regulatory environment	66.2	67	
1.2.1	Regulatory quality*	39.3	81	
1.2.2	Rule of law*	28.2	108	○
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	●
1.3	Business environment	65.8	76	
1.3.1	Ease of starting a business*	82.7	85	
1.3.2	Ease of resolving insolvency*	33.1	109	○
1.3.3	Ease of paying taxes*	81.7	39	
2	**Human capital & research**	**29.8**	**76**	
2.1	Education	31.9	107	
2.1.1	Expenditure on education, % GDP	2.6	108	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	5.1	109	○
2.1.3	School life expectancy, years	12.2	86	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	8.2	10	●
2.2	Tertiary education	42.0	38	
2.2.1	Tertiary enrolment, % gross	42.8	60	
2.2.2	Graduates in science & engineering, %[d]	23.3	34	
2.2.3	Tertiary inbound mobility, %	7.6	21	●
2.3	Research & development (R&D)	15.4	48	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	30.8	44	
3	**Infrastructure**	**37.5**	**84**	
3.1	Information & communication technologies (ICTs)	46.5	75	
3.1.1	ICT access*	65.7	57	
3.1.2	ICT use*	55.4	39	
3.1.3	Government's online service*	35.4	89	
3.1.4	E-participation*	29.4	99	
3.2	General infrastructure	24.4	109	○
3.2.1	Electricity output, kWh/cap	4,061.1	51	
3.2.2	Logistics performance*	2.7	80	
3.2.3	Gross capital formation, % GDP	n/a	n/a	
3.3	Ecological sustainability	41.5	73	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.3	41	
3.3.2	Environmental performance*	69.1	83	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	84	
4	**Market sophistication**	**37.9**	**99**	
4.1	Credit	27.1	86	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	103.3	24	●
4.1.3	Microfinance gross loans, % GDP	0.1	61	
4.2	Investment	27.7	103	
4.2.1	Ease of protecting minority investors*	43.3	104	○
4.2.2	Market capitalization, % GDP	24.4	58	
4.2.3	Total value of stocks traded, % GDP[d]	0.9	56	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	20	●
4.3	Trade, competition, & market scale	58.9	72	
4.3.1	Applied tariff rate, weighted mean, %[d]	4.3	77	
4.3.2	Intensity of local competition†	74.1	33	
4.3.3	Domestic market scale, bn PPP$	81.4	77	
5	**Business sophistication**	**31.7**	**63**	
5.1	Knowledge workers	40.6	55	
5.1.1	Knowledge-intensive employment, %[d]	31.9	44	
5.1.2	Firms offering formal training, % firms	26.6	65	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	27.4	76	
5.2.1	University/industry research collaboration†	31.4	108	○
5.2.2	State of cluster development†	44.7	65	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	38	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	74	
5.3	Knowledge absorption	27.1	71	
5.3.1	Intellectual property payments, % total trade	0.1	88	
5.3.2	High-tech imports less re-imports, % total trade	3.9	110	○
5.3.3	ICT services imports, % total trade	1.7	27	●
5.3.4	FDI net inflows, % GDP	6.5	21	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**22.4**	**74**	
6.1	Knowledge creation	14.9	55	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	13.3	53	
6.1.5	Citable documents H index	122.0	65	
6.2	Knowledge impact	25.0	[109]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	9.2	41	
6.2.5	High- & medium-high-tech manufactures, %[d]	22.0	53	
6.3	Knowledge diffusion	27.4	47	
6.3.1	Intellectual property receipts, % total trade	0.1	59	
6.3.2	High-tech exports less re-exports, % total trade	0.2	98	
6.3.3	ICT services exports, % total trade	2.7	32	●
6.3.4	FDI net outflows, % GDP[d]	2.7	22	●
7	**Creative outputs**	**32.8**	**51**	
7.1	Intangible assets	41.6	71	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	45.5	110	○
7.1.4	ICTs & organizational model creation†	37.7	112	○
7.2	Creative goods & services	41.5	15	●
7.2.1	Cultural & creative services exports, % of total trade	0.4	27	
7.2.2	National feature films/mn pop. 15–69	4.0	39	
7.2.3	Global ent. & media market/th pop. 15–69	3.2	49	
7.2.4	Printing & publishing manufactures, %[d]	4.2	1	●
7.2.5	Creative goods exports, % total trade	0.8	41	
7.3	Online creativity	6.7	70	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.4	46	
7.3.2	Country-code TLDs/th pop. 15–69	0.3	98	
7.3.3	Wikipedia edits/mn pop. 15–69	876.3	78	
7.3.4	Video uploads on YouTube/pop. 15–69	12.7	58	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Lithuania

Key indicators

Population (millions)	2.9
GDP (US$ billions)	41.3
GDP per capita, PPP$	28,359.1
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**41.8**	**36**	
Innovation Output Sub-Index		32.3	41	
Innovation Input Sub-Index		51.2	34	
Innovation Efficiency Ratio		0.6	75	
Global Innovation Index 2015 (out of 141)		42.3	38	
1	**Institutions**	**73.3**	**37**	
1.1	Political environment	74.5	32	
1.1.1	Political stability & safety*	82.4	30	
1.1.2	Government effectiveness*	66.7	35	
1.2	Regulatory environment	69.7	51	
1.2.1	Regulatory quality*	74.5	22	●
1.2.2	Rule of law*	69.7	34	
1.2.3	Cost of redundancy dismissal, salary weeks	24.6	100	○
1.3	Business environment	75.7	47	
1.3.1	Ease of starting a business*	97.7	8	●
1.3.2	Ease of resolving insolvency*	48.1	63	
1.3.3	Ease of paying taxes*	81.4	43	
2	**Human capital & research**	**49.1**	**26**	
2.1	Education	86.3	2	●
2.1.1	Expenditure on education, % GDP[4]	17.7	1	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	66.6	3	●
2.1.3	School life expectancy, years	16.5	22	
2.1.4	PISA scales in reading, maths, & science	483.9	32	
2.1.5	Pupil-teacher ratio, secondary[4]	8.1	8	●
2.2	Tertiary education	40.7	44	
2.2.1	Tertiary enrolment, % gross	72.0	24	
2.2.2	Graduates in science & engineering, %	22.2	42	
2.2.3	Tertiary inbound mobility, %	2.5	60	
2.3	Research & development (R&D)	20.2	46	
2.3.1	Researchers, FTE/mn pop.	2,961.5	29	
2.3.2	Gross expenditure on R&D, % GDP	1.0	34	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	22.1	51	
3	**Infrastructure**	**52.9**	**33**	
3.1	Information & communication technologies (ICTs)	67.9	32	
3.1.1	ICT access*	70.4	47	
3.1.2	ICT use*	61.0	30	
3.1.3	Government's online service*	75.6	21	
3.1.4	E-participation*	64.7	33	
3.2	General infrastructure	32.2	72	
3.2.1	Electricity output, kWh/cap	1,423.6	86	○
3.2.2	Logistics performance*	3.2	44	
3.2.3	Gross capital formation, % GDP	21.1	73	
3.3	Ecological sustainability	58.6	17	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.3	51	
3.3.2	Environmental performance*	85.5	23	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	8.8	11	●
4	**Market sophistication**	**45.0**	**53**	
4.1	Credit	36.5	51	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	11.9	123	○
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	33.7	76	
4.2.1	Ease of protecting minority investors*	61.7	45	
4.2.2	Market capitalization, % GDP[4]	9.2	85	○
4.2.3	Total value of stocks traded, % GDP[4]	0.4	64	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	19	
4.3	Trade, competition, & market scale	64.7	52	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	77.4	17	●
4.3.3	Domestic market scale, bn PPP$	79.9	78	
5	**Business sophistication**	**35.7**	**48**	
5.1	Knowledge workers	52.1	29	
5.1.1	Knowledge-intensive employment, %	42.7	20	
5.1.2	Firms offering formal training, % firms	42.0	35	
5.1.3	GERD performed by business, % of GDP	0.3	44	
5.1.4	GERD financed by business, %	31.7	48	
5.1.5	Females employed w/advanced degrees, % total	26.1	6	●
5.2	Innovation linkages	36.8	44	
5.2.1	University/industry research collaboration†	60.1	26	
5.2.2	State of cluster development†	41.9	80	
5.2.3	GERD financed by abroad, %	34.3	12	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	34	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.4	36	
5.3	Knowledge absorption	18.1	111	○
5.3.1	Intellectual property payments, % total trade	0.1	92	○
5.3.2	High-tech imports less re-imports, % total trade	5.3	92	○
5.3.3	ICT services imports, % total trade	0.7	81	
5.3.4	FDI net inflows, % GDP	0.7	106	○
5.3.5	Research talent, % in business enterprise	23.1	51	
6	**Knowledge & technology outputs**	**25.7**	**60**	
6.1	Knowledge creation	16.8	51	
6.1.1	Patents by origin/bn PPP$ GDP	1.8	50	
6.1.2	PCT patent applications/bn PPP$ GDP	0.5	35	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	25.9	30	
6.1.5	Citable documents H index	133.0	58	
6.2	Knowledge impact	39.4	47	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.9	68	
6.2.2	New businesses/th pop. 15–64	4.2	30	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	15.2	25	
6.2.5	High- & medium-high-tech manufactures, %	19.8	59	
6.3	Knowledge diffusion	21.0	87	
6.3.1	Intellectual property receipts, % total trade	0.1	60	
6.3.2	High-tech exports less re-exports, % total trade	5.3	32	
6.3.3	ICT services exports, % total trade	0.7	88	○
6.3.4	FDI net outflows, % GDP	0.3	72	
7	**Creative outputs**	**39.0**	**37**	
7.1	Intangible assets	49.1	40	
7.1.1	Trademarks by origin/bn PPP$ GDP	51.0	43	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.0	51	
7.1.3	ICTs & business model creation†	69.4	26	
7.1.4	ICTs & organizational model creation†	69.3	19	●
7.2	Creative goods & services	28.5	47	
7.2.1	Cultural & creative services exports, % of total trade[4]	0.4	26	
7.2.2	National feature films/mn pop. 15–69	7.0	23	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.0	64	
7.2.5	Creative goods exports, % total trade	1.6	30	
7.3	Online creativity	29.1	31	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	14.1	33	
7.3.2	Country-code TLDs/th pop. 15–69	30.4	23	
7.3.3	Wikipedia edits/mn pop. 15–69	3,619.1	36	
7.3.4	Video uploads on YouTube/pop. 15–69	45.2	23	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Luxembourg

Key indicators

Population (millions)	0.6
GDP (US$ billions)	57.4
GDP per capita, PPP$	98,987.2
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**57.1**	**12**	
Innovation Output Sub-Index		57.6	3	●
Innovation Input Sub-Index		56.6	23	
Innovation Efficiency Ratio		1.0	1	●
Global Innovation Index 2015 (out of 141)		59.0	9	
1	**Institutions**	**82.1**	**19**	
1.1	Political environment	91.2	5	
1.1.1	Political stability & safety*	97.4	2	●
1.1.2	Government effectiveness*	85.0	13	
1.2	Regulatory environment	81.5	25	
1.2.1	Regulatory quality*	85.6	15	
1.2.2	Rule of law*	94.4	10	
1.2.3	Cost of redundancy dismissal, salary weeks	21.7	93	○
1.3	Business environment	73.5	57	
1.3.1	Ease of starting a business*	86.5	61	
1.3.2	Ease of resolving insolvency*	45.5	72	
1.3.3	Ease of paying taxes*	88.6	20	
2	**Human capital & research**	**43.3**	**33**	
2.1	Education	51.9	53	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	18.0	67	
2.1.3	School life expectancy, years◴	13.9	62	
2.1.4	PISA scales in reading, maths, & science	489.6	26	
2.1.5	Pupil-teacher ratio, secondary◴	7.9	4	●
2.2	Tertiary education	44.0	33	
2.2.1	Tertiary enrolment, % gross◴	19.4	93	○
2.2.2	Graduates in science & engineering, %	16.3	77	○
2.2.3	Tertiary inbound mobility, %◴	40.6	1	●
2.3	Research & development (R&D)	33.9	34	
2.3.1	Researchers, FTE/mn pop.	4,577.3	11	
2.3.2	Gross expenditure on R&D, % GDP	1.3	28	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	98.3	30	
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**55.5**	**27**	
3.1	Information & communication technologies (ICTs)	73.8	23	
3.1.1	ICT access*	94.9	1	●
3.1.2	ICT use*	83.4	5	
3.1.3	Government's online service*	62.2	42	
3.1.4	E-participation*	54.9	54	
3.2	General infrastructure	41.9	39	
3.2.1	Electricity output, kWh/cap	3,403.6	56	
3.2.2	Logistics performance*	3.9	8	
3.2.3	Gross capital formation, % GDP	18.2	97	○
3.3	Ecological sustainability	50.8	38	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.9	33	
3.3.2	Environmental performance*	86.6	20	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.3	56	
4	**Market sophistication**	**42.5**	**69**	
4.1	Credit	25.2	93	○
4.1.1	Ease of getting credit*	15.0	121	○
4.1.2	Domestic credit to private sector, % GDP	91.6	30	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	41.7	43	
4.2.1	Ease of protecting minority investors*	45.0	97	○
4.2.2	Market capitalization, % GDP	97.4	12	
4.2.3	Total value of stocks traded, % GDP	0.2	74	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	12	
4.3	Trade, competition, & market scale	60.5	66	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	69.1	59	
4.3.3	Domestic market scale, bn PPP$	53.7	92	
5	**Business sophistication**	**59.9**	**2**	●
5.1	Knowledge workers	61.3	17	
5.1.1	Knowledge-intensive employment, %	62.3	1	●
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.7	28	
5.1.4	GERD financed by business, %◴	16.5	66	
5.1.5	Females employed w/advanced degrees, % total	22.3	17	
5.2	Innovation linkages	64.8	2	●
5.2.1	University/industry research collaboration†	65.0	17	
5.2.2	State of cluster development†	67.8	13	
5.2.3	GERD financed by abroad, %◴	32.3	13	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	1	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	6.2	6	
5.3	Knowledge absorption	53.6	6	
5.3.1	Intellectual property payments, % total trade	3.4	1	●
5.3.2	High-tech imports less re-imports, % total trade	2.8	117	○
5.3.3	ICT services imports, % total trade	3.5	4	●
5.3.4	FDI net inflows, % GDP	10.9	7	
5.3.5	Research talent, % in business enterprise	40.3	29	
6	**Knowledge & technology outputs**	**48.7**	**11**	
6.1	Knowledge creation	49.3	14	
6.1.1	Patents by origin/bn PPP$ GDP	10.9	11	
6.1.2	PCT patent applications/bn PPP$ GDP	7.2	1	●
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	17.9	41	
6.1.5	Citable documents H index	105.0	75	
6.2	Knowledge impact	38.1	55	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.1	22	
6.2.2	New businesses/th pop. 15–64◴	6.1	20	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.8	81	
6.2.5	High- & medium-high-tech manufactures, %	6.5	87	○
6.3	Knowledge diffusion	58.8	5	
6.3.1	Intellectual property receipts, % total trade	0.8	15	
6.3.2	High-tech exports less re-exports, % total trade	0.6	69	
6.3.3	ICT services exports, % total trade	5.0	10	
6.3.4	FDI net outflows, % GDP	198.7	1	●
7	**Creative outputs**	**66.4**	**2**	●
7.1	Intangible assets	72.0	1	●
7.1.1	Trademarks by origin/bn PPP$ GDP	126.2	5	
7.1.2	Industrial designs by origin/bn PPP$ GDP	11.3	13	
7.1.3	ICTs & business model creation†	79.7	5	
7.1.4	ICTs & organizational model creation†	71.8	15	
7.2	Creative goods & services	45.3	10	
7.2.1	Cultural & creative services exports, % of total trade◴	4.9	1	●
7.2.2	National feature films/mn pop. 15–69◴	42.4	1	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.4	37	
7.2.5	Creative goods exports, % total trade	0.2	81	
7.3	Online creativity	76.2	3	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	100.0	1	●
7.3.2	Country-code TLDs/th pop. 15–69	74.5	8	
7.3.3	Wikipedia edits/mn pop. 15–69	7,322.3	14	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Madagascar

Key indicators

Population (millions)	24.2
GDP (US$ billions)	9.7
GDP per capita, PPP$	1,462.2
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**24.8**	**111**	
Innovation Output Sub-Index		21.1	91	
Innovation Input Sub-Index		28.5	120	
Innovation Efficiency Ratio		0.7	35	●
Global Innovation Index 2015 (out of 141)		24.4	125	
1	**Institutions**	**49.0**	**99**	
1.1	Political environment	26.4	117	
1.1.1	Political stability & safety*	49.3	93	
1.1.2	Government effectiveness*	3.5	127	○
1.2	Regulatory environment	57.2	89	
1.2.1	Regulatory quality*	26.8	109	
1.2.2	Rule of law*	28.6	107	
1.2.3	Cost of redundancy dismissal, salary weeks	14.7	60	●
1.3	Business environment	63.4	85	
1.3.1	Ease of starting a business*	79.6	96	
1.3.2	Ease of resolving insolvency*	34.2	106	
1.3.3	Ease of paying taxes*	76.3	62	
2	**Human capital & research**	**14.8**	**114**	
2.1	Education	21.8	125	○
2.1.1	Expenditure on education, % GDP	2.1	113	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	8.4	103	
2.1.3	School life expectancy, years[d]	10.3	104	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	23.1	91	
2.2	Tertiary education	22.2	101	
2.2.1	Tertiary enrolment, % gross	4.2	117	○
2.2.2	Graduates in science & engineering, %	20.3	53	
2.2.3	Tertiary inbound mobility, %	1.7	70	
2.3	Research & development (R&D)	0.5	111	
2.3.1	Researchers, FTE/mn pop.[d]	51.0	84	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	101	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**21.9**	**122**	
3.1	Information & communication technologies (ICTs)	19.9	114	
3.1.1	ICT access*	16.7	123	○
3.1.2	ICT use*	3.3	120	○
3.1.3	Government's online service*	24.4	106	
3.1.4	E-participation*	35.3	85	
3.2	General infrastructure	20.7	123	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.4	115	
3.2.3	Gross capital formation, % GDP	16.3	110	
3.3	Ecological sustainability	25.0	121	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	37.1	125	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	115	
4	**Market sophistication**	**36.1**	**103**	
4.1	Credit	11.1	124	○
4.1.1	Ease of getting credit*	15.0	121	
4.1.2	Domestic credit to private sector, % GDP	13.0	122	○
4.1.3	Microfinance gross loans, % GDP	1.2	31	●
4.2	Investment	50.0	23	
4.2.1	Ease of protecting minority investors*	50.0	86	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	47.0	110	
4.3.1	Applied tariff rate, weighted mean, %	6.4	96	
4.3.2	Intensity of local competition†	59.4	104	
4.3.3	Domestic market scale, bn PPP$	34.1	103	
5	**Business sophistication**	**20.5**	**120**	
5.1	Knowledge workers	8.1	124	○
5.1.1	Knowledge-intensive employment, %[d]	3.5	104	○
5.1.2	Firms offering formal training, % firms	12.7	89	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[d]	2.3	83	
5.2	Innovation linkages	21.8	104	
5.2.1	University/industry research collaboration†	37.6	87	
5.2.2	State of cluster development†	32.6	112	
5.2.3	GERD financed by abroad, %[d]	10.6	44	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	87	
5.3	Knowledge absorption	31.5	48	●
5.3.1	Intellectual property payments, % total trade[d]	0.5	52	●
5.3.2	High-tech imports less re-imports, % total trade	4.7	102	
5.3.3	ICT services imports, % total trade[d]	2.9	9	●
5.3.4	FDI net inflows, % GDP	3.3	51	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.1**	**112**	
6.1	Knowledge creation	3.7	103	
6.1.1	Patents by origin/bn PPP$ GDP	0.1	99	
6.1.2	PCT patent applications/bn PPP$ GDP[d]	0.1	72	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.3	83	
6.1.5	Citable documents H index	68.0	100	
6.2	Knowledge impact	22.2	112	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.1)	91	
6.2.2	New businesses/th pop. 15–64	0.7	82	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.1	85	
6.2.5	High- & medium-high-tech manufactures, %[d]	2.4	95	○
6.3	Knowledge diffusion	22.4	78	
6.3.1	Intellectual property receipts, % total trade[d]	0.5	24	●
6.3.2	High-tech exports less re-exports, % total trade	0.1	106	
6.3.3	ICT services exports, % total trade[d]	1.7	59	
6.3.4	FDI net outflows, % GDP[d]	0.1	78	
7	**Creative outputs**	**26.1**	**80**	
7.1	Intangible assets	41.7	69	
7.1.1	Trademarks by origin/bn PPP$ GDP	66.0	26	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	6.0	23	●
7.1.3	ICTs & business model creation†	47.9	103	
7.1.4	ICTs & organizational model creation†	45.5	88	
7.2	Creative goods & services	21.1	70	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.0	61	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	2.1	23	●
7.2.5	Creative goods exports, % total trade	0.1	84	
7.3	Online creativity	0.1	124	○
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.1	121	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	117	
7.3.3	Wikipedia edits/mn pop. 15–69	16.1	121	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Malawi

Key indicators

Population (millions)	17.2
GDP (US$ billions)	6.4
GDP per capita, PPP$	1,124.2
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.3**	**98**	
Innovation Output Sub-Index		23.1	83	
Innovation Input Sub-Index		31.4	110	
Innovation Efficiency Ratio		0.7	38	●
Global Innovation Index 2015 (out of 141)		29.7	98	
1	**Institutions**	**51.6**	**94**	
1.1	Political environment	42.9	89	
1.1.1	Political stability & safety*	65.8	57	●
1.1.2	Government effectiveness*	19.9	106	
1.2	Regulatory environment	58.2	87	
1.2.1	Regulatory quality*	27.6	108	
1.2.2	Rule of law*	39.7	75	
1.2.3	Cost of redundancy dismissal, salary weeks	16.7	71	
1.3	Business environment	53.6	119	
1.3.1	Ease of starting a business*	69.7	116	
1.3.2	Ease of resolving insolvency*	19.2	125	○
1.3.3	Ease of paying taxes*	71.8	77	
2	**Human capital & research**	**14.5**	**117**	
2.1	Education	40.4	86	
2.1.1	Expenditure on education, % GDP	6.9	12	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	30.2	19	●
2.1.3	School life expectancy, years[d]	10.7	99	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	70.4	112	○
2.2	Tertiary education	2.9	123	○
2.2.1	Tertiary enrolment, % gross[d]	0.8	121	○
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	1.1	78	
2.3	Research & development (R&D)	0.2	112	
2.3.1	Researchers, FTE/mn pop.[d]	49.6	85	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**24.6**	**117**	
3.1	Information & communication technologies (ICTs)	16.0	122	
3.1.1	ICT access*	19.6	121	○
3.1.2	ICT use*	3.3	119	○
3.1.3	Government's online service*	17.3	112	
3.1.4	E-participation*	23.5	108	
3.2	General infrastructure	24.6	108	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.8	70	
3.2.3	Gross capital formation, % GDP	13.4	118	
3.3	Ecological sustainability	33.2	104	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	49.7	115	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	123	○
4	**Market sophistication**	**30.7**	**119**	
4.1	Credit	16.9	114	
4.1.1	Ease of getting credit*	25.0	118	
4.1.2	Domestic credit to private sector, % GDP	16.2	113	
4.1.3	Microfinance gross loans, % GDP	1.7	22	●
4.2	Investment	25.4	110	
4.2.1	Ease of protecting minority investors*	46.7	92	
4.2.2	Market capitalization, % GDP[d]	17.8	68	
4.2.3	Total value of stocks traded, % GDP[d]	0.4	66	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	49.8	104	
4.3.1	Applied tariff rate, weighted mean, %	3.8	68	
4.3.2	Intensity of local competition†	68.2	64	
4.3.3	Domestic market scale, bn PPP$	19.6	117	
5	**Business sophistication**	**35.7**	**47**	●
5.1	Knowledge workers	38.9	61	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	32.9	48	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	34.3	49	
5.2.1	University/industry research collaboration†	30.7	109	
5.2.2	State of cluster development†	36.1	98	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	34.0	39	●
5.3.1	Intellectual property payments, % total trade	0.1	99	
5.3.2	High-tech imports less re-imports, % total trade	9.5	38	●
5.3.3	ICT services imports, % total trade	0.7	79	
5.3.4	FDI net inflows, % GDP	16.8	1	●
5.3.5	Research talent, % in business enterprise[d]	1.7	74	
6	**Knowledge & technology outputs**	**23.8**	**66**	
6.1	Knowledge creation	18.2	47	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	19.2	39	●
6.1.5	Citable documents H index	97.0	82	
6.2	Knowledge impact	29.2	93	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.5	32	●
6.2.2	New businesses/th pop. 15–64[d]	0.1	103	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.8	110	
6.2.5	High- & medium-high-tech manufactures, %[d]	8.6	83	
6.3	Knowledge diffusion	24.1	68	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.4	81	
6.3.3	ICT services exports, % total trade	0.9	81	
6.3.4	FDI net outflows, % GDP[d]	1.2	43	●
7	**Creative outputs**	**22.4**	**95**	
7.1	Intangible assets	36.3	92	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	40.1	119	○
7.1.4	ICTs & organizational model creation†	32.6	119	○
7.2	Creative goods & services	16.7	78	
7.2.1	Cultural & creative services exports, % of total trade	0.0	63	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	1.7	29	●
7.2.5	Creative goods exports, % total trade	0.1	90	
7.3	Online creativity	0.1	122	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	116	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	110	
7.3.3	Wikipedia edits/mn pop. 15–69	14.2	122	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Malaysia

Key indicators

Population (millions)	30.3
GDP (US$ billions)	296.2
GDP per capita, PPP$	26,314.8
Income group	Upper-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**43.4**	**35**	
Innovation Output Sub-Index		34.7	39	
Innovation Input Sub-Index		52.1	32	
Innovation Efficiency Ratio		0.7	59	
Global Innovation Index 2015 (out of 141)		46.0	32	
1	**Institutions**	**70.9**	**43**	
1.1	Political environment	71.0	36	
1.1.1	Political stability & safety*	71.3	47	
1.1.2	Government effectiveness*	70.7	27	
1.2	Regulatory environment	60.9	78	
1.2.1	Regulatory quality*	65.5	36	
1.2.2	Rule of law*	63.1	39	
1.2.3	Cost of redundancy dismissal, salary weeks	29.4	114	○
1.3	Business environment	80.7	28	
1.3.1	Ease of starting a business*	95.3	14	
1.3.2	Ease of resolving insolvency*	62.5	42	
1.3.3	Ease of paying taxes*	84.3	28	
2	**Human capital & research**	**43.3**	**34**	
2.1	Education	49.5	59	
2.1.1	Expenditure on education, % GDP	6.3	22	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	23.2	41	
2.1.3	School life expectancy, years	13.4	66	
2.1.4	PISA scales in reading, maths, & science	412.7	51	○
2.1.5	Pupil-teacher ratio, secondary[d]	13.3	51	
2.2	Tertiary education	46.6	27	
2.2.1	Tertiary enrolment, % gross	38.5	68	
2.2.2	Graduates in science & engineering, %	33.3	6	●
2.2.3	Tertiary inbound mobility, %	3.6	47	
2.3	Research & development (R&D)	33.7	35	
2.3.1	Researchers, FTE/mn pop.[d]	1,793.5	39	
2.3.2	Gross expenditure on R&D, % GDP[d]	1.1	33	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	32.2	42	
2.3.4	QS university ranking, average score top 3*	49.1	28	
3	**Infrastructure**	**49.2**	**43**	
3.1	Information & communication technologies (ICTs)	58.6	46	
3.1.1	ICT access*	66.1	55	
3.1.2	ICT use*	47.6	54	
3.1.3	Government's online service*	67.7	31	
3.1.4	E-participation*	52.9	59	
3.2	General infrastructure	46.7	29	
3.2.1	Electricity output, kWh/cap	4,655.0	44	
3.2.2	Logistics performance*	3.6	24	
3.2.3	Gross capital formation, % GDP	26.5	34	
3.3	Ecological sustainability	42.4	62	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.7	79	
3.3.2	Environmental performance*	74.2	59	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.0	34	
4	**Market sophistication**	**55.0**	**24**	
4.1	Credit	39.5	46	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	120.6	19	
4.1.3	Microfinance gross loans, % GDP[d]	0.1	57	○
4.2	Investment	52.8	19	
4.2.1	Ease of protecting minority investors*	78.3	4	●
4.2.2	Market capitalization, % GDP	135.8	6	●
4.2.3	Total value of stocks traded, % GDP	42.4	17	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	48	
4.3	Trade, competition, & market scale	72.8	25	
4.3.1	Applied tariff rate, weighted mean, %[d]	2.8	60	
4.3.2	Intensity of local competition†	73.4	36	
4.3.3	Domestic market scale, bn PPP$	769.4	27	
5	**Business sophistication**	**41.8**	**29**	
5.1	Knowledge workers	47.8	35	
5.1.1	Knowledge-intensive employment, %	25.2	51	
5.1.2	Firms offering formal training, % firms[d]	50.1	25	
5.1.3	GERD performed by business, % of GDP[d]	0.7	27	
5.1.4	GERD financed by business, %[d]	60.2	11	
5.1.5	Females employed w/advanced degrees, % total	11.4	58	
5.2	Innovation linkages	39.0	36	
5.2.1	University/industry research collaboration†	72.1	12	●
5.2.2	State of cluster development†	72.0	5	●
5.2.3	GERD financed by abroad, %[d]	4.6	68	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	12	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	48	
5.3	Knowledge absorption	38.7	26	
5.3.1	Intellectual property payments, % total trade	0.6	48	
5.3.2	High-tech imports less re-imports, % total trade	23.1	3	●
5.3.3	ICT services imports, % total trade	1.2	48	
5.3.4	FDI net inflows, % GDP	3.1	58	
5.3.5	Research talent, % in business enterprise[d]	10.8	65	○
6	**Knowledge & technology outputs**	**33.4**	**35**	
6.1	Knowledge creation	8.5	69	
6.1.1	Patents by origin/bn PPP$ GDP	1.8	52	
6.1.2	PCT patent applications/bn PPP$ GDP	0.3	45	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	51	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.6	55	
6.1.5	Citable documents H index	165.0	48	
6.2	Knowledge impact	45.4	30	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.3	21	
6.2.2	New businesses/th pop. 15–64	2.4	43	
6.2.3	Computer software spending, % GDP	0.4	21	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	14.9	26	
6.2.5	High- & medium-high-tech manufactures, %	37.4	26	
6.3	Knowledge diffusion	46.4	13	
6.3.1	Intellectual property receipts, % total trade	0.0	74	○
6.3.2	High-tech exports less re-exports, % total trade	28.2	1	●
6.3.3	ICT services exports, % total trade	1.1	76	
6.3.4	FDI net outflows, % GDP[d]	4.0	12	
7	**Creative outputs**	**35.9**	**43**	
7.1	Intangible assets	47.6	47	
7.1.1	Trademarks by origin/bn PPP$ GDP	20.0	79	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.1	65	
7.1.3	ICTs & business model creation†	77.1	10	●
7.1.4	ICTs & organizational model creation†	76.3	8	●
7.2	Creative goods & services	38.2	21	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	3.4	44	
7.2.3	Global ent. & media market/th pop. 15–69	10.4	33	
7.2.4	Printing & publishing manufactures, %	0.9	69	○
7.2.5	Creative goods exports, % total trade	9.2	6	●
7.3	Online creativity	10.2	61	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	6.8	51	
7.3.2	Country-code TLDs/th pop. 15–69	5.3	52	
7.3.3	Wikipedia edits/mn pop. 15–69	1,677.1	58	
7.3.4	Video uploads on YouTube/pop. 15–69	16.2	57	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Mali

Key indicators

Population (millions)	17.6
GDP (US$ billions)	13.1
GDP per capita, PPP$	2,199.0
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**24.8**	**112**	
Innovation Output Sub-Index		21.0	92	
Innovation Input Sub-Index		28.5	119	
Innovation Efficiency Ratio		0.7	37	●
Global Innovation Index 2015 (out of 141)		28.4	105	
1	**Institutions**	**43.1**	**119**	
1.1	Political environment	13.8	125	○
1.1.1	Political stability & safety*	19.6	124	○
1.1.2	Government effectiveness*	8.0	122	
1.2	Regulatory environment	59.9	81	
1.2.1	Regulatory quality*	30.9	102	
1.2.2	Rule of law*	30.9	99	
1.2.3	Cost of redundancy dismissal, salary weeks	13.7	55	●
1.3	Business environment	55.5	112	
1.3.1	Ease of starting a business*	66.1	121	
1.3.2	Ease of resolving insolvency*	40.4	88	
1.3.3	Ease of paying taxes*	60.2	102	
2	**Human capital & research**	**13.6**	**121**	
2.1	Education	33.1	102	
2.1.1	Expenditure on education, % GDP	4.3	74	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	24.3	36	●
2.1.3	School life expectancy, years[d]	7.7	115	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	18.9	81	
2.2	Tertiary education	4.1	121	○
2.2.1	Tertiary enrolment, % gross[d]	6.9	111	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	0.5	90	
2.3	Research & development (R&D)	3.7	80	
2.3.1	Researchers, FTE/mn pop.[d]	29.2	94	○
2.3.2	Gross expenditure on R&D, % GDP[d]	0.7	53	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**28.5**	**107**	
3.1	Information & communication technologies (ICTs)	17.4	118	
3.1.1	ICT access*	34.3	105	
3.1.2	ICT use*	6.1	114	
3.1.3	Government's online service*	13.4	119	
3.1.4	E-participation*	15.7	118	
3.2	General infrastructure	40.4	44	●
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.5	108	
3.2.3	Gross capital formation, % GDP	30.5	19	●
3.3	Ecological sustainability	27.9	118	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	41.5	123	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	118	
4	**Market sophistication**	**28.2**	**125**	○
4.1	Credit	13.6	118	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	24.5	103	
4.1.3	Microfinance gross loans, % GDP	0.2	52	
4.2	Investment	27.4	105	
4.2.1	Ease of protecting minority investors*	35.0	121	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	39	●
4.3	Trade, competition, & market scale	43.7	116	
4.3.1	Applied tariff rate, weighted mean, %	7.4	102	
4.3.2	Intensity of local competition†	57.7	107	
4.3.3	Domestic market scale, bn PPP$	27.5	110	
5	**Business sophistication**	**29.2**	**79**	
5.1	Knowledge workers	22.2	105	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	32.1	50	
5.1.3	GERD performed by business, % of GDP[d]	0.0	80	
5.1.4	GERD financed by business, %[d]	10.1	71	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	29.7	70	
5.2.1	University/industry research collaboration†	36.7	92	
5.2.2	State of cluster development†	44.8	63	
5.2.3	GERD financed by abroad, %[d]	8.8	48	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	35.5	34	●
5.3.1	Intellectual property payments, % total trade[d]	0.1	101	
5.3.2	High-tech imports less re-imports, % total trade[d]	5.1	93	
5.3.3	ICT services imports, % total trade[d]	3.1	8	●
5.3.4	FDI net inflows, % GDP	1.7	87	
5.3.5	Research talent, % in business enterprise[d]	49.0	25	●
6	**Knowledge & technology outputs**	**26.9**	**55**	●
6.1	Knowledge creation	4.9	94	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	83	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.1	88	
6.1.5	Citable documents H index	68.0	100	
6.2	Knowledge impact	51.3	17	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.1	13	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.2	125	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	24.4	65	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	90	
6.3.2	High-tech exports less re-exports, % total trade[d]	0.1	108	
6.3.3	ICT services exports, % total trade[d]	4.6	11	●
6.3.4	FDI net outflows, % GDP[d]	0.0	88	
7	**Creative outputs**	**15.2**	**120**	
7.1	Intangible assets	27.7	117	
7.1.1	Trademarks by origin/bn PPP$ GDP	3.3	106	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	95	
7.1.3	ICTs & business model creation†	51.2	90	
7.1.4	ICTs & organizational model creation†	43.9	91	
7.2	Creative goods & services	0.6	126	○
7.2.1	Cultural & creative services exports, % of total trade[d]	0.0	65	
7.2.2	National feature films/mn pop. 15–69[d]	0.1	99	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade[d]	0.0	120	
7.3	Online creativity	4.6	78	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	120	
7.3.2	Country-code TLDs/th pop. 15–69	13.7	36	●
7.3.3	Wikipedia edits/mn pop. 15–69	12.7	124	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Malta

Key indicators

Population (millions)	0.4
GDP (US$ billions)	9.8
GDP per capita, PPP$	35,825.6
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**50.4**	**26**	
Innovation Output Sub-Index		49.9	12	
Innovation Input Sub-Index		51.0	35	
Innovation Efficiency Ratio		1.0	2	●
Global Innovation Index 2015 (out of 141)		50.5	26	
1	**Institutions**	**78.7**	**28**	
1.1	Political environment	79.1	20	
1.1.1	Political stability & safety*	90.6	11	
1.1.2	Government effectiveness*	67.6	31	
1.2	Regulatory environment	87.3	17	
1.2.1	Regulatory quality*	72.1	27	
1.2.2	Rule of law*	77.2	24	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	69.7	66	
1.3.1	Ease of starting a business*	78.4	99	○
1.3.2	Ease of resolving insolvency*	44.8	74	
1.3.3	Ease of paying taxes*	85.9	22	
2	**Human capital & research**	**41.1**	**38**	
2.1	Education	66.3	11	
2.1.1	Expenditure on education, % GDP	6.8	16	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	41.6	5	●
2.1.3	School life expectancy, years	14.6	54	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	7.8	3	●
2.2	Tertiary education	35.6	63	
2.2.1	Tertiary enrolment, % gross	45.1	59	
2.2.2	Graduates in science & engineering, %[4]	19.1	62	
2.2.3	Tertiary inbound mobility, %	5.9	28	
2.3	Research & development (R&D)	21.2	45	
2.3.1	Researchers, FTE/mn pop.	2,133.0	34	
2.3.2	Gross expenditure on R&D, % GDP	0.8	38	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	34.5	40	
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**51.3**	**40**	
3.1	Information & communication technologies (ICTs)	59.5	44	
3.1.1	ICT access*	90.4	7	●
3.1.2	ICT use*	60.5	31	
3.1.3	Government's online service*	40.2	79	
3.1.4	E-participation*	47.1	70	
3.2	General infrastructure	34.4	66	
3.2.1	Electricity output, kWh/cap	5,366.7	38	
3.2.2	Logistics performance*	3.1	49	
3.2.3	Gross capital formation, % GDP	19.1	92	○
3.3	Ecological sustainability	59.8	13	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	13.7	11	
3.3.2	Environmental performance*	88.5	9	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.1	43	
4	**Market sophistication**	**39.5**	**88**	○
4.1	Credit	26.7	88	○
4.1.1	Ease of getting credit*	10.0	124	○
4.1.2	Domestic credit to private sector, % GDP[4]	111.8	22	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	36.9	64	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP[4]	44.1	38	
4.2.3	Total value of stocks traded, % GDP[4]	0.7	62	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	54.9	85	○
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	80.7	11	
4.3.3	Domestic market scale, bn PPP$	14.1	124	○
5	**Business sophistication**	**44.6**	**25**	
5.1	Knowledge workers	48.0	34	
5.1.1	Knowledge-intensive employment, %	39.3	25	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.5	35	
5.1.4	GERD financed by business, %	50.0	21	
5.1.5	Females employed w/advanced degrees, % total	12.0	56	
5.2	Innovation linkages	40.9	30	
5.2.1	University/industry research collaboration†	47.6	50	
5.2.2	State of cluster development†	49.3	48	
5.2.3	GERD financed by abroad, %	21.5	18	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.5	14	
5.3	Knowledge absorption	44.8	15	
5.3.1	Intellectual property payments, % total trade	3.0	5	●
5.3.2	High-tech imports less re-imports, % total trade	8.1	57	
5.3.3	ICT services imports, % total trade	1.0	62	
5.3.4	FDI net inflows, % GDP[4]	4.1	40	
5.3.5	Research talent, % in business enterprise	59.8	12	
6	**Knowledge & technology outputs**	**38.3**	**28**	
6.1	Knowledge creation	30.4	30	
6.1.1	Patents by origin/bn PPP$ GDP	4.5	26	
6.1.2	PCT patent applications/bn PPP$ GDP	4.5	11	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	18.0	40	
6.1.5	Citable documents H index	75.0	94	○
6.2	Knowledge impact	58.6	2	●
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.9)	102	○
6.2.2	New businesses/th pop. 15–64	17.3	1	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	33.0	5	●
6.2.5	High- & medium-high-tech manufactures, %[4]	24.5	50	
6.3	Knowledge diffusion	26.0	58	
6.3.1	Intellectual property receipts, % total trade	2.1	7	
6.3.2	High-tech exports less re-exports, % total trade	5.7	30	
6.3.3	ICT services exports, % total trade	0.9	80	○
6.3.4	FDI net outflows, % GDP[4]	(92.9)	118	○
7	**Creative outputs**	**61.4**	**4**	●
7.1	Intangible assets	67.0	6	●
7.1.1	Trademarks by origin/bn PPP$ GDP[4]	132.8	3	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	13.2	11	
7.1.3	ICTs & business model creation†	65.4	36	
7.1.4	ICTs & organizational model creation†	59.3	41	
7.2	Creative goods & services	52.5	5	●
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	6.5	28	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[4]	36.2	1	●
7.2.5	Creative goods exports, % total trade	0.5	59	
7.3	Online creativity	59.2	13	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	99.1	4	●
7.3.2	Country-code TLDs/th pop. 15–69	8.8	44	
7.3.3	Wikipedia edits/mn pop. 15–69	9,424.4	5	●
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Mauritius

Key indicators

Population (millions)	1.3
GDP (US$ billions)	11.6
GDP per capita, PPP$	19,509.2
Income group	Upper-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.9**	**53**	
Innovation Output Sub-Index		26.0	68	
Innovation Input Sub-Index		45.7	48	
Innovation Efficiency Ratio		0.6	95	
Global Innovation Index 2015 (out of 141)		39.2	49	
1	**Institutions**	**80.5**	**24**	●
1.1	Political environment	75.8	25	●
1.1.1	Political stability & safety*	81.2	32	
1.1.2	Government effectiveness*	70.5	29	●
1.2	Regulatory environment	82.3	23	●
1.2.1	Regulatory quality*	69.5	32	
1.2.2	Rule of law*	70.0	33	
1.2.3	Cost of redundancy dismissal, salary weeks	10.6	37	
1.3	Business environment	83.5	21	●
1.3.1	Ease of starting a business*	92.5	34	
1.3.2	Ease of resolving insolvency*	65.9	36	
1.3.3	Ease of paying taxes*	91.9	13	●
2	**Human capital & research**	**30.0**	**75**	
2.1	Education	53.0	46	
2.1.1	Expenditure on education, % GDP	5.0	49	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	29.2	22	●
2.1.3	School life expectancy, years	15.2	42	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	15.2	65	
2.2	Tertiary education	35.6	62	
2.2.1	Tertiary enrolment, % gross	38.7	67	
2.2.2	Graduates in science & engineering, %	22.9	36	
2.2.3	Tertiary inbound mobility, %	3.8	44	
2.3	Research & development (R&D)	1.3	98	
2.3.1	Researchers, FTE/mn pop.④	181.1	70	
2.3.2	Gross expenditure on R&D, % GDP④	0.2	90	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**43.1**	**66**	
3.1	Information & communication technologies (ICTs)	49.4	69	
3.1.1	ICT access*	64.8	59	
3.1.2	ICT use*	32.5	74	
3.1.3	Government's online service*	47.2	68	
3.1.4	E-participation*	52.9	59	
3.2	General infrastructure	28.7	86	
3.2.1	Electricity output, kWh/cap	2,292.1	74	
3.2.2	Logistics performance*	2.5	105	○
3.2.3	Gross capital formation, % GDP	25.4	39	
3.3	Ecological sustainability	51.2	36	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	13.9	9	●
3.3.2	Environmental performance*	70.9	70	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	69	
4	**Market sophistication**	**49.5**	**39**	
4.1	Credit	51.9	19	●
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	100.1	26	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	39.1	54	
4.2.1	Ease of protecting minority investors*	65.0	28	
4.2.2	Market capitalization, % GDP	69.3	26	
4.2.3	Total value of stocks traded, % GDP	3.7	46	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	26	
4.3	Trade, competition, & market scale	57.4	78	
4.3.1	Applied tariff rate, weighted mean, %	0.7	6	●
4.3.2	Intensity of local competition†	74.3	31	
4.3.3	Domestic market scale, bn PPP$	23.5	113	○
5	**Business sophistication**	**25.6**	**94**	
5.1	Knowledge workers	24.0	99	
5.1.1	Knowledge-intensive employment, %④	20.4	68	
5.1.2	Firms offering formal training, % firms④	25.6	69	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %④	0.3	90	○
5.1.5	Females employed w/advanced degrees, % total④	7.4	73	
5.2	Innovation linkages	26.5	77	
5.2.1	University/industry research collaboration†	36.5	93	
5.2.2	State of cluster development†	50.1	43	
5.2.3	GERD financed by abroad, %④	6.4	60	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	19	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	51	
5.3	Knowledge absorption	26.4	75	
5.3.1	Intellectual property payments, % total trade	0.2	80	
5.3.2	High-tech imports less re-imports, % total trade	8.4	52	
5.3.3	ICT services imports, % total trade	1.3	45	
5.3.4	FDI net inflows, % GDP	3.3	50	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**22.9**	**73**	
6.1	Knowledge creation	2.9	114	○
6.1.1	Patents by origin/bn PPP$ GDP④	0.1	105	○
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.3	103	
6.1.5	Citable documents H index	50.0	114	○
6.2	Knowledge impact	20.0	113	○
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	5.1	24	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	9.4	40	
6.2.5	High- & medium-high-tech manufactures, %	8.2	84	○
6.3	Knowledge diffusion	45.8	16	●
6.3.1	Intellectual property receipts, % total trade	0.0	64	
6.3.2	High-tech exports less re-exports, % total trade	0.0	120	○
6.3.3	ICT services exports, % total trade	2.5	38	
6.3.4	FDI net outflows, % GDP	182.1	1	●
7	**Creative outputs**	**29.0**	**65**	
7.1	Intangible assets	37.5	88	
7.1.1	Trademarks by origin/bn PPP$ GDP④	35.2	62	
7.1.2	Industrial designs by origin/bn PPP$ GDP④	0.4	81	
7.1.3	ICTs & business model creation†	58.1	64	
7.1.4	ICTs & organizational model creation†	53.0	67	
7.2	Creative goods & services	33.1	35	
7.2.1	Cultural & creative services exports, % of total trade	0.0	58	
7.2.2	National feature films/mn pop. 15–69④	1.1	69	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	3.2	5	●
7.2.5	Creative goods exports, % total trade	0.7	52	
7.3	Online creativity	7.9	66	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	13.5	34	
7.3.2	Country-code TLDs/th pop. 15–69	2.8	62	
7.3.3	Wikipedia edits/mn pop. 15–69	998.8	71	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Mexico

Key indicators

Population (millions)	127.0
GDP (US$ billions)	1,144.3
GDP per capita, PPP$	17,534.4
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**34.6**	**61**	
Innovation Output Sub-Index		26.6	62	
Innovation Input Sub-Index		42.5	60	
Innovation Efficiency Ratio		0.6	76	
Global Innovation Index 2015 (out of 141)		38.0	57	
1	**Institutions**	**60.5**	**65**	
1.1	Political environment	44.1	83	
1.1.1	Political stability & safety*	44.0	99	
1.1.2	Government effectiveness*	44.3	59	
1.2	Regulatory environment	59.0	85	
1.2.1	Regulatory quality*	55.4	53	
1.2.2	Rule of law*	35.9	89	
1.2.3	Cost of redundancy dismissal, salary weeks	22.0	95	
1.3	Business environment	78.5	35	
1.3.1	Ease of starting a business*	88.9	54	
1.3.2	Ease of resolving insolvency*	73.0	26	●
1.3.3	Ease of paying taxes*	73.7	72	
2	**Human capital & research**	**33.7**	**53**	
2.1	Education	41.5	83	
2.1.1	Expenditure on education, % GDP[d]	5.1	44	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	15.9	77	
2.1.3	School life expectancy, years	13.1	71	
2.1.4	PISA scales in reading, maths, & science	417.3	47	
2.1.5	Pupil-teacher ratio, secondary[d]	17.7	77	
2.2	Tertiary education	33.1	72	
2.2.1	Tertiary enrolment, % gross	29.2	79	
2.2.2	Graduates in science & engineering, %[d]	26.9	17	●
2.2.3	Tertiary inbound mobility, %	0.2	96	○
2.3	Research & development (R&D)	26.4	41	
2.3.1	Researchers, FTE/mn pop.[d]	322.5	65	
2.3.2	Gross expenditure on R&D, % GDP	0.5	59	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	58.6	34	
2.3.4	QS university ranking, average score top 3*	44.4	33	●
3	**Infrastructure**	**42.8**	**67**	
3.1	Information & communication technologies (ICTs)	52.3	59	
3.1.1	ICT access*	48.4	82	
3.1.2	ICT use*	33.7	71	
3.1.3	Government's online service*	66.1	35	
3.1.4	E-participation*	60.8	45	
3.2	General infrastructure	33.8	67	
3.2.1	Electricity output, kWh/cap	2,507.7	68	
3.2.2	Logistics performance*	3.1	48	
3.2.3	Gross capital formation, % GDP	22.1	63	
3.3	Ecological sustainability	42.4	63	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.6	47	
3.3.2	Environmental performance*	73.6	63	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.7	74	
4	**Market sophistication**	**45.7**	**51**	
4.1	Credit	35.0	56	
4.1.1	Ease of getting credit*	90.0	5	●
4.1.2	Domestic credit to private sector, % GDP	31.0	93	
4.1.3	Microfinance gross loans, % GDP	0.3	45	
4.2	Investment	29.2	95	
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP	37.1	44	
4.2.3	Total value of stocks traded, % GDP	11.0	32	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	69	○
4.3	Trade, competition, & market scale	73.0	24	●
4.3.1	Applied tariff rate, weighted mean, %[d]	5.4	87	
4.3.2	Intensity of local competition†	69.4	57	
4.3.3	Domestic market scale, bn PPP$	2,148.9	11	●
5	**Business sophistication**	**29.8**	**77**	
5.1	Knowledge workers	35.0	75	
5.1.1	Knowledge-intensive employment, %	19.5	73	
5.1.2	Firms offering formal training, % firms[d]	50.8	24	●
5.1.3	GERD performed by business, % of GDP[d]	0.2	54	
5.1.4	GERD financed by business, %	23.8	61	
5.1.5	Females employed w/advanced degrees, % total[d]	8.2	69	○
5.2	Innovation linkages	23.4	91	
5.2.1	University/industry research collaboration†	49.5	42	
5.2.2	State of cluster development†	53.2	33	
5.2.3	GERD financed by abroad, %	0.5	94	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	60	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	66	
5.3	Knowledge absorption	31.0	51	
5.3.1	Intellectual property payments, % total trade	0.4	59	
5.3.2	High-tech imports less re-imports, % total trade	16.9	8	●
5.3.3	ICT services imports, % total trade	0.0	121	○
5.3.4	FDI net inflows, % GDP	1.9	83	
5.3.5	Research talent, % in business enterprise[d]	30.0	42	
6	**Knowledge & technology outputs**	**23.3**	**70**	
6.1	Knowledge creation	8.2	73	
6.1.1	Patents by origin/bn PPP$ GDP	0.6	71	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	55	
6.1.3	Utility models by origin/bn PPP$ GDP	0.3	39	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.5	90	
6.1.5	Citable documents H index	289.0	34	
6.2	Knowledge impact	35.4	66	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.7	43	
6.2.2	New businesses/th pop. 15–64	0.9	73	
6.2.3	Computer software spending, % GDP	0.2	67	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.7	69	
6.2.5	High- & medium-high-tech manufactures, %[d]	43.7	14	●
6.3	Knowledge diffusion	26.4	56	
6.3.1	Intellectual property receipts, % total trade	0.0	77	
6.3.2	High-tech exports less re-exports, % total trade	14.8	9	●
6.3.3	ICT services exports, % total trade	0.0	123	○
6.3.4	FDI net outflows, % GDP	0.4	64	
7	**Creative outputs**	**29.9**	**62**	
7.1	Intangible assets	39.9	77	
7.1.1	Trademarks by origin/bn PPP$ GDP	37.7	61	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.8	73	
7.1.3	ICTs & business model creation†	61.0	53	
7.1.4	ICTs & organizational model creation†	56.1	54	
7.2	Creative goods & services	30.2	42	
7.2.1	Cultural & creative services exports, % of total trade	0.0	66	○
7.2.2	National feature films/mn pop. 15–69	1.5	63	
7.2.3	Global ent. & media market/th pop. 15–69	8.2	37	
7.2.4	Printing & publishing manufactures, %[d]	0.6	85	○
7.2.5	Creative goods exports, % total trade	10.3	3	●
7.3	Online creativity	9.4	63	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.7	69	
7.3.2	Country-code TLDs/th pop. 15–69	3.2	59	
7.3.3	Wikipedia edits/mn pop. 15–69	1,479.0	63	
7.3.4	Video uploads on YouTube/pop. 15–69	20.8	50	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Moldova, Republic of

Key indicators

Population (millions)	4.1
GDP (US$ billions)	6.4
GDP per capita, PPP$	5,006.2
Income group	Lower-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**38.4**	**46**	
Innovation Output Sub-Index		37.2	36	
Innovation Input Sub-Index		39.6	74	
Innovation Efficiency Ratio		0.9	4	●
Global Innovation Index 2015 (out of 141)		40.5	44	
1	**Institutions**	**58.7**	**68**	
1.1	Political environment	44.4	81	
1.1.1	Political stability & safety*	60.3	74	
1.1.2	Government effectiveness*	28.4	89	
1.2	Regulatory environment	57.0	91	
1.2.1	Regulatory quality*	45.4	69	
1.2.2	Rule of law*	40.3	74	
1.2.3	Cost of redundancy dismissal, salary weeks	22.6	96	
1.3	Business environment	74.8	50	
1.3.1	Ease of starting a business*	94.2	25	●
1.3.2	Ease of resolving insolvency*	53.9	57	
1.3.3	Ease of paying taxes*	76.3	64	
2	**Human capital & research**	**34.1**	**51**	
2.1	Education	61.7	17	●
2.1.1	Expenditure on education, % GDP	7.5	6	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	38.8	7	●
2.1.3	School life expectancy, years	11.8	91	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	9.4	18	●
2.2	Tertiary education	36.7	58	
2.2.1	Tertiary enrolment, % gross	41.3	61	
2.2.2	Graduates in science & engineering, %	25.7	23	
2.2.3	Tertiary inbound mobility, %	1.9	66	
2.3	Research & development (R&D)	3.9	79	
2.3.1	Researchers, FTE/mn pop.	652.0	55	
2.3.2	Gross expenditure on R&D, % GDP	0.4	71	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**39.5**	**75**	
3.1	Information & communication technologies (ICTs)	55.7	51	
3.1.1	ICT access*	67.0	53	
3.1.2	ICT use*	40.2	61	
3.1.3	Government's online service*	52.8	60	
3.1.4	E-participation*	62.7	40	
3.2	General infrastructure	26.0	100	
3.2.1	Electricity output, kWh/cap	1,261.5	89	
3.2.2	Logistics performance*	2.7	89	
3.2.3	Gross capital formation, % GDP	21.9	65	
3.3	Ecological sustainability	36.9	90	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.7	101	○
3.3.2	Environmental performance*	76.7	54	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.1	61	
4	**Market sophistication**	**38.6**	**93**	
4.1	Credit	29.2	79	
4.1.1	Ease of getting credit*	70.0	27	
4.1.2	Domestic credit to private sector, % GDP	37.1	81	
4.1.3	Microfinance gross loans, % GDP	0.4	42	
4.2	Investment	42.3	40	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP◴	0.2	71	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	44.2	115	○
4.3.1	Applied tariff rate, weighted mean, %	5.7	89	
4.3.2	Intensity of local competition†	60.4	98	
4.3.3	Domestic market scale, bn PPP$	17.8	121	○
5	**Business sophistication**	**27.0**	**89**	
5.1	Knowledge workers	35.1	74	
5.1.1	Knowledge-intensive employment, %	28.7	47	
5.1.2	Firms offering formal training, % firms	32.4	49	
5.1.3	GERD performed by business, % of GDP	0.1	62	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total◴	13.9	43	
5.2	Innovation linkages	19.0	113	○
5.2.1	University/industry research collaboration†	29.0	112	○
5.2.2	State of cluster development†	22.0	123	○
5.2.3	GERD financed by abroad, %	12.8	37	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	46	
5.3	Knowledge absorption	26.8	74	
5.3.1	Intellectual property payments, % total trade	0.5	55	
5.3.2	High-tech imports less re-imports, % total trade	7.8	59	
5.3.3	ICT services imports, % total trade	2.0	17	●
5.3.4	FDI net inflows, % GDP	4.4	33	
5.3.5	Research talent, % in business enterprise	6.6	69	○
6	**Knowledge & technology outputs**	**34.9**	**31**	
6.1	Knowledge creation	41.7	21	●
6.1.1	Patents by origin/bn PPP$ GDP	3.8	31	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	42	
6.1.3	Utility models by origin/bn PPP$ GDP	8.8	1	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.4	58	
6.1.5	Citable documents H index	74.0	95	
6.2	Knowledge impact	36.4	60	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.5	17	●
6.2.2	New businesses/th pop. 15–64◴	1.6	52	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	6.9	50	
6.2.5	High- & medium-high-tech manufactures, %	9.0	81	○
6.3	Knowledge diffusion	26.5	54	
6.3.1	Intellectual property receipts, % total trade	0.2	37	
6.3.2	High-tech exports less re-exports, % total trade	0.6	70	
6.3.3	ICT services exports, % total trade	4.3	14	●
6.3.4	FDI net outflows, % GDP	0.4	61	
7	**Creative outputs**	**39.6**	**34**	
7.1	Intangible assets	67.7	4	●
7.1.1	Trademarks by origin/bn PPP$ GDP	179.2	1	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	17.4	6	●
7.1.3	ICTs & business model creation†	47.3	105	○
7.1.4	ICTs & organizational model creation†	42.6	97	
7.2	Creative goods & services	19.3	71	
7.2.1	Cultural & creative services exports, % of total trade	0.3	29	
7.2.2	National feature films/mn pop. 15–69	1.0	77	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.9	25	
7.2.5	Creative goods exports, % total trade	0.0	98	
7.3	Online creativity	3.7	81	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.2	77	
7.3.2	Country-code TLDs/th pop. 15–69	2.8	61	
7.3.3	Wikipedia edits/mn pop. 15–69	812.6	80	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Mongolia

Key indicators

Population (millions)	3.0
GDP (US$ billions)	11.7
GDP per capita, PPP$	12,146.6
Income group	Upper-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.7**	**55**	
Innovation Output Sub-Index		29.9	51	
Innovation Input Sub-Index		41.6	66	
Innovation Efficiency Ratio		0.7	47	
Global Innovation Index 2015 (out of 141)		36.4	66	
1	**Institutions**	**64.8**	**58**	
1.1	Political environment	56.0	52	
1.1.1	Political stability & safety*	84.4	25	
1.1.2	Government effectiveness*	27.5	93	
1.2	Regulatory environment	68.6	57	
1.2.1	Regulatory quality*	38.5	83	
1.2.2	Rule of law*	38.4	83	
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	
1.3	Business environment	70.0	64	
1.3.1	Ease of starting a business*	92.6	33	
1.3.2	Ease of resolving insolvency*	43.8	80	
1.3.3	Ease of paying taxes*	73.8	71	
2	**Human capital & research**	**26.9**	**83**	
2.1	Education	45.8	68	
2.1.1	Expenditure on education, % GDP[4]	4.6	64	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	15.4	81	
2.1.3	School life expectancy, years	14.8	51	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	13.7	55	
2.2	Tertiary education	33.6	70	
2.2.1	Tertiary enrolment, % gross	64.3	33	
2.2.2	Graduates in science & engineering, %	19.5	60	
2.2.3	Tertiary inbound mobility, %	0.6	85	
2.3	Research & development (R&D)	1.4	97	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	0.2	83	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**38.3**	**81**	
3.1	Information & communication technologies (ICTs)	52.9	56	
3.1.1	ICT access*	49.7	81	
3.1.2	ICT use*	32.0	75	
3.1.3	Government's online service*	61.4	43	
3.1.4	E-participation*	68.6	30	
3.2	General infrastructure	31.8	74	
3.2.1	Electricity output, kWh/cap	1,767.6	79	
3.2.2	Logistics performance*	2.4	116	○
3.2.3	Gross capital formation, % GDP	31.6	13	●
3.3	Ecological sustainability	30.2	114	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.4	104	
3.3.2	Environmental performance*	64.4	96	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	103	
4	**Market sophistication**	**49.9**	**36**	
4.1	Credit	60.9	14	●
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	60.7	50	
4.1.3	Microfinance gross loans, % GDP	19.7	1	●
4.2	Investment	37.8	60	
4.2.1	Ease of protecting minority investors*	73.3	8	●
4.2.2	Market capitalization, % GDP[4]	10.5	80	
4.2.3	Total value of stocks traded, % GDP[4]	0.3	67	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	51.0	101	
4.3.1	Applied tariff rate, weighted mean, %	5.0	85	
4.3.2	Intensity of local competition†	66.0	76	
4.3.3	Domestic market scale, bn PPP$	34.9	100	
5	**Business sophistication**	**27.8**	**85**	
5.1	Knowledge workers	41.4	53	
5.1.1	Knowledge-intensive employment, %	25.0	52	
5.1.2	Firms offering formal training, % firms	60.9	10	●
5.1.3	GERD performed by business, % of GDP	0.0	79	○
5.1.4	GERD financed by business, %	7.5	74	
5.1.5	Females employed w/advanced degrees, % total	16.7	31	
5.2	Innovation linkages	17.3	120	○
5.2.1	University/industry research collaboration†	33.1	104	
5.2.2	State of cluster development†	31.0	118	○
5.2.3	GERD financed by abroad, %	2.8	74	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[4]	0.0	81	
5.3	Knowledge absorption	24.6	87	
5.3.1	Intellectual property payments, % total trade	0.2	81	
5.3.2	High-tech imports less re-imports, % total trade	5.1	95	
5.3.3	ICT services imports, % total trade	1.8	23	
5.3.4	FDI net inflows, % GDP	3.2	55	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**23.4**	**68**	
6.1	Knowledge creation	39.3	22	●
6.1.1	Patents by origin/bn PPP$ GDP	4.0	30	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	85	○
6.1.3	Utility models by origin/bn PPP$ GDP	5.4	1	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.1	87	
6.1.5	Citable documents H index	65.0	104	
6.2	Knowledge impact	14.8	115	○
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	6.3	19	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.5	118	○
6.2.5	High- & medium-high-tech manufactures, %[4]	5.5	90	○
6.3	Knowledge diffusion	16.1	115	○
6.3.1	Intellectual property receipts, % total trade	0.0	63	
6.3.2	High-tech exports less re-exports, % total trade	0.5	75	
6.3.3	ICT services exports, % total trade	0.2	111	○
6.3.4	FDI net outflows, % GDP[4]	0.3	70	
7	**Creative outputs**	**36.5**	**41**	
7.1	Intangible assets	52.0	27	
7.1.1	Trademarks by origin/bn PPP$ GDP	120.4	6	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	7.4	17	●
7.1.3	ICTs & business model creation†	52.9	83	
7.1.4	ICTs & organizational model creation†	42.4	98	
7.2	Creative goods & services	38.5	18	●
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	10.5	11	●
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[4]	2.9	6	●
7.2.5	Creative goods exports, % total trade	0.0	119	○
7.3	Online creativity	3.2	89	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	103	
7.3.2	Country-code TLDs/th pop. 15–69	1.7	69	
7.3.3	Wikipedia edits/mn pop. 15–69	984.7	72	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Montenegro

Key indicators

Population (millions)	0.6
GDP (US$ billions)	4.0
GDP per capita, PPP$	16,123.1
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**37.4**	**51**	
Innovation Output Sub-Index		28.6	52	
Innovation Input Sub-Index		46.1	46	
Innovation Efficiency Ratio		0.6	80	
Global Innovation Index 2015 (out of 141)		41.2	41	
1	**Institutions**	**69.2**	**45**	
1.1	Political environment	57.7	48	
1.1.1	Political stability & safety*	68.7	50	
1.1.2	Government effectiveness*	46.7	54	
1.2	Regulatory environment	70.9	45	
1.2.1	Regulatory quality*	47.7	66	
1.2.2	Rule of law*	48.8	57	
1.2.3	Cost of redundancy dismissal, salary weeks	11.2	40	
1.3	Business environment	79.0	33	
1.3.1	Ease of starting a business*	90.1	49	
1.3.2	Ease of resolving insolvency*	68.2	33	
1.3.3	Ease of paying taxes*	78.6	54	
2	**Human capital & research**	**35.8**	**49**	
2.1	Education	53.6	43	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years[4]	15.1	44	
2.1.4	PISA scales in reading, maths, & science	413.9	49	○
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	49.9	18	
2.2.1	Tertiary enrolment, % gross[4]	55.3	47	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	3.9	78	
2.3.1	Researchers, FTE/mn pop.[4]	646.8	56	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.4	70	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**45.8**	**56**	
3.1	Information & communication technologies (ICTs)	54.5	52	
3.1.1	ICT access*	67.4	52	
3.1.2	ICT use*	39.1	62	
3.1.3	Government's online service*	52.8	60	
3.1.4	E-participation*	58.8	49	
3.2	General infrastructure	39.4	50	
3.2.1	Electricity output, kWh/cap	6,362.9	29	●
3.2.2	Logistics performance*	2.9	64	
3.2.3	Gross capital formation, % GDP	26.3	37	
3.3	Ecological sustainability	43.6	58	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.5	82	
3.3.2	Environmental performance*	78.9	46	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.8	38	
4	**Market sophistication**	**43.8**	**58**	
4.1	Credit	46.8	32	
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	n/a	n/a	
4.1.3	Microfinance gross loans, % GDP	0.7	35	
4.2	Investment	42.7	39	
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP[4]	92.6	14	●
4.2.3	Total value of stocks traded, % GDP[4]	1.0	54	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	41.9	118	○
4.3.1	Applied tariff rate, weighted mean, %[4]	2.6	57	
4.3.2	Intensity of local competition†	53.0	119	○
4.3.3	Domestic market scale, bn PPP$	9.4	126	○
5	**Business sophistication**	**36.0**	**46**	
5.1	Knowledge workers	38.7	62	
5.1.1	Knowledge-intensive employment, %[4]	37.2	29	
5.1.2	Firms offering formal training, % firms	23.7	75	○
5.1.3	GERD performed by business, % of GDP[4]	0.2	51	
5.1.4	GERD financed by business, %[4]	42.3	32	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	29.8	68	
5.2.1	University/industry research collaboration†	49.1	45	
5.2.2	State of cluster development†	32.4	115	○
5.2.3	GERD financed by abroad, %[4]	22.5	17	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	47	
5.3	Knowledge absorption	39.7	25	●
5.3.1	Intellectual property payments, % total trade	0.2	78	
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	2.2	15	●
5.3.4	FDI net inflows, % GDP	10.8	8	●
5.3.5	Research talent, % in business enterprise[4]	21.3	53	
6	**Knowledge & technology outputs**	**23.4**	**69**	
6.1	Knowledge creation	10.3	63	
6.1.1	Patents by origin/bn PPP$ GDP	1.4	57	
6.1.2	PCT patent applications/bn PPP$ GDP[4]	0.1	60	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	20.9	35	
6.1.5	Citable documents H index	28.0	125	○
6.2	Knowledge impact	34.1	76	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	6.9	17	●
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	13.8	28	●
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	25.8	59	
6.3.1	Intellectual property receipts, % total trade	0.0	61	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	2.1	45	
6.3.4	FDI net outflows, % GDP	0.6	58	
7	**Creative outputs**	**33.8**	**50**	
7.1	Intangible assets	41.2	73	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.6	55	
7.1.3	ICTs & business model creation†	54.2	78	
7.1.4	ICTs & organizational model creation†	44.7	90	○
7.2	Creative goods & services	12.7	85	
7.2.1	Cultural & creative services exports, % of total trade	0.1	49	
7.2.2	National feature films/mn pop. 15–69	6.7	27	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.2	82	
7.3	Online creativity	39.9	22	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.8	86	
7.3.2	Country-code TLDs/th pop. 15–69	100.0	1	●
7.3.3	Wikipedia edits/mn pop. 15–69	5,218.3	24	●
7.3.4	Video uploads on YouTube/pop. 15–69	19.3	53	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Morocco

Key indicators

Population (millions)	34.4
GDP (US$ billions)	103.1
GDP per capita, PPP$	8,164.4
Income group	Lower-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**32.3**	**72**	
Innovation Output Sub-Index		25.6	70	
Innovation Input Sub-Index		38.9	75	
Innovation Efficiency Ratio		0.7	64	
Global Innovation Index 2015 (out of 141)		33.2	78	
1	**Institutions**	**57.5**	**74**	
1.1	Political environment	44.1	84	
1.1.1	Political stability & safety*	53.0	87	
1.1.2	Government effectiveness*	35.2	77	
1.2	Regulatory environment	60.0	80	
1.2.1	Regulatory quality*	44.5	71	
1.2.2	Rule of law*	45.7	62	
1.2.3	Cost of redundancy dismissal, salary weeks	20.7	87	
1.3	Business environment	68.3	71	
1.3.1	Ease of starting a business*	92.1	37	●
1.3.2	Ease of resolving insolvency*	33.9	107	○
1.3.3	Ease of paying taxes*	78.9	52	
2	**Human capital & research**	**32.3**	**61**	
2.1	Education	47.4	64	
2.1.1	Expenditure on education, % GDP[d]	5.4	40	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	36.5	10	●
2.1.3	School life expectancy, years[d]	12.1	89	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	42.9	36	
2.2.1	Tertiary enrolment, % gross	24.6	85	
2.2.2	Graduates in science & engineering, %[d]	34.9	4	●
2.2.3	Tertiary inbound mobility, %[d]	1.9	65	
2.3	Research & development (R&D)	6.5	72	
2.3.1	Researchers, FTE/mn pop.[d]	856.9	48	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.7	47	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**48.6**	**45**	
3.1	Information & communication technologies (ICTs)	58.9	45	
3.1.1	ICT access*	56.5	71	
3.1.2	ICT use*	29.5	80	
3.1.3	Government's online service*	69.3	30	●
3.1.4	E-participation*	80.4	17	●
3.2	General infrastructure	40.1	45	
3.2.1	Electricity output, kWh/cap	846.1	95	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	33.4	9	●
3.3	Ecological sustainability	46.7	48	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.0	21	●
3.3.2	Environmental performance*	74.2	60	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.5	80	
4	**Market sophistication**	**38.0**	**98**	
4.1	Credit	24.1	94	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	68.7	43	
4.1.3	Microfinance gross loans, % GDP	0.5	36	
4.2	Investment	26.4	109	○
4.2.1	Ease of protecting minority investors*	50.0	86	
4.2.2	Market capitalization, % GDP	47.9	33	
4.2.3	Total value of stocks traded, % GDP	2.8	50	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	46	
4.3	Trade, competition, & market scale	63.6	55	
4.3.1	Applied tariff rate, weighted mean, %[d]	4.1	74	
4.3.2	Intensity of local competition†	67.1	71	
4.3.3	Domestic market scale, bn PPP$	259.2	54	
5	**Business sophistication**	**18.3**	**125**	○
5.1	Knowledge workers	20.8	113	○
5.1.1	Knowledge-intensive employment, %[d]	6.8	98	○
5.1.2	Firms offering formal training, % firms	26.3	66	
5.1.3	GERD performed by business, % of GDP[d]	0.2	49	
5.1.4	GERD financed by business, %[d]	29.9	52	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	17.6	118	○
5.2.1	University/industry research collaboration†	37.2	90	
5.2.2	State of cluster development†	40.5	86	
5.2.3	GERD financed by abroad, %[d]	1.7	81	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	71	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	102	○
5.3	Knowledge absorption	16.4	120	○
5.3.1	Intellectual property payments, % total trade[d]	0.2	82	
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade[d]	0.5	93	
5.3.4	FDI net inflows, % GDP	3.3	52	
5.3.5	Research talent, % in business enterprise[d]	9.3	67	○
6	**Knowledge & technology outputs**	**22.9**	**72**	
6.1	Knowledge creation	6.9	78	
6.1.1	Patents by origin/bn PPP$ GDP	1.4	58	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	57	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.2	85	
6.1.5	Citable documents H index	117.0	68	
6.2	Knowledge impact	35.0	70	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.0	26	●
6.2.2	New businesses/th pop. 15–64	1.5	54	
6.2.3	Computer software spending, % GDP	0.3	56	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.1	76	
6.2.5	High- & medium-high-tech manufactures, %	27.2	44	
6.3	Knowledge diffusion	26.9	52	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	91	○
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade[d]	2.9	27	●
6.3.4	FDI net outflows, % GDP[d]	0.4	63	
7	**Creative outputs**	**28.2**	**67**	
7.1	Intangible assets	49.9	36	●
7.1.1	Trademarks by origin/bn PPP$ GDP	55.5	36	
7.1.2	Industrial designs by origin/bn PPP$ GDP	14.2	8	●
7.1.3	ICTs & business model creation†	58.7	62	
7.1.4	ICTs & organizational model creation†	47.1	84	
7.2	Creative goods & services	8.6	100	
7.2.1	Cultural & creative services exports, % of total trade	0.1	48	
7.2.2	National feature films/mn pop. 15–69	1.0	75	
7.2.3	Global ent. & media market/th pop. 15–69	0.7	56	○
7.2.4	Printing & publishing manufactures, %	0.8	73	
7.2.5	Creative goods exports, % total trade	n/a	n/a	
7.3	Online creativity	4.5	79	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.7	87	
7.3.2	Country-code TLDs/th pop. 15–69	0.9	82	
7.3.3	Wikipedia edits/mn pop. 15–69	390.4	92	
7.3.4	Video uploads on YouTube/pop. 15–69	12.3	60	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Mozambique

Key indicators

Population (millions)	28.0
GDP (US$ billions)	15.0
GDP per capita, PPP$	1,186.2
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.8**	**84**	
Innovation Output Sub-Index		25.1	73	●
Innovation Input Sub-Index		34.6	96	
Innovation Efficiency Ratio		0.7	45	●
Global Innovation Index 2015 (out of 141)		30.1	95	
1	**Institutions**	**46.1**	**111**	
1.1	Political environment	36.4	97	
1.1.1	Political stability & safety*	54.1	84	
1.1.2	Government effectiveness*	18.8	108	
1.2	Regulatory environment	36.1	121	
1.2.1	Regulatory quality*	35.0	95	
1.2.2	Rule of law*	26.2	112	
1.2.3	Cost of redundancy dismissal, salary weeks	37.5	122	
1.3	Business environment	65.9	75	●
1.3.1	Ease of starting a business*	80.2	93	
1.3.2	Ease of resolving insolvency*	49.6	61	●
1.3.3	Ease of paying taxes*	67.8	85	
2	**Human capital & research**	**22.7**	**94**	
2.1	Education	58.2	30	●
2.1.1	Expenditure on education, % GDP	6.7	17	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	70.0	2	●
2.1.3	School life expectancy, years	9.1	107	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary ◴	31.2	105	
2.2	Tertiary education	7.6	117	
2.2.1	Tertiary enrolment, % gross	6.0	113	
2.2.2	Graduates in science & engineering, %	8.1	99	○
2.2.3	Tertiary inbound mobility, %	0.4	92	
2.3	Research & development (R&D)	2.3	88	
2.3.1	Researchers, FTE/mn pop. ◴	37.5	92	
2.3.2	Gross expenditure on R&D, % GDP ◴	0.4	66	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**28.6**	**106**	
3.1	Information & communication technologies (ICTs)	23.8	108	
3.1.1	ICT access*	27.4	114	
3.1.2	ICT use*	3.0	121	○
3.1.3	Government's online service*	31.5	94	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	44.5	33	●
3.2.1	Electricity output, kWh/cap	576.7	102	
3.2.2	Logistics performance*	2.2	121	○
3.2.3	Gross capital formation, % GDP	48.6	3	●
3.3	Ecological sustainability	17.5	127	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	2.3	118	○
3.3.2	Environmental performance*	41.8	121	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	92	
4	**Market sophistication**	**38.2**	**95**	
4.1	Credit	13.0	121	
4.1.1	Ease of getting credit*	25.0	118	
4.1.2	Domestic credit to private sector, % GDP	31.8	91	
4.1.3	Microfinance gross loans, % GDP	0.2	51	
4.2	Investment	51.7	21	
4.2.1	Ease of protecting minority investors*	51.7	83	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	50.0	103	
4.3.1	Applied tariff rate, weighted mean, % ◴	4.2	75	●
4.3.2	Intensity of local competition†	59.4	103	
4.3.3	Domestic market scale, bn PPP$	31.2	105	
5	**Business sophistication**	**37.1**	**38**	●
5.1	Knowledge workers	16.9	116	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms ◴	22.1	77	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total ◴	0.5	87	○
5.2	Innovation linkages	53.5	4	●
5.2.1	University/industry research collaboration†	38.0	83	
5.2.2	State of cluster development†	41.0	83	
5.2.3	GERD financed by abroad, % ◴	78.1	1	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	83	
5.3	Knowledge absorption	40.9	22	●
5.3.1	Intellectual property payments, % total trade	0.3	71	
5.3.2	High-tech imports less re-imports, % total trade	5.8	83	
5.3.3	ICT services imports, % total trade	1.0	58	●
5.3.4	FDI net inflows, % GDP	31.4	1	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**28.5**	**47**	●
6.1	Knowledge creation	7.0	76	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.8	78	
6.1.5	Citable documents H index	66.0	103	
6.2	Knowledge impact	55.1	[9]	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.8	7	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.4	99	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	23.5	71	●
6.3.1	Intellectual property receipts, % total trade ◴	0.0	88	
6.3.2	High-tech exports less re-exports, % total trade	0.5	73	
6.3.3	ICT services exports, % total trade	0.5	96	
6.3.4	FDI net outflows, % GDP ◴	3.3	15	●
7	**Creative outputs**	**21.7**	**98**	
7.1	Intangible assets	43.1	63	●
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	48.7	100	
7.1.4	ICTs & organizational model creation†	37.4	115	
7.2	Creative goods & services	0.8	125	○
7.2.1	Cultural & creative services exports, % of total trade	0.0	64	
7.2.2	National feature films/mn pop. 15–69 ◴	0.1	100	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	117	
7.3	Online creativity	0.1	123	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.0	127	○
7.3.2	Country-code TLDs/th pop. 15–69	0.1	111	
7.3.3	Wikipedia edits/mn pop. 15–69	27.5	116	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Namibia

Key indicators

Population (millions)	2.5
GDP (US$ billions)	12.8
GDP per capita, PPP$	11,408.2
Income group	Upper-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**28.2**	**93**	
Innovation Output Sub-Index		19.8	101	
Innovation Input Sub-Index		36.7	87	
Innovation Efficiency Ratio		0.5	102	
Global Innovation Index 2015 (out of 141)		28.1	107	
1	**Institutions**	**64.7**	**59**	
1.1	Political environment	60.1	47	●
1.1.1	Political stability & safety*	78.2	39	●
1.1.2	Government effectiveness*	41.9	63	
1.2	Regulatory environment	72.4	43	●
1.2.1	Regulatory quality*	45.5	68	
1.2.2	Rule of law*	50.6	55	●
1.2.3	Cost of redundancy dismissal, salary weeks	9.7	31	●
1.3	Business environment	61.6	89	
1.3.1	Ease of starting a business*	68.9	117	○
1.3.2	Ease of resolving insolvency*	42.2	86	
1.3.3	Ease of paying taxes*	73.6	73	
2	**Human capital & research**	**21.0**	**100**	
2.1	Education	47.2	66	
2.1.1	Expenditure on education, % GDP[d]	8.4	4	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	15.9	76	
2.1.3	School life expectancy, years[d]	11.3	95	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	24.6	92	
2.2	Tertiary education	15.2	107	
2.2.1	Tertiary enrolment, % gross[d]	9.3	107	
2.2.2	Graduates in science & engineering, %[d]	2.6	102	○
2.2.3	Tertiary inbound mobility, %[d]	10.2	14	●
2.3	Research & development (R&D)	0.8	106	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	96	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**36.2**	**92**	
3.1	Information & communication technologies (ICTs)	31.2	98	
3.1.1	ICT access*	41.4	97	
3.1.2	ICT use*	17.7	96	
3.1.3	Government's online service*	32.3	91	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	32.3	71	
3.2.1	Electricity output, kWh/cap	578.7	101	
3.2.2	Logistics performance*	2.7	88	
3.2.3	Gross capital formation, % GDP	29.6	23	●
3.3	Ecological sustainability	45.3	53	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.9	23	●
3.3.2	Environmental performance*	70.8	71	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.6	77	
4	**Market sophistication**	**40.0**	**87**	
4.1	Credit	26.2	90	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	49.1	68	
4.1.3	Microfinance gross loans, % GDP[d]	0.0	68	
4.2	Investment	39.9	51	●
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP	14.8	73	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	53.9	89	
4.3.1	Applied tariff rate, weighted mean, %	0.8	7	●
4.3.2	Intensity of local competition†	60.6	95	
4.3.3	Domestic market scale, bn PPP$	23.5	114	○
5	**Business sophistication**	**21.3**	**117**	○
5.1	Knowledge workers	21.5	108	
5.1.1	Knowledge-intensive employment, %[d]	14.5	89	
5.1.2	Firms offering formal training, % firms	25.4	71	
5.1.3	GERD performed by business, % of GDP[d]	0.0	77	
5.1.4	GERD financed by business, %[d]	19.8	62	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	23.7	90	
5.2.1	University/industry research collaboration†	41.0	76	
5.2.2	State of cluster development†	47.9	54	
5.2.3	GERD financed by abroad, %[d]	1.5	84	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	77	
5.3	Knowledge absorption	18.9	107	
5.3.1	Intellectual property payments, % total trade	0.1	91	
5.3.2	High-tech imports less re-imports, % total trade	6.0	79	
5.3.3	ICT services imports, % total trade	0.3	109	
5.3.4	FDI net inflows, % GDP	3.8	43	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**8.8**	**125**	○
6.1	Knowledge creation	5.6	90	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	54	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.2	75	
6.1.5	Citable documents H index	67.0	102	
6.2	Knowledge impact	4.7	121	○
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64[d]	0.9	77	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.7	94	
6.2.5	High- & medium-high-tech manufactures, %	4.9	92	○
6.3	Knowledge diffusion	15.9	116	○
6.3.1	Intellectual property receipts, % total trade[d]	0.0	100	○
6.3.2	High-tech exports less re-exports, % total trade	1.6	55	
6.3.3	ICT services exports, % total trade	0.1	122	○
6.3.4	FDI net outflows, % GDP[d]	0.2	75	
7	**Creative outputs**	**30.9**	**59**	
7.1	Intangible assets	50.9	30	●
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	53.3	82	
7.1.4	ICTs & organizational model creation†	48.6	80	
7.2	Creative goods & services	18.1	75	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.7	55	
7.3	Online creativity	3.7	82	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	9.3	42	●
7.3.2	Country-code TLDs/th pop. 15–69	0.1	118	○
7.3.3	Wikipedia edits/mn pop. 15–69	224.1	100	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Nepal

Key indicators

Population (millions)	28.5
GDP (US$ billions)	21.4
GDP per capita, PPP$	2,465.2
Income group	Low income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**23.1**	**115**	
Innovation Output Sub-Index		16.9	112	
Innovation Input Sub-Index		29.3	116	
Innovation Efficiency Ratio		0.6	94	
Global Innovation Index 2015 (out of 141)		21.1	135	
1	**Institutions**	**46.6**	**108**	
1.1	Political environment	30.7	110	
1.1.1	Political stability & safety*	45.4	98	
1.1.2	Government effectiveness*	16.0	117	
1.2	Regulatory environment	44.5	114	
1.2.1	Regulatory quality*	23.7	115	
1.2.2	Rule of law*	30.2	101	
1.2.3	Cost of redundancy dismissal, salary weeks	27.2	104	
1.3	Business environment	64.7	81	
1.3.1	Ease of starting a business*	83.5	79	
1.3.2	Ease of resolving insolvency*	44.2	77	
1.3.3	Ease of paying taxes*	66.5	89	
2	**Human capital & research**	**16.7**	**109**	
2.1	Education	34.5	100	
2.1.1	Expenditure on education, % GDP	4.7	59	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	14.6	87	
2.1.3	School life expectancy, years	12.2	87	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	28.8	101	
2.2	Tertiary education	13.7	112	
2.2.1	Tertiary enrolment, % gross	15.8	96	
2.2.2	Graduates in science & engineering, %	12.1	95	
2.2.3	Tertiary inbound mobility, % [4]	0.0	107	○
2.3	Research & development (R&D)	2.0	93	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP [4]	0.3	76	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**25.9**	**115**	
3.1	Information & communication technologies (ICTs)	21.4	111	
3.1.1	ICT access*	29.2	110	
3.1.2	ICT use*	11.4	105	
3.1.3	Government's online service*	15.7	115	
3.1.4	E-participation*	29.4	99	
3.2	General infrastructure	30.2	81	
3.2.1	Electricity output, kWh/cap	131.2	113	○
3.2.2	Logistics performance*	2.6	99	
3.2.3	Gross capital formation, % GDP	28.9	26	●
3.3	Ecological sustainability	26.1	120	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.2	95	
3.3.2	Environmental performance*	50.2	114	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	102	
4	**Market sophistication**	**31.3**	**118**	
4.1	Credit	22.9	99	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	62.6	49	●
4.1.3	Microfinance gross loans, % GDP	1.2	30	●
4.2	Investment	31.7	85	
4.2.1	Ease of protecting minority investors*	58.3	55	●
4.2.2	Market capitalization, % GDP [4]	22.1	61	
4.2.3	Total value of stocks traded, % GDP [4]	0.3	69	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	39.4	121	○
4.3.1	Applied tariff rate, weighted mean, %	14.7	124	○
4.3.2	Intensity of local competition†	65.5	80	
4.3.3	Domestic market scale, bn PPP$	67.1	87	
5	**Business sophistication**	**26.0**	**93**	
5.1	Knowledge workers	21.7	107	
5.1.1	Knowledge-intensive employment, % [4]	4.3	99	○
5.1.2	Firms offering formal training, % firms	31.9	54	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	33.2	54	
5.2.1	University/industry research collaboration†	27.3	116	○
5.2.2	State of cluster development†	36.2	97	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	23.1	93	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	9.6	37	●
5.3.3	ICT services imports, % total trade [4]	0.8	78	
5.3.4	FDI net inflows, % GDP	0.0	124	○
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.6**	**103**	
6.1	Knowledge creation	6.2	86	
6.1.1	Patents by origin/bn PPP$ GDP [4]	0.3	87	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.4	74	
6.1.5	Citable documents H index	87.0	87	
6.2	Knowledge impact	5.2	119	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	0.7	83	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.4	98	
6.2.5	High- & medium-high-tech manufactures, % [4]	6.7	86	
6.3	Knowledge diffusion	41.4	24	●
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.1	110	
6.3.3	ICT services exports, % total trade [4]	7.5	5	●
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**16.3**	**112**	
7.1	Intangible assets	28.4	115	
7.1.1	Trademarks by origin/bn PPP$ GDP	37.8	60	●
7.1.2	Industrial designs by origin/bn PPP$ GDP [4]	0.3	88	
7.1.3	ICTs & business model creation†	39.7	120	○
7.1.4	ICTs & organizational model creation†	38.2	111	
7.2	Creative goods & services	7.5	102	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, % [4]	0.4	88	○
7.2.5	Creative goods exports, % total trade	0.3	66	●
7.3	Online creativity	1.0	103	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.5	110	
7.3.2	Country-code TLDs/th pop. 15–69	0.9	81	
7.3.3	Wikipedia edits/mn pop. 15–69	218.2	101	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Netherlands

Key indicators

Population (millions)	16.9
GDP (US$ billions)	738.4
GDP per capita, PPP$	49,165.8
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**58.3**	**9**	
Innovation Output Sub-Index		52.5	9	
Innovation Input Sub-Index		64.0	12	
Innovation Efficiency Ratio		0.8	20	
Global Innovation Index 2015 (out of 141)		61.6	4	
1	**Institutions**	**91.0**	**8**	
1.1	Political environment	89.4	9	
1.1.1	Political stability & safety*	88.9	15	
1.1.2	Government effectiveness*	89.9	6	●
1.2	Regulatory environment	95.7	6	●
1.2.1	Regulatory quality*	88.8	10	
1.2.2	Rule of law*	96.5	7	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	
1.3	Business environment	87.9	10	
1.3.1	Ease of starting a business*	94.1	27	
1.3.2	Ease of resolving insolvency*	83.8	10	
1.3.3	Ease of paying taxes*	85.8	23	
2	**Human capital & research**	**55.3**	**17**	
2.1	Education	60.4	23	
2.1.1	Expenditure on education, % GDP	5.5	36	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	24.2	37	
2.1.3	School life expectancy, years[4]	18.1	8	
2.1.4	PISA scales in reading, maths, & science	518.8	10	
2.1.5	Pupil-teacher ratio, secondary[4]	14.1	56	○
2.2	Tertiary education	40.0	46	○
2.2.1	Tertiary enrolment, % gross[4]	78.5	17	
2.2.2	Graduates in science & engineering, %[4]	14.4	88	○
2.2.3	Tertiary inbound mobility, %[4]	7.2	23	
2.3	Research & development (R&D)	65.5	12	
2.3.1	Researchers, FTE/mn pop.	4,478.1	15	
2.3.2	Gross expenditure on R&D, % GDP	2.0	18	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	2,257.5	8	
2.3.4	QS university ranking, average score top 3*	75.8	12	
3	**Infrastructure**	**62.1**	**12**	
3.1	Information & communication technologies (ICTs)	90.1	3	●
3.1.1	ICT access*	90.4	8	
3.1.2	ICT use*	76.9	12	
3.1.3	Government's online service*	92.9	8	
3.1.4	E-participation*	100.0	1	●
3.2	General infrastructure	46.3	30	
3.2.1	Electricity output, kWh/cap	6,079.9	30	
3.2.2	Logistics performance*	4.0	2	●
3.2.3	Gross capital formation, % GDP	17.9	99	○
3.3	Ecological sustainability	49.8	41	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.0	44	○
3.3.2	Environmental performance*	82.0	36	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.0	33	
4	**Market sophistication**	**58.1**	**18**	
4.1	Credit	47.7	30	
4.1.1	Ease of getting credit*	50.0	69	○
4.1.2	Domestic credit to private sector, % GDP	116.5	21	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	48.7	25	
4.2.1	Ease of protecting minority investors*	56.7	62	○
4.2.2	Market capitalization, % GDP	89.5	17	
4.2.3	Total value of stocks traded, % GDP	54.3	14	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	18	
4.3	Trade, competition, & market scale	77.7	13	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	81.0	10	
4.3.3	Domestic market scale, bn PPP$	808.8	26	
5	**Business sophistication**	**53.7**	**9**	
5.1	Knowledge workers	60.2	20	
5.1.1	Knowledge-intensive employment, %	46.4	9	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.1	19	
5.1.4	GERD financed by business, %	51.5	19	
5.1.5	Females employed w/advanced degrees, % total	18.3	28	
5.2	Innovation linkages	45.1	18	
5.2.1	University/industry research collaboration†	73.0	9	
5.2.2	State of cluster development†	70.3	10	
5.2.3	GERD financed by abroad, %	12.5	38	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	28	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	3.4	12	
5.3	Knowledge absorption	55.9	4	●
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	12.5	21	
5.3.3	ICT services imports, % total trade	n/a	n/a	
5.3.4	FDI net inflows, % GDP	5.5	25	
5.3.5	Research talent, % in business enterprise	60.8	10	
6	**Knowledge & technology outputs**	**44.1**	**16**	
6.1	Knowledge creation	67.7	4	●
6.1.1	Patents by origin/bn PPP$ GDP	11.3	10	
6.1.2	PCT patent applications/bn PPP$ GDP	5.2	8	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	42.8	13	
6.1.5	Citable documents H index	694.0	8	
6.2	Knowledge impact	48.3	22	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.2	59	○
6.2.2	New businesses/th pop. 15–64	5.3	23	
6.2.3	Computer software spending, % GDP	0.6	7	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	12.9	30	
6.2.5	High- & medium-high-tech manufactures, %	41.0	22	
6.3	Knowledge diffusion	16.3	114	○
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	13.1	14	
6.3.3	ICT services exports, % total trade	n/a	n/a	
6.3.4	FDI net outflows, % GDP	(5.9)	118	○
7	**Creative outputs**	**61.0**	**6**	●
7.1	Intangible assets	56.7	18	
7.1.1	Trademarks by origin/bn PPP$ GDP	56.7	35	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.5	35	
7.1.3	ICTs & business model creation†	80.1	4	●
7.1.4	ICTs & organizational model creation†	77.7	4	●
7.2	Creative goods & services	46.2	8	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	5.6	32	
7.2.3	Global ent. & media market/th pop. 15–69	52.1	14	
7.2.4	Printing & publishing manufactures, %	1.5	35	○
7.2.5	Creative goods exports, % total trade	5.3	8	
7.3	Online creativity	84.5	2	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	82.5	5	●
7.3.2	Country-code TLDs/th pop. 15–69	100.0	1	●
7.3.3	Wikipedia edits/mn pop. 15–69	9,406.7	6	●
7.3.4	Video uploads on YouTube/pop. 15–69	85.9	2	●

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

New Zealand

Key indicators

Population (millions)	4.5
GDP (US$ billions)	172.2
GDP per capita, PPP$	36,171.6
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
	Global Innovation Index (out of 128)	**54.2**	**17**	
	Innovation Output Sub-Index	45.8	17	
	Innovation Input Sub-Index	62.6	14	
	Innovation Efficiency Ratio	0.7	40	
	Global Innovation Index 2015 (out of 141)	55.9	15	
1	**Institutions**	**93.5**	**3**	●
1.1	Political environment	96.3	2	●
1.1.1	Political stability & safety*	100.0	1	●
1.1.2	Government effectiveness*	92.6	4	●
1.2	Regulatory environment	97.6	2	●
1.2.1	Regulatory quality*	92.9	3	●
1.2.2	Rule of law*	97.4	4	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	86.5	16	
1.3.1	Ease of starting a business*	100.0	1	●
1.3.2	Ease of resolving insolvency*	71.4	29	
1.3.3	Ease of paying taxes*	88.1	21	
2	**Human capital & research**	**56.6**	**15**	
2.1	Education	66.9	10	
2.1.1	Expenditure on education, % GDP	7.3	8	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	24.7	34	
2.1.3	School life expectancy, years	19.2	5	●
2.1.4	PISA scales in reading, maths, & science	509.2	16	
2.1.5	Pupil-teacher ratio, secondary [d]	14.4	61	
2.2	Tertiary education	56.6	10	
2.2.1	Tertiary enrolment, % gross	79.7	15	
2.2.2	Graduates in science & engineering, % [d]	18.8	65	○
2.2.3	Tertiary inbound mobility, %	16.1	8	
2.3	Research & development (R&D)	46.3	24	
2.3.1	Researchers, FTE/mn pop. [d]	4,008.7	22	
2.3.2	Gross expenditure on R&D, % GDP [d]	1.2	32	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	84.9	32	
2.3.4	QS university ranking, average score top 3*	60.2	19	
3	**Infrastructure**	**58.8**	**20**	
3.1	Information & communication technologies (ICTs)	79.9	13	
3.1.1	ICT access*	80.8	22	
3.1.2	ICT use*	76.3	14	
3.1.3	Government's online service*	84.3	15	
3.1.4	E-participation*	78.4	19	
3.2	General infrastructure	51.1	18	
3.2.1	Electricity output, kWh/cap	9,654.3	14	
3.2.2	Logistics performance*	3.6	22	
3.2.3	Gross capital formation, % GDP	23.7	53	
3.3	Ecological sustainability	45.3	54	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.2	88	○
3.3.2	Environmental performance*	88.0	11	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.8	48	
4	**Market sophistication**	**63.5**	**11**	
4.1	Credit	78.2	5	●
4.1.1	Ease of getting credit*	100.0	1	●
4.1.2	Domestic credit to private sector, % GDP [d]	143.6	9	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	44.1	34	
4.2.1	Ease of protecting minority investors*	83.3	1	●
4.2.2	Market capitalization, % GDP [d]	29.5	52	○
4.2.3	Total value of stocks traded, % GDP [d]	3.0	48	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	21	
4.3	Trade, competition, & market scale	68.1	43	
4.3.1	Applied tariff rate, weighted mean, %	1.4	41	
4.3.2	Intensity of local competition†	77.9	15	
4.3.3	Domestic market scale, bn PPP$	160.8	64	
5	**Business sophistication**	**40.9**	**30**	
5.1	Knowledge workers	53.1	27	
5.1.1	Knowledge-intensive employment, % [d]	42.9	18	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP [d]	0.5	32	
5.1.4	GERD financed by business, % [d]	39.8	36	
5.1.5	Females employed w/advanced degrees, % total [d]	20.8	22	
5.2	Innovation linkages	36.2	46	
5.2.1	University/industry research collaboration†	65.1	16	
5.2.2	State of cluster development†	49.6	45	
5.2.3	GERD financed by abroad, % [d]	7.2	56	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	18	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.4	15	
5.3	Knowledge absorption	33.4	42	
5.3.1	Intellectual property payments, % total trade	1.6	11	
5.3.2	High-tech imports less re-imports, % total trade	10.7	29	
5.3.3	ICT services imports, % total trade	1.2	51	
5.3.4	FDI net inflows, % GDP [d]	0.8	101	○
5.3.5	Research talent, % in business enterprise [d]	34.1	39	
6	**Knowledge & technology outputs**	**38.3**	**27**	
6.1	Knowledge creation	49.9	13	
6.1.1	Patents by origin/bn PPP$ GDP	10.2	13	
6.1.2	PCT patent applications/bn PPP$ GDP	2.2	17	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	51.1	7	●
6.1.5	Citable documents H index	351.0	26	
6.2	Knowledge impact	42.4	38	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.2)	92	○
6.2.2	New businesses/th pop. 15–64	16.6	3	●
6.2.3	Computer software spending, % GDP	0.3	34	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	8.0	44	
6.2.5	High- & medium-high-tech manufactures, % [d]	14.8	66	○
6.3	Knowledge diffusion	22.7	75	○
6.3.1	Intellectual property receipts, % total trade	0.6	21	
6.3.2	High-tech exports less re-exports, % total trade	1.3	60	
6.3.3	ICT services exports, % total trade	1.1	74	○
6.3.4	FDI net outflows, % GDP [d]	(0.1)	101	○
7	**Creative outputs**	**53.3**	**12**	
7.1	Intangible assets	60.8	14	
7.1.1	Trademarks by origin/bn PPP$ GDP	97.3	14	
7.1.2	Industrial designs by origin/bn PPP$ GDP	6.4	21	
7.1.3	ICTs & business model creation†	73.8	19	
7.1.4	ICTs & organizational model creation†	67.9	22	
7.2	Creative goods & services	33.6	33	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	8.0	20	
7.2.3	Global ent. & media market/th pop. 15–69	53.4	12	
7.2.4	Printing & publishing manufactures, % [d]	2.0	24	
7.2.5	Creative goods exports, % total trade	0.3	69	
7.3	Online creativity	58.0	14	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	37.1	20	
7.3.2	Country-code TLDs/th pop. 15–69	73.7	10	
7.3.3	Wikipedia edits/mn pop. 15–69	7,816.3	10	
7.3.4	Video uploads on YouTube/pop. 15–69	63.2	15	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Nicaragua

Key indicators

Population (millions)	6.1
GDP (US$ billions)	12.2
GDP per capita, PPP$	4,997.2
Income group	Lower-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**23.1**	**116**	
Innovation Output Sub-Index		13.3	120	○
Innovation Input Sub-Index		32.8	106	
Innovation Efficiency Ratio		0.4	120	○
Global Innovation Index 2015 (out of 141)		23.5	130	
1	**Institutions**	**51.8**	**92**	
1.1	Political environment	38.8	94	
1.1.1	Political stability & safety*	61.7	70	
1.1.2	Government effectiveness*	15.9	118	
1.2	Regulatory environment	59.6	82	
1.2.1	Regulatory quality*	35.4	94	
1.2.2	Rule of law*	30.4	100	
1.2.3	Cost of redundancy dismissal, salary weeks	14.9	62	●
1.3	Business environment	57.1	106	
1.3.1	Ease of starting a business*	80.5	92	
1.3.2	Ease of resolving insolvency*	40.1	91	
1.3.3	Ease of paying taxes*	50.6	113	
2	**Human capital & research**	**11.7**	**125**	○
2.1	Education	23.4	122	○
2.1.1	Expenditure on education, % GDP[d]	4.5	69	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	7.4	104	○
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	30.8	104	
2.2	Tertiary education	n/a	n/a	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**27.3**	**109**	
3.1	Information & communication technologies (ICTs)	16.8	120	○
3.1.1	ICT access*	40.1	100	
3.1.2	ICT use*	7.7	109	
3.1.3	Government's online service*	9.4	123	○
3.1.4	E-participation*	9.8	123	○
3.2	General infrastructure	30.4	80	
3.2.1	Electricity output, kWh/cap	684.7	98	
3.2.2	Logistics performance*	2.7	90	
3.2.3	Gross capital formation, % GDP	27.5	31	●
3.3	Ecological sustainability	34.8	96	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	75	
3.3.2	Environmental performance*	64.2	97	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	97	
4	**Market sophistication**	**41.9**	**76**	
4.1	Credit	31.8	73	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	34.1	85	
4.1.3	Microfinance gross loans, % GDP	3.1	14	●
4.2	Investment	40.0	49	
4.2.1	Ease of protecting minority investors*	40.0	112	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	53.8	91	
4.3.1	Applied tariff rate, weighted mean, %	1.9	50	●
4.3.2	Intensity of local competition†	61.6	91	
4.3.3	Domestic market scale, bn PPP$	29.7	106	
5	**Business sophistication**	**31.2**	**67**	
5.1	Knowledge workers	40.3	56	
5.1.1	Knowledge-intensive employment, %[d]	14.8	87	
5.1.2	Firms offering formal training, % firms[d]	47.2	28	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	26.1	78	
5.2.1	University/industry research collaboration†	32.6	106	
5.2.2	State of cluster development†	35.2	104	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	84	
5.3	Knowledge absorption	27.1	70	
5.3.1	Intellectual property payments, % total trade	0.0	111	○
5.3.2	High-tech imports less re-imports, % total trade	8.6	51	●
5.3.3	ICT services imports, % total trade	0.4	103	
5.3.4	FDI net inflows, % GDP	7.5	17	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**10.8**	**122**	○
6.1	Knowledge creation	1.9	123	○
6.1.1	Patents by origin/bn PPP$ GDP	0.0	115	○
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.1	117	
6.1.5	Citable documents H index	56.0	110	
6.2	Knowledge impact	3.4	[123]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.7	95	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	27.1	50	●
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.2	101	
6.3.3	ICT services exports, % total trade	2.6	35	●
6.3.4	FDI net outflows, % GDP	0.7	57	●
7	**Creative outputs**	**15.9**	**113**	
7.1	Intangible assets	29.4	108	
7.1.1	Trademarks by origin/bn PPP$ GDP[d]	41.1	55	●
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	0.0	109	○
7.1.3	ICTs & business model creation†	43.6	115	○
7.1.4	ICTs & organizational model creation†	36.9	117	○
7.2	Creative goods & services	1.8	118	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	0.3	95	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.1	94	
7.3	Online creativity	2.9	93	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.0	65	
7.3.2	Country-code TLDs/th pop. 15–69	0.6	88	
7.3.3	Wikipedia edits/mn pop. 15–69	691.2	85	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Niger

Key indicators

Population (millions)	19.9
GDP (US$ billions)	7.2
GDP per capita, PPP$	1,079.7
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**20.4**	**124**	
Innovation Output Sub-Index		10.8	125	
Innovation Input Sub-Index		30.1	113	
Innovation Efficiency Ratio		0.4	125	
Global Innovation Index 2015 (out of 141)		21.2	134	
1	**Institutions**	**46.8**	**107**	
1.1	Political environment	24.9	118	
1.1.1	Political stability & safety*	31.3	120	
1.1.2	Government effectiveness*	18.6	109	
1.2	Regulatory environment	58.6	86	
1.2.1	Regulatory quality*	28.4	106	
1.2.2	Rule of law*	29.9	103	
1.2.3	Cost of redundancy dismissal, salary weeks	14.0	57	●
1.3	Business environment	56.8	108	
1.3.1	Ease of starting a business*	77.6	101	
1.3.2	Ease of resolving insolvency*	36.0	101	
1.3.3	Ease of paying taxes*	56.9	108	
2	**Human capital & research**	**21.1**	**99**	
2.1	Education	54.3	42	●
2.1.1	Expenditure on education, % GDP	6.8	15	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	71.0	1	●
2.1.3	School life expectancy, years[d]	5.3	117	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	25.1	95	
2.2	Tertiary education	9.0	113	
2.2.1	Tertiary enrolment, % gross[d]	1.7	120	○
2.2.2	Graduates in science & engineering, %[d]	4.3	101	○
2.2.3	Tertiary inbound mobility, %[d]	5.4	31	●
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**26.6**	**112**	
3.1	Information & communication technologies (ICTs)	18.1	117	
3.1.1	ICT access*	n/a	n/a	
3.1.2	ICT use*	n/a	n/a	
3.1.3	Government's online service*	12.6	120	
3.1.4	E-participation*	23.5	108	
3.2	General infrastructure	41.4	40	●
3.2.1	Electricity output, kWh/cap	24.8	117	
3.2.2	Logistics performance*	2.4	114	
3.2.3	Gross capital formation, % GDP	43.8	5	●
3.3	Ecological sustainability	20.4	124	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.0	98	
3.3.2	Environmental performance*	37.5	124	○
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	117	
4	**Market sophistication**	**25.8**	**127**	○
4.1	Credit	13.0	120	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	14.2	120	
4.1.3	Microfinance gross loans, % GDP	0.4	39	
4.2	Investment	35.0	69	
4.2.1	Ease of protecting minority investors*	35.0	121	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	29.5	126	○
4.3.1	Applied tariff rate, weighted mean, %	10.2	121	
4.3.2	Intensity of local competition†	n/a	n/a	
4.3.3	Domestic market scale, bn PPP$	18.0	120	
5	**Business sophistication**	**30.0**	**76**	
5.1	Knowledge workers	37.9	65	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms[d]	32.1	50	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	2.1	[127]	
5.2.1	University/industry research collaboration†	n/a	n/a	
5.2.2	State of cluster development†	n/a	n/a	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	71	
5.3	Knowledge absorption	50.1	8	●
5.3.1	Intellectual property payments, % total trade[d]	0.1	93	
5.3.2	High-tech imports less re-imports, % total trade	7.7	61	
5.3.3	ICT services imports, % total trade[d]	4.4	3	●
5.3.4	FDI net inflows, % GDP	9.4	11	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**21.1**	**84**	
6.1	Knowledge creation	4.0	100	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	76	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	76	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.7	81	
6.1.5	Citable documents H index	54.0	112	
6.2	Knowledge impact	36.7	59	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.5	18	●
6.2.2	New businesses/th pop. 15–64[d]	0.0	107	○
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.4	121	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	22.5	77	
6.3.1	Intellectual property receipts, % total trade[d]	0.0	99	
6.3.2	High-tech exports less re-exports, % total trade	3.0	44	●
6.3.3	ICT services exports, % total trade[d]	2.8	30	●
6.3.4	FDI net outflows, % GDP[d]	0.0	91	
7	**Creative outputs**	**0.5**	**128**	○
7.1	Intangible assets	0.0	128	○
7.1.1	Trademarks by origin/bn PPP$ GDP	1.2	109	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.1	106	
7.1.3	ICTs & business model creation†	n/a	n/a	
7.1.4	ICTs & organizational model creation†	n/a	n/a	
7.2	Creative goods & services	1.6	120	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	0.7	82	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	108	
7.3	Online creativity	0.4	112	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.1	97	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	126	○
7.3.3	Wikipedia edits/mn pop. 15–69	5.3	128	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Nigeria

Key indicators

Population (millions)	182.2
GDP (US$ billions)	490.2
GDP per capita, PPP$	6,108.4
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**23.1**	**114**	
Innovation Output Sub-Index		18.5	107	
Innovation Input Sub-Index		27.8	122	
Innovation Efficiency Ratio		0.7	60	●
Global Innovation Index 2015 (out of 141)		23.7	128	
1	**Institutions**	**36.2**	**125**	
1.1	Political environment	8.2	127	○
1.1.1	Political stability & safety*	10.5	126	○
1.1.2	Government effectiveness*	5.9	123	
1.2	Regulatory environment	53.8	98	
1.2.1	Regulatory quality*	24.5	112	
1.2.2	Rule of law*	20.1	125	
1.2.3	Cost of redundancy dismissal, salary weeks	15.4	64	●
1.3	Business environment	46.7	126	○
1.3.1	Ease of starting a business*	77.1	105	
1.3.2	Ease of resolving insolvency*	30.7	114	
1.3.3	Ease of paying taxes*	32.2	124	
2	**Human capital & research**	**12.4**	**123**	
2.1	Education	23.8	121	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	33.1	106	
2.2	Tertiary education	n/a	n/a	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	1.1	103	
2.3.1	Researchers, FTE/mn pop.[d]	38.6	90	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.2	85	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**27.0**	**110**	
3.1	Information & communication technologies (ICTs)	27.6	103	
3.1.1	ICT access*	28.2	112	
3.1.2	ICT use*	18.1	94	
3.1.3	Government's online service*	30.7	97	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	22.3	116	
3.2.1	Electricity output, kWh/cap	166.4	112	
3.2.2	Logistics performance*	2.8	72	
3.2.3	Gross capital formation, % GDP	17.4	106	
3.3	Ecological sustainability	31.0	111	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.3	86	
3.3.2	Environmental performance*	58.3	106	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	120	
4	**Market sophistication**	**43.3**	**61**	●
4.1	Credit	21.7	104	
4.1.1	Ease of getting credit*	60.0	53	●
4.1.2	Domestic credit to private sector, % GDP	14.5	117	
4.1.3	Microfinance gross loans, % GDP	0.1	63	
4.2	Investment	46.2	31	●
4.2.1	Ease of protecting minority investors*	68.3	20	●
4.2.2	Market capitalization, % GDP	100.0	11	●
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	76	
4.3	Trade, competition, & market scale	62.0	59	●
4.3.1	Applied tariff rate, weighted mean, %	10.1	120	
4.3.2	Intensity of local competition†	69.2	58	●
4.3.3	Domestic market scale, bn PPP$	1,052.9	21	●
5	**Business sophistication**	**20.1**	**121**	
5.1	Knowledge workers	24.1	98	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	30.8	57	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	0.2	91	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	16.6	122	
5.2.1	University/industry research collaboration†	29.2	111	
5.2.2	State of cluster development†	42.1	78	
5.2.3	GERD financed by abroad, %[d]	1.0	88	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	75	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	114	○
5.3	Knowledge absorption	19.6	101	
5.3.1	Intellectual property payments, % total trade	0.3	70	
5.3.2	High-tech imports less re-imports, % total trade	3.4	113	
5.3.3	ICT services imports, % total trade	1.8	25	●
5.3.4	FDI net inflows, % GDP	0.8	102	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.5**	**104**	
6.1	Knowledge creation	2.9	116	
6.1.1	Patents by origin/bn PPP$ GDP[d]	0.1	111	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	95	○
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.0	118	
6.1.5	Citable documents H index	115.0	69	●
6.2	Knowledge impact	30.7	88	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.8	15	●
6.2.2	New businesses/th pop. 15–64	0.8	80	
6.2.3	Computer software spending, % GDP	0.1	73	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.2	127	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	19.0	101	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.2	100	
6.3.3	ICT services exports, % total trade	0.1	121	○
6.3.4	FDI net outflows, % GDP[d]	0.3	69	
7	**Creative outputs**	**19.5**	**106**	
7.1	Intangible assets	31.4	103	
7.1.1	Trademarks by origin/bn PPP$ GDP[d]	19.8	81	
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	0.9	70	
7.1.3	ICTs & business model creation†	54.0	80	
7.1.4	ICTs & organizational model creation†	43.1	95	
7.2	Creative goods & services	14.9	82	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	11.2	9	●
7.2.3	Global ent. & media market/th pop. 15–69	0.5	57	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	115	
7.3	Online creativity	0.2	116	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.6	107	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	108	
7.3.3	Wikipedia edits/mn pop. 15–69	36.2	115	
7.3.4	Video uploads on YouTube/pop. 15–69	0.0	74	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Norway

Key indicators

Population (millions)	5.2
GDP (US$ billions)	389.5
GDP per capita, PPP$	68,430.2
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**52.0**	**22**	
Innovation Output Sub-Index		42.0	26	
Innovation Input Sub-Index		62.0	17	
Innovation Efficiency Ratio		0.7	55	
Global Innovation Index 2015 (out of 141)		53.8	20	
1	**Institutions**	**91.9**	**5**	●
1.1	Political environment	90.2	7	●
1.1.1	Political stability & safety*	91.0	9	
1.1.2	Government effectiveness*	89.3	8	●
1.2	Regulatory environment	95.2	7	●
1.2.1	Regulatory quality*	85.3	16	
1.2.2	Rule of law*	98.1	3	●
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	
1.3	Business environment	90.5	4	●
1.3.1	Ease of starting a business*	94.3	23	
1.3.2	Ease of resolving insolvency*	85.7	6	●
1.3.3	Ease of paying taxes*	91.4	14	
2	**Human capital & research**	**53.0**	**21**	
2.1	Education	62.4	16	
2.1.1	Expenditure on education, % GDP	7.4	7	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	25.8	29	
2.1.3	School life expectancy, years	17.7	11	
2.1.4	PISA scales in reading, maths, & science	495.9	23	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	40.7	43	
2.2.1	Tertiary enrolment, % gross	76.1	20	
2.2.2	Graduates in science & engineering, %	20.0	56	○
2.2.3	Tertiary inbound mobility, %	3.6	48	
2.3	Research & development (R&D)	55.9	19	
2.3.1	Researchers, FTE/mn pop.	5,703.6	8	
2.3.2	Gross expenditure on R&D, % GDP	1.7	20	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	212.6	24	
2.3.4	QS university ranking, average score top 3*	55.3	23	
3	**Infrastructure**	**67.0**	**3**	●
3.1	Information & communication technologies (ICTs)	77.7	15	
3.1.1	ICT access*	82.4	17	
3.1.2	ICT use*	84.3	2	●
3.1.3	Government's online service*	75.6	21	
3.1.4	E-participation*	68.6	30	
3.2	General infrastructure	72.0	2	●
3.2.1	Electricity output, kWh/cap	27,550.0	1	●
3.2.2	Logistics performance*	4.0	7	●
3.2.3	Gross capital formation, % GDP	28.2	30	
3.3	Ecological sustainability	51.4	35	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.3	51	
3.3.2	Environmental performance*	86.9	17	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.5	26	
4	**Market sophistication**	**52.3**	**26**	
4.1	Credit	43.8	37	
4.1.1	Ease of getting credit*	55.0	63	○
4.1.2	Domestic credit to private sector, % GDP[d]	84.8	34	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	42.1	41	
4.2.1	Ease of protecting minority investors*	71.7	14	
4.2.2	Market capitalization, % GDP	43.9	39	
4.2.3	Total value of stocks traded, % GDP	25.2	25	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	28	
4.3	Trade, competition, & market scale	70.9	32	
4.3.1	Applied tariff rate, weighted mean, %	1.1	37	
4.3.2	Intensity of local competition†	71.4	48	
4.3.3	Domestic market scale, bn PPP$	346.3	47	
5	**Business sophistication**	**45.7**	**21**	
5.1	Knowledge workers	63.1	12	
5.1.1	Knowledge-intensive employment, %	50.7	4	●
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.9	23	
5.1.4	GERD financed by business, %[d]	43.1	30	
5.1.5	Females employed w/advanced degrees, % total	24.1	11	
5.2	Innovation linkages	42.1	25	
5.2.1	University/industry research collaboration†	67.0	14	
5.2.2	State of cluster development†	70.1	11	
5.2.3	GERD financed by abroad, %[d]	9.5	46	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	14	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.6	24	
5.3	Knowledge absorption	31.8	46	
5.3.1	Intellectual property payments, % total trade	0.4	66	○
5.3.2	High-tech imports less re-imports, % total trade	6.0	80	○
5.3.3	ICT services imports, % total trade	1.6	31	
5.3.4	FDI net inflows, % GDP	2.1	76	○
5.3.5	Research talent, % in business enterprise	49.3	24	
6	**Knowledge & technology outputs**	**36.2**	**29**	
6.1	Knowledge creation	35.7	25	
6.1.1	Patents by origin/bn PPP$ GDP	4.7	24	
6.1.2	PCT patent applications/bn PPP$ GDP	1.9	20	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	33.3	22	
6.1.5	Citable documents H index	402.0	20	
6.2	Knowledge impact	47.8	24	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.1	63	○
6.2.2	New businesses/th pop. 15–64	7.7	15	
6.2.3	Computer software spending, % GDP	0.6	15	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	6.9	51	
6.2.5	High- & medium-high-tech manufactures, %	42.9	19	
6.3	Knowledge diffusion	25.0	63	○
6.3.1	Intellectual property receipts, % total trade	0.2	31	
6.3.2	High-tech exports less re-exports, % total trade	3.3	40	
6.3.3	ICT services exports, % total trade	1.4	68	○
6.3.4	FDI net outflows, % GDP[d]	1.4	39	
7	**Creative outputs**	**47.9**	**19**	
7.1	Intangible assets	50.2	35	
7.1.1	Trademarks by origin/bn PPP$ GDP	30.5	66	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.0	50	
7.1.3	ICTs & business model creation†	76.5	13	
7.1.4	ICTs & organizational model creation†	77.2	6	●
7.2	Creative goods & services	34.7	28	
7.2.1	Cultural & creative services exports, % of total trade	0.1	56	○
7.2.2	National feature films/mn pop. 15–69	8.0	19	
7.2.3	Global ent. & media market/th pop. 15–69	100.0	1	●
7.2.4	Printing & publishing manufactures, %	1.6	31	
7.2.5	Creative goods exports, % total trade	0.5	61	○
7.3	Online creativity	56.5	16	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	55.4	14	
7.3.2	Country-code TLDs/th pop. 15–69	65.3	13	
7.3.3	Wikipedia edits/mn pop. 15–69	7,232.9	15	
7.3.4	Video uploads on YouTube/pop. 15–69	52.0	19	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Oman

Key indicators

Population (millions)	4.5
GDP (US$ billions)	58.5
GDP per capita, PPP$	44,628.3
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**32.2**	**73**	
Innovation Output Sub-Index		22.3	86	
Innovation Input Sub-Index		42.1	63	
Innovation Efficiency Ratio		0.5	103	
Global Innovation Index 2015 (out of 141)		35.0	69	
1	**Institutions**	**71.0**	**41**	
1.1	Political environment	63.1	45	
1.1.1	Political stability & safety*	79.2	36	●
1.1.2	Government effectiveness*	47.0	53	
1.2	Regulatory environment	80.8	26	●
1.2.1	Regulatory quality*	61.8	41	
1.2.2	Rule of law*	61.6	41	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	69.1	70	
1.3.1	Ease of starting a business*	75.0	110	
1.3.2	Ease of resolving insolvency*	39.3	93	
1.3.3	Ease of paying taxes*	92.9	10	●
2	**Human capital & research**	**33.9**	**52**	
2.1	Education	38.2	92	
2.1.1	Expenditure on education, % GDP◴	4.2	76	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	20.0	55	
2.1.3	School life expectancy, years◴	13.7	64	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	60.3	5	●
2.2.1	Tertiary enrolment, % gross◴	28.6	81	
2.2.2	Graduates in science & engineering, %	48.7	1	●
2.2.3	Tertiary inbound mobility, %	3.0	51	
2.3	Research & development (R&D)	3.4	83	
2.3.1	Researchers, FTE/mn pop.◴	127.3	80	
2.3.2	Gross expenditure on R&D, % GDP◴	0.2	93	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	9.1	62	
3	**Infrastructure**	**47.5**	**51**	
3.1	Information & communication technologies (ICTs)	66.7	36	●
3.1.1	ICT access*	72.4	41	
3.1.2	ICT use*	50.5	50	
3.1.3	Government's online service*	73.2	26	●
3.1.4	E-participation*	70.6	24	●
3.2	General infrastructure	45.1	32	●
3.2.1	Electricity output, kWh/cap	7,228.7	25	●
3.2.2	Logistics performance*	3.0	57	
3.2.3	Gross capital formation, % GDP	29.5	24	●
3.3	Ecological sustainability	30.8	112	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.4	91	
3.3.2	Environmental performance*	60.1	101	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.5	83	
4	**Market sophistication**	**39.0**	**90**	
4.1	Credit	26.0	92	
4.1.1	Ease of getting credit*	35.0	101	
4.1.2	Domestic credit to private sector, % GDP	46.5	70	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	28.5	99	
4.2.1	Ease of protecting minority investors*	43.3	104	
4.2.2	Market capitalization, % GDP	46.2	35	
4.2.3	Total value of stocks traded, % GDP	7.1	39	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	62.4	57	
4.3.1	Applied tariff rate, weighted mean, %	2.5	55	
4.3.2	Intensity of local competition†	61.8	90	
4.3.3	Domestic market scale, bn PPP$	163.0	63	
5	**Business sophistication**	**19.1**	**124**	○
5.1	Knowledge workers	16.4	[117]	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP◴	0.0	71	
5.1.4	GERD financed by business, %◴	24.5	58	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	25.9	80	
5.2.1	University/industry research collaboration†	43.6	67	
5.2.2	State of cluster development†	43.1	74	
5.2.3	GERD financed by abroad, %◴	0.0	99	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	10	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	108	○
5.3	Knowledge absorption	14.9	123	○
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	3.1	116	○
5.3.3	ICT services imports, % total trade	0.2	116	○
5.3.4	FDI net inflows, % GDP	0.9	100	
5.3.5	Research talent, % in business enterprise◴	20.2	56	
6	**Knowledge & technology outputs**	**18.5**	**95**	
6.1	Knowledge creation	3.0	113	
6.1.1	Patents by origin/bn PPP$ GDP◴	0.0	119	○
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	88	○
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.3	104	
6.1.5	Citable documents H index	83.0	89	
6.2	Knowledge impact	28.4	96	
6.2.1	Growth rate of PPP$ GDP/worker, %	(2.0)	105	○
6.2.2	New businesses/th pop. 15–64◴	1.0	69	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.3	74	
6.2.5	High- & medium-high-tech manufactures, %	36.7	27	●
6.3	Knowledge diffusion	23.9	70	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.5	76	
6.3.3	ICT services exports, % total trade	0.2	114	○
6.3.4	FDI net outflows, % GDP◴	1.8	35	
7	**Creative outputs**	**26.2**	**79**	
7.1	Intangible assets	47.7	46	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	51.7	86	
7.1.4	ICTs & organizational model creation†	43.7	93	
7.2	Creative goods & services	5.8	106	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69◴	0.0	101	○
7.2.3	Global ent. & media market/th pop. 15–69	6.6	40	
7.2.4	Printing & publishing manufactures, %	0.7	77	
7.2.5	Creative goods exports, % total trade	0.0	107	
7.3	Online creativity	3.6	85	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.0	80	
7.3.2	Country-code TLDs/th pop. 15–69	0.2	104	
7.3.3	Wikipedia edits/mn pop. 15–69	637.4	86	
7.3.4	Video uploads on YouTube/pop. 15–69	7.7	63	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Pakistan

Key indicators

Population (millions)	188.9
GDP (US$ billions)	270.0
GDP per capita, PPP$	5,000.0
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**22.6**	**119**	
Innovation Output Sub-Index		17.7	108	
Innovation Input Sub-Index		27.5	123	○
Innovation Efficiency Ratio		0.6	71	
Global Innovation Index 2015 (out of 141)		23.1	131	
1	**Institutions**	**37.1**	**124**	○
1.1	Political environment	10.3	126	○
1.1.1	Political stability & safety*	2.3	127	○
1.1.2	Government effectiveness*	18.2	112	
1.2	Regulatory environment	44.9	113	
1.2.1	Regulatory quality*	27.8	107	
1.2.2	Rule of law*	27.7	109	
1.2.3	Cost of redundancy dismissal, salary weeks	27.2	104	
1.3	Business environment	56.1	111	
1.3.1	Ease of starting a business*	80.9	91	
1.3.2	Ease of resolving insolvency*	43.0	84	
1.3.3	Ease of paying taxes*	44.5	118	
2	**Human capital & research**	**13.0**	**122**	○
2.1	Education	22.6	124	○
2.1.1	Expenditure on education, % GDP	2.5	110	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	13.2	89	
2.1.3	School life expectancy, years	8.1	113	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	19.2	82	
2.2	Tertiary education	8.7	114	
2.2.1	Tertiary enrolment, % gross	10.4	104	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	7.6	68	
2.3.1	Researchers, FTE/mn pop. [4]	166.9	73	
2.3.2	Gross expenditure on R&D, % GDP [4]	0.3	78	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	22.7	49	●
3	**Infrastructure**	**26.5**	**114**	
3.1	Information & communication technologies (ICTs)	26.0	106	
3.1.1	ICT access*	31.5	107	
3.1.2	ICT use*	6.9	111	
3.1.3	Government's online service*	32.3	91	
3.1.4	E-participation*	33.3	89	
3.2	General infrastructure	20.9	121	○
3.2.1	Electricity output, kWh/cap	537.3	103	
3.2.2	Logistics performance*	2.8	69	
3.2.3	Gross capital formation, % GDP	15.1	112	
3.3	Ecological sustainability	32.6	108	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	8.4	50	●
3.3.2	Environmental performance*	51.4	111	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	90	
4	**Market sophistication**	**35.7**	**105**	
4.1	Credit	12.3	122	○
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	15.6	114	
4.1.3	Microfinance gross loans, % GDP	0.2	54	
4.2	Investment	35.0	70	
4.2.1	Ease of protecting minority investors*	66.7	25	●
4.2.2	Market capitalization, % GDP [4]	15.2	71	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	86	○
4.3	Trade, competition, & market scale	60.0	69	
4.3.1	Applied tariff rate, weighted mean, % [4]	9.6	114	
4.3.2	Intensity of local competition†	61.5	93	
4.3.3	Domestic market scale, bn PPP$	884.2	25	●
5	**Business sophistication**	**25.3**	**97**	
5.1	Knowledge workers	34.1	78	
5.1.1	Knowledge-intensive employment, % [4]	19.5	72	
5.1.2	Firms offering formal training, % firms	32.0	52	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	18.6	115	
5.2.1	University/industry research collaboration†	36.9	91	
5.2.2	State of cluster development†	44.7	64	
5.2.3	GERD financed by abroad, % [4]	1.3	85	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	72	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	111	○
5.3	Knowledge absorption	23.2	91	
5.3.1	Intellectual property payments, % total trade	0.4	64	
5.3.2	High-tech imports less re-imports, % total trade	9.4	41	●
5.3.3	ICT services imports, % total trade	0.9	63	●
5.3.4	FDI net inflows, % GDP	0.7	105	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**19.6**	**90**	
6.1	Knowledge creation	8.3	71	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	97	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.9	71	
6.1.5	Citable documents H index	148.0	54	●
6.2	Knowledge impact	31.1	87	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.1	36	●
6.2.2	New businesses/th pop. 15–64	0.0	105	○
6.2.3	Computer software spending, % GDP	0.3	48	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.8	79	
6.2.5	High- & medium-high-tech manufactures, % [4]	23.7	51	●
6.3	Knowledge diffusion	19.5	99	
6.3.1	Intellectual property receipts, % total trade	0.0	67	
6.3.2	High-tech exports less re-exports, % total trade	0.7	68	
6.3.3	ICT services exports, % total trade	2.0	47	●
6.3.4	FDI net outflows, % GDP	0.0	84	
7	**Creative outputs**	**15.9**	**114**	
7.1	Intangible assets	29.3	110	
7.1.1	Trademarks by origin/bn PPP$ GDP	23.3	75	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.5	79	
7.1.3	ICTs & business model creation†	51.3	88	
7.1.4	ICTs & organizational model creation†	37.5	114	
7.2	Creative goods & services	4.0	110	
7.2.1	Cultural & creative services exports, % of total trade [4]	0.0	67	
7.2.2	National feature films/mn pop. 15–69 [4]	0.3	96	○
7.2.3	Global ent. & media market/th pop. 15–69	0.0	60	○
7.2.4	Printing & publishing manufactures, % [4]	0.3	91	○
7.2.5	Creative goods exports, % total trade	0.3	65	
7.3	Online creativity	0.9	105	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	106	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	106	
7.3.3	Wikipedia edits/mn pop. 15–69	244.8	98	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Panama

Key indicators

Population (millions)	3.9
GDP (US$ billions)	52.1
GDP per capita, PPP$	21,764.6
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.5**	**68**	
Innovation Output Sub-Index		26.7	61	
Innovation Input Sub-Index		40.3	73	
Innovation Efficiency Ratio		0.7	61	
Global Innovation Index 2015 (out of 141)		36.8	62	
1	**Institutions**	**59.6**	**67**	
1.1	Political environment	56.0	51	
1.1.1	Political stability & safety*	65.3	58	
1.1.2	Government effectiveness*	46.7	55	
1.2	Regulatory environment	64.7	72	
1.2.1	Regulatory quality*	54.0	56	
1.2.2	Rule of law*	44.9	65	
1.2.3	Cost of redundancy dismissal, salary weeks	18.1	77	
1.3	Business environment	58.0	103	
1.3.1	Ease of starting a business*	92.0	38	
1.3.2	Ease of resolving insolvency*	33.6	108	
1.3.3	Ease of paying taxes*	48.6	114	
2	**Human capital & research**	**22.0**	**97**	
2.1	Education	34.3	101	
2.1.1	Expenditure on education, % GDP[d]	3.3	96	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	9.7	101	○
2.1.3	School life expectancy, years	12.8	78	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	15.5	68	
2.2	Tertiary education	30.7	81	
2.2.1	Tertiary enrolment, % gross	38.7	66	
2.2.2	Graduates in science & engineering, %	15.9	80	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	1.1	101	
2.3.1	Researchers, FTE/mn pop.[d]	119.0	81	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.2	91	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**47.0**	**53**	
3.1	Information & communication technologies (ICTs)	43.1	80	
3.1.1	ICT access*	57.2	68	
3.1.2	ICT use*	29.2	81	
3.1.3	Government's online service*	37.0	85	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	40.4	43	
3.2.1	Electricity output, kWh/cap	2,320.7	73	
3.2.2	Logistics performance*	3.2	43	
3.2.3	Gross capital formation, % GDP	28.5	28	●
3.3	Ecological sustainability	57.4	21	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	16.1	4	●
3.3.2	Environmental performance*	78.0	50	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	96	
4	**Market sophistication**	**42.3**	**72**	
4.1	Credit	38.0	49	
4.1.1	Ease of getting credit*	75.0	18	●
4.1.2	Domestic credit to private sector, % GDP	88.3	33	●
4.1.3	Microfinance gross loans, % GDP	0.4	38	
4.2	Investment	33.8	75	
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP	29.8	51	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	45	
4.3	Trade, competition, & market scale	55.1	84	
4.3.1	Applied tariff rate, weighted mean, %	6.1	91	
4.3.2	Intensity of local competition†	71.3	50	
4.3.3	Domestic market scale, bn PPP$	76.8	80	
5	**Business sophistication**	**30.7**	**71**	
5.1	Knowledge workers	24.1	97	
5.1.1	Knowledge-intensive employment, %	24.0	58	
5.1.2	Firms offering formal training, % firms[d]	11.0	90	○
5.1.3	GERD performed by business, % of GDP[d]	0.0	83	○
5.1.4	GERD financed by business, %[d]	18.9	64	
5.1.5	Females employed w/advanced degrees, % total[d]	16.6	33	
5.2	Innovation linkages	30.6	64	
5.2.1	University/industry research collaboration†	50.6	40	
5.2.2	State of cluster development†	50.6	40	
5.2.3	GERD financed by abroad, %[d]	20.7	19	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	52	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	60	
5.3	Knowledge absorption	37.3	30	●
5.3.1	Intellectual property payments, % total trade	0.4	68	
5.3.2	High-tech imports less re-imports, % total trade[d]	20.1	5	●
5.3.3	ICT services imports, % total trade	0.3	113	○
5.3.4	FDI net inflows, % GDP	11.3	6	●
5.3.5	Research talent, % in business enterprise[d]	0.9	77	○
6	**Knowledge & technology outputs**	**24.2**	**64**	
6.1	Knowledge creation	3.8	101	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	96	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	50	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	57	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.8	96	
6.1.5	Citable documents H index	128.0	60	
6.2	Knowledge impact	33.2	78	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64[d]	14.1	6	●
6.2.3	Computer software spending, % GDP	0.2	63	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.9	89	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	35.5	36	
6.3.1	Intellectual property receipts, % total trade	0.0	66	
6.3.2	High-tech exports less re-exports, % total trade[d]	18.3	7	●
6.3.3	ICT services exports, % total trade	1.4	70	
6.3.4	FDI net outflows, % GDP	1.9	34	
7	**Creative outputs**	**29.2**	**63**	
7.1	Intangible assets	46.7	51	
7.1.1	Trademarks by origin/bn PPP$ GDP	64.5	31	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.2	101	○
7.1.3	ICTs & business model creation†	67.4	33	
7.1.4	ICTs & organizational model creation†	60.2	37	
7.2	Creative goods & services	3.0	113	
7.2.1	Cultural & creative services exports, % of total trade	0.1	44	
7.2.2	National feature films/mn pop. 15–69[d]	0.4	91	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	110	
7.3	Online creativity	20.3	42	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	49.0	16	●
7.3.2	Country-code TLDs/th pop. 15–69	1.5	76	
7.3.3	Wikipedia edits/mn pop. 15–69	1,416.5	67	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Paraguay

Key indicators

Population (millions)	6.6
GDP (US$ billions)	28.1
GDP per capita, PPP$	8,707.8
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**28.2**	**94**	
Innovation Output Sub-Index		21.6	88	
Innovation Input Sub-Index		34.7	95	
Innovation Efficiency Ratio		0.6	77	
Global Innovation Index 2015 (out of 141)		30.7	88	
1	**Institutions**	**47.9**	**104**	
1.1	Political environment	35.6	99	
1.1.1	Political stability & safety*	57.9	79	
1.1.2	Government effectiveness*	13.4	120	○
1.2	Regulatory environment	45.8	112	
1.2.1	Regulatory quality*	37.9	86	
1.2.2	Rule of law*	30.1	102	
1.2.3	Cost of redundancy dismissal, salary weeks	29.4	113	
1.3	Business environment	62.4	87	
1.3.1	Ease of starting a business*	77.5	102	
1.3.2	Ease of resolving insolvency*	40.2	90	
1.3.3	Ease of paying taxes*	69.5	82	
2	**Human capital & research**	**24.4**	**87**	
2.1	Education	41.1	84	
2.1.1	Expenditure on education, % GDP	5.0	51	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	17.4	69	
2.1.3	School life expectancy, years[4]	12.3	85	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[4]	18.4	79	
2.2	Tertiary education	31.3	78	
2.2.1	Tertiary enrolment, % gross[4]	35.1	72	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	0.7	107	
2.3.1	Researchers, FTE/mn pop.[4]	169.5	72	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.1	104	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**34.1**	**95**	
3.1	Information & communication technologies (ICTs)	27.5	104	
3.1.1	ICT access*	44.4	88	
3.1.2	ICT use*	17.1	98	
3.1.3	Government's online service*	22.8	110	
3.1.4	E-participation*	25.5	104	
3.2	General infrastructure	32.6	70	
3.2.1	Electricity output, kWh/cap	8,879.6	17	●
3.2.2	Logistics performance*	2.8	75	
3.2.3	Gross capital formation, % GDP	16.8	108	
3.3	Ecological sustainability	42.2	64	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.6	37	●
3.3.2	Environmental performance*	70.4	75	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	107	
4	**Market sophistication**	**42.3**	**71**	
4.1	Credit	44.4	35	●
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	49.9	66	
4.1.3	Microfinance gross loans, % GDP	5.3	8	●
4.2	Investment	27.8	102	
4.2.1	Ease of protecting minority investors*	41.7	109	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP[4]	0.2	73	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	54.8	86	
4.3.1	Applied tariff rate, weighted mean, %	4.4	80	
4.3.2	Intensity of local competition†	65.9	77	
4.3.3	Domestic market scale, bn PPP$	58.5	91	
5	**Business sophistication**	**25.0**	**99**	
5.1	Knowledge workers	32.8	82	
5.1.1	Knowledge-intensive employment, %	18.1	76	
5.1.2	Firms offering formal training, % firms[4]	54.9	18	●
5.1.3	GERD performed by business, % of GDP[4]	0.0	86	○
5.1.4	GERD financed by business, %[4]	0.8	86	
5.1.5	Females employed w/advanced degrees, % total[4]	12.4	52	
5.2	Innovation linkages	18.0	116	
5.2.1	University/industry research collaboration†	28.3	113	
5.2.2	State of cluster development†	29.6	120	○
5.2.3	GERD financed by abroad, %[4]	7.7	51	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[4]	0.0	95	
5.3	Knowledge absorption	24.2	90	
5.3.1	Intellectual property payments, % total trade	0.1	89	
5.3.2	High-tech imports less re-imports, % total trade	13.9	15	●
5.3.3	ICT services imports, % total trade	0.0	123	○
5.3.4	FDI net inflows, % GDP	1.7	84	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**11.8**	**119**	
6.1	Knowledge creation	2.4	120	○
6.1.1	Patents by origin/bn PPP$ GDP[4]	0.4	80	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.7	120	○
6.1.5	Citable documents H index	54.0	112	
6.2	Knowledge impact	15.1	114	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	4.6	65	●
6.2.5	High- & medium-high-tech manufactures, %[4]	15.0	65	
6.3	Knowledge diffusion	18.0	109	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.5	79	
6.3.3	ICT services exports, % total trade	0.1	118	○
6.3.4	FDI net outflows, % GDP[4]	(0.1)	103	
7	**Creative outputs**	**31.5**	**54**	●
7.1	Intangible assets	55.6	22	●
7.1.1	Trademarks by origin/bn PPP$ GDP[4]	296.3	1	●
7.1.2	Industrial designs by origin/bn PPP$ GDP[4]	2.7	44	●
7.1.3	ICTs & business model creation†	50.0	96	
7.1.4	ICTs & organizational model creation†	37.4	116	○
7.2	Creative goods & services	11.4	89	
7.2.1	Cultural & creative services exports, % of total trade	0.0	75	
7.2.2	National feature films/mn pop. 15–69[4]	1.3	66	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[4]	1.3	43	●
7.2.5	Creative goods exports, % total trade	0.1	89	
7.3	Online creativity	3.3	88	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.8	85	
7.3.2	Country-code TLDs/th pop. 15–69	1.5	73	
7.3.3	Wikipedia edits/mn pop. 15–69	872.4	79	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Peru

Key indicators

Population (millions)	31.4
GDP (US$ billions)	192.1
GDP per capita, PPP$	12,194.7
Income group	Upper-middle income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**32.5**	**71**	
Innovation Output Sub-Index		21.8	87	
Innovation Input Sub-Index		43.2	56	
Innovation Efficiency Ratio		0.5	109	○
Global Innovation Index 2015 (out of 141)		34.9	71	
1	**Institutions**	**60.4**	**66**	
1.1	Political environment	40.6	91	
1.1.1	Political stability & safety*	49.9	91	
1.1.2	Government effectiveness*	31.4	84	
1.2	Regulatory environment	69.3	53	
1.2.1	Regulatory quality*	57.7	50	
1.2.2	Rule of law*	33.3	95	
1.2.3	Cost of redundancy dismissal, salary weeks	11.4	41	●
1.3	Business environment	71.3	61	
1.3.1	Ease of starting a business*	85.0	74	
1.3.2	Ease of resolving insolvency*	47.6	67	
1.3.3	Ease of paying taxes*	81.2	44	
2	**Human capital & research**	**27.5**	**81**	
2.1	Education	35.7	97	
2.1.1	Expenditure on education, % GDP	3.7	87	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	12.9	91	○
2.1.3	School life expectancy, years[d]	13.4	67	
2.1.4	PISA scales in reading, maths, & science	375.1	61	○
2.1.5	Pupil-teacher ratio, secondary	14.2	57	
2.2	Tertiary education	36.3	60	
2.2.1	Tertiary enrolment, % gross[d]	40.5	62	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	10.5	57	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	21.1	52	
3	**Infrastructure**	**45.0**	**57**	
3.1	Information & communication technologies (ICTs)	50.4	64	
3.1.1	ICT access*	46.8	83	
3.1.2	ICT use*	21.1	93	
3.1.3	Government's online service*	63.0	41	●
3.1.4	E-participation*	70.6	24	●
3.2	General infrastructure	31.8	75	
3.2.1	Electricity output, kWh/cap	1,427.6	85	
3.2.2	Logistics performance*	2.8	68	
3.2.3	Gross capital formation, % GDP	25.4	40	●
3.3	Ecological sustainability	53.0	28	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	14.3	6	●
3.3.2	Environmental performance*	73.0	67	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.9	64	
4	**Market sophistication**	**50.0**	**35**	●
4.1	Credit	51.0	23	●
4.1.1	Ease of getting credit*	80.0	14	●
4.1.2	Domestic credit to private sector, % GDP	34.0	87	
4.1.3	Microfinance gross loans, % GDP	5.0	9	●
4.2	Investment	29.1	96	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	38.9	41	
4.2.3	Total value of stocks traded, % GDP	1.8	51	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	52	
4.3	Trade, competition, & market scale	70.1	34	●
4.3.1	Applied tariff rate, weighted mean, %	1.5	44	
4.3.2	Intensity of local competition†	69.5	56	
4.3.3	Domestic market scale, bn PPP$	372.7	45	
5	**Business sophistication**	**32.9**	**54**	
5.1	Knowledge workers	47.4	36	●
5.1.1	Knowledge-intensive employment, %[d]	15.0	86	
5.1.2	Firms offering formal training, % firms[d]	60.1	11	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[d]	13.9	44	
5.2	Innovation linkages	22.4	97	
5.2.1	University/industry research collaboration†	35.0	99	
5.2.2	State of cluster development†	36.5	95	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	61	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	98	○
5.3	Knowledge absorption	29.0	62	
5.3.1	Intellectual property payments, % total trade[d]	0.4	60	
5.3.2	High-tech imports less re-imports, % total trade	10.2	30	●
5.3.3	ICT services imports, % total trade[d]	1.0	61	
5.3.4	FDI net inflows, % GDP	3.9	42	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.4**	**109**	○
6.1	Knowledge creation	5.9	89	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	93	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	68	
6.1.3	Utility models by origin/bn PPP$ GDP	0.5	33	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.6	113	○
6.1.5	Citable documents H index	140.0	56	
6.2	Knowledge impact	27.9	103	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.3	56	
6.2.2	New businesses/th pop. 15–64	2.4	42	
6.2.3	Computer software spending, % GDP	0.3	54	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.9	78	
6.2.5	High- & medium-high-tech manufactures, %[d]	9.2	80	○
6.3	Knowledge diffusion	15.5	118	○
6.3.1	Intellectual property receipts, % total trade[d]	0.0	81	
6.3.2	High-tech exports less re-exports, % total trade	0.4	80	
6.3.3	ICT services exports, % total trade[d]	0.3	105	○
6.3.4	FDI net outflows, % GDP[d]	0.1	83	
7	**Creative outputs**	**27.2**	**73**	
7.1	Intangible assets	38.2	84	
7.1.1	Trademarks by origin/bn PPP$ GDP	49.5	48	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	91	○
7.1.3	ICTs & business model creation†	57.9	65	
7.1.4	ICTs & organizational model creation†	47.9	81	
7.2	Creative goods & services	22.5	66	
7.2.1	Cultural & creative services exports, % of total trade	0.1	51	
7.2.2	National feature films/mn pop. 15–69	0.6	88	○
7.2.3	Global ent. & media market/th pop. 15–69	4.8	45	
7.2.4	Printing & publishing manufactures, %[d]	2.7	11	●
7.2.5	Creative goods exports, % total trade	0.4	63	
7.3	Online creativity	10.2	60	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	5.6	54	
7.3.2	Country-code TLDs/th pop. 15–69	1.5	75	
7.3.3	Wikipedia edits/mn pop. 15–69	1,929.6	53	
7.3.4	Video uploads on YouTube/pop. 15–69	19.3	54	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Philippines

Key indicators

Population (millions)	100.7
GDP (US$ billions)	292.0
GDP per capita, PPP$	7,254.2
Income group	Lower-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**31.8**	**74**	
Innovation Output Sub-Index		26.4	64	
Innovation Input Sub-Index		37.2	86	
Innovation Efficiency Ratio		0.7	49	
Global Innovation Index 2015 (out of 141)		31.1	83	
1	**Institutions**	**53.4**	**88**	
1.1	Political environment	44.9	79	
1.1.1	Political stability & safety*	45.4	97	
1.1.2	Government effectiveness*	44.4	58	
1.2	Regulatory environment	51.6	105	
1.2.1	Regulatory quality*	44.4	72	
1.2.2	Rule of law*	38.9	79	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	110	
1.3	Business environment	63.9	83	
1.3.1	Ease of starting a business*	68.6	118	○
1.3.2	Ease of resolving insolvency*	56.8	50	
1.3.3	Ease of paying taxes*	66.2	90	
2	**Human capital & research**	**22.7**	**95**	
2.1	Education	27.0	115	○
2.1.1	Expenditure on education, % GDP[d]	2.7	105	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	9.1	102	○
2.1.3	School life expectancy, years	12.7	81	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	27.0	98	
2.2	Tertiary education	32.9	74	
2.2.1	Tertiary enrolment, % gross	35.8	71	
2.2.2	Graduates in science & engineering, %	25.5	26	●
2.2.3	Tertiary inbound mobility, %[d]	0.1	101	○
2.3	Research & development (R&D)	8.1	65	
2.3.1	Researchers, FTE/mn pop.[d]	221.3	69	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	97	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	27.6	47	
3	**Infrastructure**	**41.4**	**72**	
3.1	Information & communication technologies (ICTs)	46.1	76	
3.1.1	ICT access*	43.9	90	
3.1.2	ICT use*	35.5	68	
3.1.3	Government's online service*	48.0	66	
3.1.4	E-participation*	56.9	51	
3.2	General infrastructure	28.7	87	
3.2.1	Electricity output, kWh/cap	765.0	96	
3.2.2	Logistics performance*	3.0	55	
3.2.3	Gross capital formation, % GDP	20.7	76	
3.3	Ecological sustainability	49.5	42	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	12.5	14	●
3.3.2	Environmental performance*	73.7	62	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.6	75	
4	**Market sophistication**	**38.3**	**94**	
4.1	Credit	19.0	108	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	39.2	79	
4.1.3	Microfinance gross loans, % GDP	0.2	50	
4.2	Investment	26.8	106	
4.2.1	Ease of protecting minority investors*	38.3	115	○
4.2.2	Market capitalization, % GDP	91.9	15	●
4.2.3	Total value of stocks traded, % GDP	14.8	29	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	75	○
4.3	Trade, competition, & market scale	69.1	38	●
4.3.1	Applied tariff rate, weighted mean, %[d]	4.4	79	
4.3.2	Intensity of local competition†	70.4	54	
4.3.3	Domestic market scale, bn PPP$	693.4	29	●
5	**Business sophistication**	**30.3**	**74**	
5.1	Knowledge workers	33.4	81	
5.1.1	Knowledge-intensive employment, %	23.5	60	
5.1.2	Firms offering formal training, % firms[d]	31.1	55	
5.1.3	GERD performed by business, % of GDP[d]	0.0	69	
5.1.4	GERD financed by business, %[d]	36.9	42	
5.1.5	Females employed w/advanced degrees, % total	12.7	50	
5.2	Innovation linkages	23.7	89	
5.2.1	University/industry research collaboration†	46.6	54	
5.2.2	State of cluster development†	49.6	44	
5.2.3	GERD financed by abroad, %[d]	1.8	80	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	35	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	91	
5.3	Knowledge absorption	33.8	41	●
5.3.1	Intellectual property payments, % total trade	0.7	43	
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	0.8	72	
5.3.4	FDI net inflows, % GDP	2.2	74	
5.3.5	Research talent, % in business enterprise[d]	54.1	18	●
6	**Knowledge & technology outputs**	**30.8**	**44**	
6.1	Knowledge creation	10.6	61	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	77	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	82	
6.1.3	Utility models by origin/bn PPP$ GDP	1.3	21	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.5	123	○
6.1.5	Citable documents H index	147.0	55	
6.2	Knowledge impact	44.3	31	●
6.2.1	Growth rate of PPP$ GDP/worker, %	6.2	2	●
6.2.2	New businesses/th pop. 15–64[d]	0.3	93	
6.2.3	Computer software spending, % GDP	0.3	53	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.3	83	
6.2.5	High- & medium-high-tech manufactures, %[d]	44.0	12	●
6.3	Knowledge diffusion	37.4	31	●
6.3.1	Intellectual property receipts, % total trade	0.0	84	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	4.5	12	●
6.3.4	FDI net outflows, % GDP	2.5	26	●
7	**Creative outputs**	**22.1**	**96**	
7.1	Intangible assets	38.9	81	
7.1.1	Trademarks by origin/bn PPP$ GDP	28.8	69	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.2	61	
7.1.3	ICTs & business model creation†	60.3	57	
7.1.4	ICTs & organizational model creation†	57.1	46	
7.2	Creative goods & services	5.5	107	
7.2.1	Cultural & creative services exports, % of total trade	0.1	52	
7.2.2	National feature films/mn pop. 15–69	0.8	79	
7.2.3	Global ent. & media market/th pop. 15–69	1.8	51	
7.2.4	Printing & publishing manufactures, %[d]	0.5	86	○
7.2.5	Creative goods exports, % total trade	n/a	n/a	
7.3	Online creativity	5.0	75	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.2	92	
7.3.2	Country-code TLDs/th pop. 15–69	0.4	96	
7.3.3	Wikipedia edits/mn pop. 15–69	1,298.3	68	
7.3.4	Video uploads on YouTube/pop. 15–69	8.8	61	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Poland

Key indicators

Population (millions)	38.6
GDP (US$ billions)	474.9
GDP per capita, PPP$	26,455.3
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**40.2**	**39**	
Innovation Output Sub-Index		31.7	46	
Innovation Input Sub-Index		48.7	39	
Innovation Efficiency Ratio		0.7	66	
Global Innovation Index 2015 (out of 141)		40.2	46	
1	**Institutions**	**75.3**	**32**	
1.1	Political environment	73.2	33	
1.1.1	Political stability & safety*	84.4	26	●
1.1.2	Government effectiveness*	62.0	39	
1.2	Regulatory environment	74.0	41	
1.2.1	Regulatory quality*	71.0	30	
1.2.2	Rule of law*	67.5	36	
1.2.3	Cost of redundancy dismissal, salary weeks	18.8	79	
1.3	Business environment	78.7	34	
1.3.1	Ease of starting a business*	85.9	66	
1.3.2	Ease of resolving insolvency*	70.4	30	
1.3.3	Ease of paying taxes*	79.6	49	
2	**Human capital & research**	**39.6**	**42**	
2.1	Education	57.1	34	
2.1.1	Expenditure on education, % GDP[d]	4.9	55	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	23.5	38	
2.1.3	School life expectancy, years	16.4	25	
2.1.4	PISA scales in reading, maths, & science	520.5	9	●
2.1.5	Pupil-teacher ratio, secondary[d]	9.5	21	●
2.2	Tertiary education	34.0	68	
2.2.1	Tertiary enrolment, % gross	71.2	25	
2.2.2	Graduates in science & engineering, %	17.4	71	○
2.2.3	Tertiary inbound mobility, %	1.5	74	○
2.3	Research & development (R&D)	27.7	39	
2.3.1	Researchers, FTE/mn pop.	2,037.2	35	
2.3.2	Gross expenditure on R&D, % GDP	0.9	36	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	18.6	44	
2.3.4	QS university ranking, average score top 3*	31.7	42	
3	**Infrastructure**	**47.6**	**50**	
3.1	Information & communication technologies (ICTs)	57.8	48	
3.1.1	ICT access*	71.5	45	
3.1.2	ICT use*	56.2	37	
3.1.3	Government's online service*	54.3	57	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	38.7	53	
3.2.1	Electricity output, kWh/cap	4,117.9	50	
3.2.2	Logistics performance*	3.5	30	
3.2.3	Gross capital formation, % GDP	20.1	84	○
3.3	Ecological sustainability	46.3	49	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.8	57	
3.3.2	Environmental performance*	81.3	38	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.3	41	
4	**Market sophistication**	**46.5**	**48**	
4.1	Credit	32.0	70	
4.1.1	Ease of getting credit*	75.0	18	●
4.1.2	Domestic credit to private sector, % GDP	52.2	61	
4.1.3	Microfinance gross loans, % GDP	0.1	58	○
4.2	Investment	31.3	89	○
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	31.0	49	
4.2.3	Total value of stocks traded, % GDP	10.7	33	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	37	
4.3	Trade, competition, & market scale	76.2	15	●
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	71.5	47	
4.3.3	Domestic market scale, bn PPP$	959.8	22	●
5	**Business sophistication**	**34.6**	**51**	
5.1	Knowledge workers	45.5	41	
5.1.1	Knowledge-intensive employment, %	36.8	30	
5.1.2	Firms offering formal training, % firms	34.6	46	
5.1.3	GERD performed by business, % of GDP	0.4	38	
5.1.4	GERD financed by business, %	39.0	38	
5.1.5	Females employed w/advanced degrees, % total	19.0	26	
5.2	Innovation linkages	25.5	82	
5.2.1	University/industry research collaboration†	41.7	71	
5.2.2	State of cluster development†	43.0	75	
5.2.3	GERD financed by abroad, %	13.4	32	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	62	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.5	32	
5.3	Knowledge absorption	32.7	43	
5.3.1	Intellectual property payments, % total trade	1.2	22	●
5.3.2	High-tech imports less re-imports, % total trade	9.7	35	
5.3.3	ICT services imports, % total trade	1.2	55	
5.3.4	FDI net inflows, % GDP	3.2	57	
5.3.5	Research talent, % in business enterprise	31.8	40	
6	**Knowledge & technology outputs**	**27.2**	**52**	
6.1	Knowledge creation	24.0	38	
6.1.1	Patents by origin/bn PPP$ GDP	4.6	25	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	37	
6.1.3	Utility models by origin/bn PPP$ GDP[d]	1.1	24	
6.1.4	Scientific & technical articles/bn PPP$ GDP	24.9	34	
6.1.5	Citable documents H index	371.0	24	●
6.2	Knowledge impact	35.4	68	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.7	44	
6.2.2	New businesses/th pop. 15–64[d]	0.5	86	○
6.2.3	Computer software spending, % GDP	0.3	51	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	10.0	38	
6.2.5	High- & medium-high-tech manufactures, %	33.1	34	
6.3	Knowledge diffusion	22.2	79	
6.3.1	Intellectual property receipts, % total trade	0.1	46	
6.3.2	High-tech exports less re-exports, % total trade	6.6	27	
6.3.3	ICT services exports, % total trade	1.6	61	
6.3.4	FDI net outflows, % GDP[d]	(0.6)	110	○
7	**Creative outputs**	**36.3**	**42**	
7.1	Intangible assets	43.5	59	
7.1.1	Trademarks by origin/bn PPP$ GDP	47.5	50	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	53.9	81	○
7.1.4	ICTs & organizational model creation†	50.7	73	
7.2	Creative goods & services	34.1	32	
7.2.1	Cultural & creative services exports, % of total trade[d]	1.0	9	●
7.2.2	National feature films/mn pop. 15–69	1.1	70	○
7.2.3	Global ent. & media market/th pop. 15–69	11.0	31	
7.2.4	Printing & publishing manufactures, %	1.1	61	○
7.2.5	Creative goods exports, % total trade	4.3	11	●
7.3	Online creativity	23.8	36	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.5	45	
7.3.2	Country-code TLDs/th pop. 15–69	33.1	21	●
7.3.3	Wikipedia edits/mn pop. 15–69	2,614.2	46	
7.3.4	Video uploads on YouTube/pop. 15–69	35.3	32	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Portugal

Key indicators

Population (millions)	10.3
GDP (US$ billions)	199.1
GDP per capita, PPP$	27,834.8
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**46.4**	**30**	
Innovation Output Sub-Index		39.8	32	
Innovation Input Sub-Index		53.1	30	
Innovation Efficiency Ratio		0.8	31	
Global Innovation Index 2015 (out of 141)		46.6	30	
1	**Institutions**	**79.1**	**27**	
1.1	Political environment	74.8	30	
1.1.1	Political stability & safety*	82.6	29	
1.1.2	Government effectiveness*	67.1	33	
1.2	Regulatory environment	75.9	35	
1.2.1	Regulatory quality*	63.8	38	
1.2.2	Rule of law*	75.3	26	
1.2.3	Cost of redundancy dismissal, salary weeks	17.0	72	
1.3	Business environment	86.5	15	●
1.3.1	Ease of starting a business*	96.3	13	●
1.3.2	Ease of resolving insolvency*	84.8	7	●
1.3.3	Ease of paying taxes*	78.5	55	
2	**Human capital & research**	**48.7**	**27**	
2.1	Education	60.3	24	
2.1.1	Expenditure on education, % GDP[d]	5.1	46	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	32.6	14	●
2.1.3	School life expectancy, years	16.8	17	
2.1.4	PISA scales in reading, maths, & science	488.0	29	
2.1.5	Pupil-teacher ratio, secondary[d]	9.8	25	
2.2	Tertiary education	45.5	30	
2.2.1	Tertiary enrolment, % gross	66.2	30	
2.2.2	Graduates in science & engineering, %	26.1	22	
2.2.3	Tertiary inbound mobility, %	3.9	42	
2.3	Research & development (R&D)	40.3	28	
2.3.1	Researchers, FTE/mn pop.	3,699.9	24	
2.3.2	Gross expenditure on R&D, % GDP	1.3	27	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	73.1	33	
2.3.4	QS university ranking, average score top 3*	39.0	35	
3	**Infrastructure**	**52.7**	**34**	
3.1	Information & communication technologies (ICTs)	64.4	41	
3.1.1	ICT access*	77.7	31	
3.1.2	ICT use*	51.4	47	
3.1.3	Government's online service*	63.8	39	
3.1.4	E-participation*	64.7	33	
3.2	General infrastructure	35.7	63	
3.2.1	Electricity output, kWh/cap	5,009.0	40	
3.2.2	Logistics performance*	3.6	25	
3.2.3	Gross capital formation, % GDP	14.7	114	○
3.3	Ecological sustainability	58.0	18	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.6	24	
3.3.2	Environmental performance*	88.6	7	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	4.7	23	
4	**Market sophistication**	**50.2**	**34**	
4.1	Credit	47.8	27	
4.1.1	Ease of getting credit*	45.0	81	○
4.1.2	Domestic credit to private sector, % GDP	129.5	16	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	33.0	82	○
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP	25.1	55	○
4.2.3	Total value of stocks traded, % GDP	20.5	26	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	31	
4.3	Trade, competition, & market scale	69.8	35	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	71.0	52	
4.3.3	Domestic market scale, bn PPP$	281.4	52	
5	**Business sophistication**	**34.5**	**53**	
5.1	Knowledge workers	45.3	42	
5.1.1	Knowledge-intensive employment, %	34.8	38	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.6	31	
5.1.4	GERD financed by business, %[d]	42.3	33	
5.1.5	Females employed w/advanced degrees, % total	14.9	40	
5.2	Innovation linkages	28.4	74	○
5.2.1	University/industry research collaboration†	61.4	22	
5.2.2	State of cluster development†	52.6	34	
5.2.3	GERD financed by abroad, %[d]	6.1	61	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	57	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.4	34	
5.3	Knowledge absorption	29.9	56	
5.3.1	Intellectual property payments, % total trade	0.6	46	
5.3.2	High-tech imports less re-imports, % total trade	6.6	75	○
5.3.3	ICT services imports, % total trade	1.4	37	
5.3.4	FDI net inflows, % GDP	5.4	27	
5.3.5	Research talent, % in business enterprise	27.4	48	○
6	**Knowledge & technology outputs**	**32.4**	**36**	
6.1	Knowledge creation	22.0	42	
6.1.1	Patents by origin/bn PPP$ GDP	3.0	36	
6.1.2	PCT patent applications/bn PPP$ GDP	0.6	34	
6.1.3	Utility models by origin/bn PPP$ GDP	0.3	38	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	44.9	11	●
6.1.5	Citable documents H index	297.0	31	
6.2	Knowledge impact	45.5	29	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.5)	98	○
6.2.2	New businesses/th pop. 15–64	4.6	26	
6.2.3	Computer software spending, % GDP	0.6	10	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	28.5	9	●
6.2.5	High- & medium-high-tech manufactures, %	26.2	47	
6.3	Knowledge diffusion	29.7	42	
6.3.1	Intellectual property receipts, % total trade	0.1	48	
6.3.2	High-tech exports less re-exports, % total trade	2.5	47	
6.3.3	ICT services exports, % total trade	1.5	67	
6.3.4	FDI net outflows, % GDP	3.9	13	●
7	**Creative outputs**	**47.3**	**22**	
7.1	Intangible assets	65.6	7	●
7.1.1	Trademarks by origin/bn PPP$ GDP	102.1	12	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	12.2	12	●
7.1.3	ICTs & business model creation†	75.2	16	
7.1.4	ICTs & organizational model creation†	65.0	26	
7.2	Creative goods & services	26.4	49	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.6	23	
7.2.2	National feature films/mn pop. 15–69	1.7	59	○
7.2.3	Global ent. & media market/th pop. 15–69	29.1	23	
7.2.4	Printing & publishing manufactures, %	1.3	47	
7.2.5	Creative goods exports, % total trade	1.3	36	
7.3	Online creativity	31.4	30	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	19.7	29	
7.3.2	Country-code TLDs/th pop. 15–69	37.9	17	
7.3.3	Wikipedia edits/mn pop. 15–69	3,156.4	42	
7.3.4	Video uploads on YouTube/pop. 15–69	44.9	24	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Qatar

Key indicators

Population (millions)	2.2
GDP (US$ billions)	185.4
GDP per capita, PPP$	132,098.7
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**37.5**	**50**	
Innovation Output Sub-Index		26.9	58	
Innovation Input Sub-Index		48.1	41	
Innovation Efficiency Ratio		0.6	97	
Global Innovation Index 2015 (out of 141)		39.0	50	
1	**Institutions**	**75.0**	**34**	
1.1	Political environment	77.2	24	
1.1.1	Political stability & safety*	87.7	20	
1.1.2	Government effectiveness*	66.6	36	
1.2	Regulatory environment	67.5	62	
1.2.1	Regulatory quality*	58.8	47	
1.2.2	Rule of law*	71.7	29	
1.2.3	Cost of redundancy dismissal, salary weeks	23.2	99	
1.3	Business environment	80.4	30	
1.3.1	Ease of starting a business*	83.2	82	
1.3.2	Ease of resolving insolvency*	58.4	48	
1.3.3	Ease of paying taxes*	99.4	1	●
2	**Human capital & research**	**32.6**	**59**	
2.1	Education	35.6	98	
2.1.1	Expenditure on education, % GDP	3.5	91	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	10.3	98	○
2.1.3	School life expectancy, years◴	13.1	73	
2.1.4	PISA scales in reading, maths, & science	382.5	60	○
2.1.5	Pupil-teacher ratio, secondary	10.2	29	
2.2	Tertiary education	55.5	13	●
2.2.1	Tertiary enrolment, % gross	15.8	97	
2.2.2	Graduates in science & engineering, %	27.6	16	
2.2.3	Tertiary inbound mobility, %	39.9	1	●
2.3	Research & development (R&D)	6.8	71	
2.3.1	Researchers, FTE/mn pop.◴	597.1	57	
2.3.2	Gross expenditure on R&D, % GDP◴	0.5	63	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	9.9	61	
3	**Infrastructure**	**60.5**	**16**	●
3.1	Information & communication technologies (ICTs)	69.2	30	
3.1.1	ICT access*	81.3	20	
3.1.2	ICT use*	69.3	22	
3.1.3	Government's online service*	65.4	37	
3.1.4	E-participation*	60.8	45	
3.2	General infrastructure	75.4	1	●
3.2.1	Electricity output, kWh/cap	15,976.0	6	●
3.2.2	Logistics performance*	3.5	28	
3.2.3	Gross capital formation, % GDP	n/a	n/a	
3.3	Ecological sustainability	36.9	89	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.5	83	
3.3.2	Environmental performance*	69.9	78	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.7	73	
4	**Market sophistication**	**42.8**	**68**	
4.1	Credit	23.3	96	
4.1.1	Ease of getting credit*	30.0	106	○
4.1.2	Domestic credit to private sector, % GDP	45.2	71	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	38.4	58	
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	88.5	19	
4.2.3	Total value of stocks traded, % GDP	26.0	24	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	66.6	47	
4.3.1	Applied tariff rate, weighted mean, %	4.1	73	
4.3.2	Intensity of local competition†	75.8	24	
4.3.3	Domestic market scale, bn PPP$	306.6	49	
5	**Business sophistication**	**29.3**	**78**	
5.1	Knowledge workers	21.0	110	
5.1.1	Knowledge-intensive employment, %◴	18.2	75	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP◴	0.1	59	
5.1.4	GERD financed by business, %◴	24.2	60	
5.1.5	Females employed w/advanced degrees, % total◴	4.5	78	
5.2	Innovation linkages	40.1	32	
5.2.1	University/industry research collaboration†	74.0	8	●
5.2.2	State of cluster development†	71.4	8	●
5.2.3	GERD financed by abroad, %◴	2.4	77	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	8	●
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	54	
5.3	Knowledge absorption	26.9	73	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	2.7	118	○
5.3.3	ICT services imports, % total trade	2.6	10	●
5.3.4	FDI net inflows, % GDP	0.5	114	○
5.3.5	Research talent, % in business enterprise◴	28.0	46	
6	**Knowledge & technology outputs**	**20.0**	**88**	
6.1	Knowledge creation	3.1	108	
6.1.1	Patents by origin/bn PPP$ GDP	0.0	116	○
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	73	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.1	94	
6.1.5	Citable documents H index	70.0	99	
6.2	Knowledge impact	28.5	95	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.9	67	
6.2.2	New businesses/th pop. 15–64	1.7	51	
6.2.3	Computer software spending, % GDP	0.2	61	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	2.1	86	
6.2.5	High- & medium-high-tech manufactures, %◴	20.8	56	
6.3	Knowledge diffusion	28.3	44	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.0	121	○
6.3.3	ICT services exports, % total trade	0.4	102	
6.3.4	FDI net outflows, % GDP	3.2	16	●
7	**Creative outputs**	**33.8**	**49**	
7.1	Intangible assets	52.9	25	
7.1.1	Trademarks by origin/bn PPP$ GDP	4.6	105	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	80.1	3	●
7.1.4	ICTs & organizational model creation†	76.6	7	●
7.2	Creative goods & services	16.8	77	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	34.8	21	
7.2.4	Printing & publishing manufactures, %◴	1.2	56	
7.2.5	Creative goods exports, % total trade	0.0	124	○
7.3	Online creativity	12.6	54	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	4.7	56	
7.3.2	Country-code TLDs/th pop. 15–69	4.0	57	
7.3.3	Wikipedia edits/mn pop. 15–69	2,058.2	52	
7.3.4	Video uploads on YouTube/pop. 15–69	26.6	46	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Romania

Key indicators

Population (millions)	19.5
GDP (US$ billions)	177.3
GDP per capita, PPP$	20,786.9
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**37.9**	**48**	
Innovation Output Sub-Index		31.8	45	
Innovation Input Sub-Index		44.0	52	
Innovation Efficiency Ratio		0.7	46	
Global Innovation Index 2015 (out of 141)		38.2	54	
1	**Institutions**	**69.0**	**48**	
1.1	Political environment	51.9	60	
1.1.1	Political stability & safety*	64.8	61	
1.1.2	Government effectiveness*	39.0	68	
1.2	Regulatory environment	77.6	33	●
1.2.1	Regulatory quality*	59.5	45	
1.2.2	Rule of law*	50.8	54	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	77.5	40	
1.3.1	Ease of starting a business*	91.9	39	
1.3.2	Ease of resolving insolvency*	59.8	43	
1.3.3	Ease of paying taxes*	80.7	48	
2	**Human capital & research**	**30.2**	**73**	
2.1	Education	40.5	85	
2.1.1	Expenditure on education, % GDP	3.0	100	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	12.6	92	○
2.1.3	School life expectancy, years◴	15.3	39	
2.1.4	PISA scales in reading, maths, & science	440.3	43	
2.1.5	Pupil-teacher ratio, secondary◴	12.8	47	
2.2	Tertiary education	41.1	40	
2.2.1	Tertiary enrolment, % gross	52.2	51	
2.2.2	Graduates in science & engineering, %	25.5	28	
2.2.3	Tertiary inbound mobility, %	3.5	50	
2.3	Research & development (R&D)	8.9	61	
2.3.1	Researchers, FTE/mn pop.	921.5	47	
2.3.2	Gross expenditure on R&D, % GDP	0.4	67	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	16.4	57	
3	**Infrastructure**	**48.9**	**44**	
3.1	Information & communication technologies (ICTs)	50.7	62	
3.1.1	ICT access*	66.9	54	
3.1.2	ICT use*	44.8	59	
3.1.3	Government's online service*	44.1	73	
3.1.4	E-participation*	47.1	70	
3.2	General infrastructure	32.2	73	
3.2.1	Electricity output, kWh/cap	2,929.7	63	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	24.2	47	
3.3	Ecological sustainability	63.7	7	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.8	57	
3.3.2	Environmental performance*	83.2	34	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	23.6	1	●
4	**Market sophistication**	**41.8**	**77**	
4.1	Credit	32.2	68	
4.1.1	Ease of getting credit*	85.0	7	●
4.1.2	Domestic credit to private sector, % GDP	31.2	92	
4.1.3	Microfinance gross loans, % GDP	0.1	65	○
4.2	Investment	24.7	112	○
4.2.1	Ease of protecting minority investors*	58.3	55	
4.2.2	Market capitalization, % GDP	11.2	77	○
4.2.3	Total value of stocks traded, % GDP◴	1.2	53	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	81	○
4.3	Trade, competition, & market scale	68.4	41	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	58.6	106	○
4.3.3	Domestic market scale, bn PPP$	393.8	44	
5	**Business sophistication**	**30.2**	**75**	
5.1	Knowledge workers	34.4	76	
5.1.1	Knowledge-intensive employment, %	21.5	65	
5.1.2	Firms offering formal training, % firms	40.7	37	
5.1.3	GERD performed by business, % of GDP	0.2	56	
5.1.4	GERD financed by business, %	32.9	45	
5.1.5	Females employed w/advanced degrees, % total	9.6	64	
5.2	Innovation linkages	25.7	81	
5.2.1	University/industry research collaboration†	43.2	69	
5.2.2	State of cluster development†	44.1	69	
5.2.3	GERD financed by abroad, %	17.0	27	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	68	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	55	
5.3	Knowledge absorption	30.3	54	
5.3.1	Intellectual property payments, % total trade	1.1	23	●
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	1.6	32	●
5.3.4	FDI net inflows, % GDP	1.9	80	
5.3.5	Research talent, % in business enterprise	29.0	45	
6	**Knowledge & technology outputs**	**31.0**	**42**	
6.1	Knowledge creation	9.9	64	
6.1.1	Patents by origin/bn PPP$ GDP	2.5	42	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	62	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	50	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	17.6	42	
6.1.5	Citable documents H index	167.0	46	
6.2	Knowledge impact	53.3	12	●
6.2.1	Growth rate of PPP$ GDP/worker, %	1.9	40	
6.2.2	New businesses/th pop. 15–64	4.1	31	
6.2.3	Computer software spending, % GDP	0.3	41	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	48.2	1	●
6.2.5	High- & medium-high-tech manufactures, %	34.9	30	
6.3	Knowledge diffusion	29.8	41	
6.3.1	Intellectual property receipts, % total trade	0.2	36	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	3.7	18	●
6.3.4	FDI net outflows, % GDP	0.0	87	○
7	**Creative outputs**	**32.6**	**53**	
7.1	Intangible assets	41.7	70	
7.1.1	Trademarks by origin/bn PPP$ GDP	58.0	34	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.0	39	
7.1.3	ICTs & business model creation†	54.2	79	
7.1.4	ICTs & organizational model creation†	51.8	70	
7.2	Creative goods & services	30.0	43	
7.2.1	Cultural & creative services exports, % of total trade◴	1.4	4	●
7.2.2	National feature films/mn pop. 15–69	2.6	51	
7.2.3	Global ent. & media market/th pop. 15–69	4.8	43	
7.2.4	Printing & publishing manufactures, %	1.1	58	
7.2.5	Creative goods exports, % total trade	1.4	35	
7.3	Online creativity	17.0	47	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	5.0	55	
7.3.2	Country-code TLDs/th pop. 15–69	20.6	30	●
7.3.3	Wikipedia edits/mn pop. 15–69	934.5	75	
7.3.4	Video uploads on YouTube/pop. 15–69	35.6	31	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Russian Federation

Key indicators

Population (millions)	143.5
GDP (US$ billions)	1,324.7
GDP per capita, PPP$	25,410.9
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**38.5**	**43**	
Innovation Output Sub-Index		30.3	47	
Innovation Input Sub-Index		46.7	44	
Innovation Efficiency Ratio		0.6	69	
Global Innovation Index 2015 (out of 141)		39.3	48	
1	**Institutions**	**57.9**	**73**	
1.1	Political environment	39.4	93	
1.1.1	Political stability & safety*	42.0	103	○
1.1.2	Government effectiveness*	36.9	74	
1.2	Regulatory environment	56.8	92	
1.2.1	Regulatory quality*	34.7	97	○
1.2.2	Rule of law*	29.4	104	○
1.2.3	Cost of redundancy dismissal, salary weeks	17.3	75	
1.3	Business environment	77.4	41	
1.3.1	Ease of starting a business*	92.4	36	
1.3.2	Ease of resolving insolvency*	58.4	48	
1.3.3	Ease of paying taxes*	81.6	41	
2	**Human capital & research**	**50.4**	**23**	
2.1	Education	58.5	27	
2.1.1	Expenditure on education, % GDP	4.2	79	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	14.9	49	
2.1.4	PISA scales in reading, maths, & science	481.2	35	
2.1.5	Pupil-teacher ratio, secondary[4]	8.8	16	●
2.2	Tertiary education	47.7	23	
2.2.1	Tertiary enrolment, % gross	78.0	18	●
2.2.2	Graduates in science & engineering, %[4]	28.1	11	●
2.2.3	Tertiary inbound mobility, %	1.8	68	
2.3	Research & development (R&D)	45.0	25	
2.3.1	Researchers, FTE/mn pop.	3,101.6	28	
2.3.2	Gross expenditure on R&D, % GDP	1.2	31	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	300.2	22	
2.3.4	QS university ranking, average score top 3*	51.5	27	
3	**Infrastructure**	**44.5**	**60**	
3.1	Information & communication technologies (ICTs)	66.8	35	
3.1.1	ICT access*	72.4	42	
3.1.2	ICT use*	55.2	40	
3.1.3	Government's online service*	70.9	27	
3.1.4	E-participation*	68.6	30	
3.2	General infrastructure	31.4	77	
3.2.1	Electricity output, kWh/cap	7,395.7	23	
3.2.2	Logistics performance*	2.7	85	
3.2.3	Gross capital formation, % GDP	18.7	95	○
3.3	Ecological sustainability	35.5	94	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	3.0	114	○
3.3.2	Environmental performance*	83.5	32	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	91	
4	**Market sophistication**	**43.1**	**63**	
4.1	Credit	29.1	80	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	59.3	52	
4.1.3	Microfinance gross loans, % GDP	0.0	72	○
4.2	Investment	26.6	107	○
4.2.1	Ease of protecting minority investors*	56.7	62	
4.2.2	Market capitalization, % GDP	20.7	64	
4.2.3	Total value of stocks traded, % GDP	8.6	38	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	67	○
4.3	Trade, competition, & market scale	73.5	22	
4.3.1	Applied tariff rate, weighted mean, %	6.3	93	
4.3.2	Intensity of local competition†	66.2	75	
4.3.3	Domestic market scale, bn PPP$	3,576.8	6	●
5	**Business sophistication**	**37.5**	**37**	
5.1	Knowledge workers	58.1	24	
5.1.1	Knowledge-intensive employment, %	44.2	14	●
5.1.2	Firms offering formal training, % firms[4]	46.1	30	
5.1.3	GERD performed by business, % of GDP	0.7	26	
5.1.4	GERD financed by business, %	27.1	56	
5.1.5	Females employed w/advanced degrees, % total	33.0	2	●
5.2	Innovation linkages	19.2	112	○
5.2.1	University/industry research collaboration†	43.9	65	
5.2.2	State of cluster development†	35.6	101	○
5.2.3	GERD financed by abroad, %	2.5	76	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	51	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	52	
5.3	Knowledge absorption	35.3	35	
5.3.1	Intellectual property payments, % total trade	1.6	14	●
5.3.2	High-tech imports less re-imports, % total trade	8.3	54	
5.3.3	ICT services imports, % total trade	1.4	40	
5.3.4	FDI net inflows, % GDP	1.2	95	
5.3.5	Research talent, % in business enterprise	46.7	27	
6	**Knowledge & technology outputs**	**31.9**	**40**	
6.1	Knowledge creation	37.6	23	
6.1.1	Patents by origin/bn PPP$ GDP	6.8	18	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	48	
6.1.3	Utility models by origin/bn PPP$ GDP	3.6	7	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	9.3	67	
6.1.5	Citable documents H index	390.0	21	
6.2	Knowledge impact	32.0	82	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.4	81	
6.2.2	New businesses/th pop. 15–64	4.2	29	
6.2.3	Computer software spending, % GDP	0.3	52	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.2	75	
6.2.5	High- & medium-high-tech manufactures, %	26.3	46	
6.3	Knowledge diffusion	26.1	57	
6.3.1	Intellectual property receipts, % total trade	0.1	43	
6.3.2	High-tech exports less re-exports, % total trade	2.1	51	
6.3.3	ICT services exports, % total trade	0.9	83	
6.3.4	FDI net outflows, % GDP	3.0	21	
7	**Creative outputs**	**28.7**	**66**	
7.1	Intangible assets	37.2	89	
7.1.1	Trademarks by origin/bn PPP$ GDP	49.8	47	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.9	69	
7.1.3	ICTs & business model creation†	50.4	94	○
7.1.4	ICTs & organizational model creation†	50.3	74	
7.2	Creative goods & services	23.3	59	
7.2.1	Cultural & creative services exports, % of total trade[4]	1.0	11	●
7.2.2	National feature films/mn pop. 15–69	1.3	65	
7.2.3	Global ent. & media market/th pop. 15–69	6.4	41	
7.2.4	Printing & publishing manufactures, %	1.2	53	
7.2.5	Creative goods exports, % total trade	0.8	47	
7.3	Online creativity	17.1	46	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.5	59	
7.3.2	Country-code TLDs/th pop. 15–69	17.0	33	
7.3.3	Wikipedia edits/mn pop. 15–69	1,569.0	61	
7.3.4	Video uploads on YouTube/pop. 15–69	36.5	30	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Rwanda

Key indicators

Population (millions)	11.6
GDP (US$ billions)	8.3
GDP per capita, PPP$	1,807.0
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.0**	**83**	
Innovation Output Sub-Index		16.5	114	
Innovation Input Sub-Index		43.4	55	
Innovation Efficiency Ratio		0.4	123	○
Global Innovation Index 2015 (out of 141)		30.1	94	
1	**Institutions**	**63.5**	**62**	
1.1	Political environment	50.0	64	
1.1.1	Political stability & safety*	60.4	73	
1.1.2	Government effectiveness*	39.7	67	
1.2	Regulatory environment	69.7	50	
1.2.1	Regulatory quality*	49.2	63	
1.2.2	Rule of law*	49.1	56	
1.2.3	Cost of redundancy dismissal, salary weeks	13.0	47	
1.3	Business environment	70.8	63	
1.3.1	Ease of starting a business*	83.1	84	
1.3.2	Ease of resolving insolvency*	47.8	65	
1.3.3	Ease of paying taxes*	81.5	42	●
2	**Human capital & research**	**24.0**	**89**	
2.1	Education	47.8	63	
2.1.1	Expenditure on education, % GDP	5.0	48	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	41.3	6	●
2.1.3	School life expectancy, years	11.2	96	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary ④	22.8	90	
2.2	Tertiary education	24.3	98	
2.2.1	Tertiary enrolment, % gross	7.5	109	
2.2.2	Graduates in science & engineering, % ④	22.5	38	
2.2.3	Tertiary inbound mobility, %	1.0	81	
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop. ④	12.3	97	○
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**35.3**	**93**	
3.1	Information & communication technologies (ICTs)	33.7	94	
3.1.1	ICT access*	25.4	118	○
3.1.2	ICT use*	7.3	110	
3.1.3	Government's online service*	51.2	63	
3.1.4	E-participation*	51.0	63	
3.2	General infrastructure	38.4	55	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	2.8	77	
3.2.3	Gross capital formation, % GDP	25.3	41	●
3.3	Ecological sustainability	33.7	102	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	50.3	113	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	121	○
4	**Market sophistication**	**55.5**	**23**	●
4.1	Credit	83.3	3	●
4.1.1	Ease of getting credit*	95.0	2	●
4.1.2	Domestic credit to private sector, % GDP	n/a	n/a	
4.1.3	Microfinance gross loans, % GDP	5.8	6	●
4.2	Investment	41.5	44	
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	35	
4.3	Trade, competition, & market scale	41.7	119	
4.3.1	Applied tariff rate, weighted mean, %	8.7	111	
4.3.2	Intensity of local competition†	67.4	68	
4.3.3	Domestic market scale, bn PPP$	18.9	119	
5	**Business sophistication**	**38.7**	**35**	●
5.1	Knowledge workers	36.7	69	
5.1.1	Knowledge-intensive employment, % ④	3.8	103	○
5.1.2	Firms offering formal training, % firms ④	55.4	16	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	48.1	[9]	
5.2.1	University/industry research collaboration†	44.2	62	
5.2.2	State of cluster development†	50.1	42	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	31.2	50	
5.3.1	Intellectual property payments, % total trade ④	0.1	105	
5.3.2	High-tech imports less re-imports, % total trade	13.4	17	●
5.3.3	ICT services imports, % total trade ④	1.0	60	
5.3.4	FDI net inflows, % GDP	3.7	46	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**15.1**	**116**	
6.1	Knowledge creation	3.1	109	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	89	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	80	
6.1.3	Utility models by origin/bn PPP$ GDP	0.1	59	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	8.9	68	
6.1.5	Citable documents H index	48.0	115	
6.2	Knowledge impact	4.6	[122]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	1.5	57	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.3	123	○
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	37.4	30	●
6.3.1	Intellectual property receipts, % total trade ④	2.0	8	●
6.3.2	High-tech exports less re-exports, % total trade	0.4	82	
6.3.3	ICT services exports, % total trade ④	1.5	66	
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**18.0**	**108**	
7.1	Intangible assets	35.5	97	
7.1.1	Trademarks by origin/bn PPP$ GDP ④	6.7	104	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.1	104	
7.1.3	ICTs & business model creation†	67.5	31	●
7.1.4	ICTs & organizational model creation†	53.4	66	
7.2	Creative goods & services	0.9	[124]	
7.2.1	Cultural & creative services exports, % of total trade	0.0	82	○
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	100	
7.3	Online creativity	0.2	120	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	119	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	114	
7.3.3	Wikipedia edits/mn pop. 15–69	38.6	114	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Saudi Arabia

Key indicators

Population (millions)	31.5
GDP (US$ billions)	653.2
GDP per capita, PPP$	53,624.4
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**37.8**	**49**	
Innovation Output Sub-Index		28.5	54	
Innovation Input Sub-Index		47.0	43	
Innovation Efficiency Ratio		0.6	85	
Global Innovation Index 2015 (out of 141)		40.7	43	
1	**Institutions**	**57.9**	**72**	
1.1	Political environment	51.1	62	
1.1.1	Political stability & safety*	56.9	82	
1.1.2	Government effectiveness*	45.3	57	
1.2	Regulatory environment	63.3	75	
1.2.1	Regulatory quality*	44.6	70	
1.2.2	Rule of law*	53.8	51	
1.2.3	Cost of redundancy dismissal, salary weeks	19.5	83	
1.3	Business environment	59.3	99	○
1.3.1	Ease of starting a business*	78.7	98	○
1.3.2	Ease of resolving insolvency*	0.0	127	○
1.3.3	Ease of paying taxes*	99.2	3	●
2	**Human capital & research**	**44.7**	**32**	
2.1	Education	52.3	49	
2.1.1	Expenditure on education, % GDP[4]	5.1	45	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	18.1	66	
2.1.3	School life expectancy, years	16.1	29	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	11.0	34	
2.2	Tertiary education	46.3	28	
2.2.1	Tertiary enrolment, % gross	61.1	41	
2.2.2	Graduates in science & engineering, %	26.9	18	●
2.2.3	Tertiary inbound mobility, %	4.8	33	
2.3	Research & development (R&D)	35.6	33	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.1	106	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	173.4	25	●
2.3.4	QS university ranking, average score top 3*	48.0	30	
3	**Infrastructure**	**51.4**	**39**	
3.1	Information & communication technologies (ICTs)	67.1	34	
3.1.1	ICT access*	74.2	36	
3.1.2	ICT use*	60.0	33	
3.1.3	Government's online service*	77.2	18	●
3.1.4	E-participation*	56.9	51	
3.2	General infrastructure	50.6	21	●
3.2.1	Electricity output, kWh/cap	9,851.4	13	●
3.2.2	Logistics performance*	3.1	47	
3.2.3	Gross capital formation, % GDP	29.7	22	●
3.3	Ecological sustainability	36.5	92	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	71	
3.3.2	Environmental performance*	68.6	84	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	111	○
4	**Market sophistication**	**49.6**	**38**	
4.1	Credit	33.1	64	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	44.4	73	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	40.4	47	
4.2.1	Ease of protecting minority investors*	51.7	83	
4.2.2	Market capitalization, % GDP	64.7	29	
4.2.3	Total value of stocks traded, % GDP	76.0	9	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	68	○
4.3	Trade, competition, & market scale	75.3	17	●
4.3.1	Applied tariff rate, weighted mean, %	3.6	64	
4.3.2	Intensity of local competition†	73.1	39	
4.3.3	Domestic market scale, bn PPP$	1,609.6	14	●
5	**Business sophistication**	**31.3**	**66**	
5.1	Knowledge workers	35.3	73	
5.1.1	Knowledge-intensive employment, %	28.1	48	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	5.8	76	○
5.2	Innovation linkages	39.2	35	
5.2.1	University/industry research collaboration†	53.3	37	
5.2.2	State of cluster development†	60.0	20	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	26	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	59	
5.3	Knowledge absorption	19.6	102	○
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade[4]	6.0	78	
5.3.3	ICT services imports, % total trade	0.8	77	
5.3.4	FDI net inflows, % GDP	1.1	98	○
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**22.4**	**75**	
6.1	Knowledge creation	9.4	66	
6.1.1	Patents by origin/bn PPP$ GDP	0.6	70	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.5	73	
6.1.5	Citable documents H index	164.0	51	
6.2	Knowledge impact	37.7	56	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.6	75	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.3	29	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.9	90	
6.2.5	High- & medium-high-tech manufactures, %[4]	35.9	28	
6.3	Knowledge diffusion	20.1	98	○
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade[4]	0.1	109	○
6.3.3	ICT services exports, % total trade	0.1	120	○
6.3.4	FDI net outflows, % GDP	0.7	56	
7	**Creative outputs**	**34.6**	**47**	
7.1	Intangible assets	50.8	31	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.1	103	○
7.1.3	ICTs & business model creation†	67.5	32	
7.1.4	ICTs & organizational model creation†	59.3	40	
7.2	Creative goods & services	24.5	56	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	8.9	36	
7.2.4	Printing & publishing manufactures, %[4]	2.3	17	●
7.2.5	Creative goods exports, % total trade[4]	0.1	85	
7.3	Online creativity	12.3	56	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.3	62	
7.3.2	Country-code TLDs/th pop. 15–69	0.7	86	
7.3.3	Wikipedia edits/mn pop. 15–69	1,469.8	65	
7.3.4	Video uploads on YouTube/pop. 15–69	34.4	33	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Senegal

Key indicators

Population (millions)	15.1
GDP (US$ billions)	13.7
GDP per capita, PPP$	2,451.3
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.1**	**106**	
Innovation Output Sub-Index		20.8	96	
Innovation Input Sub-Index		31.5	109	
Innovation Efficiency Ratio		0.7	62	
Global Innovation Index 2015 (out of 141)		31.0	84	
1	**Institutions**	**53.8**	**84**	
1.1	Political environment	43.9	85	
1.1.1	Political stability & safety*	59.7	75	
1.1.2	Government effectiveness*	28.2	90	
1.2	Regulatory environment	64.2	74	
1.2.1	Regulatory quality*	39.3	82	
1.2.2	Rule of law*	44.6	67	
1.2.3	Cost of redundancy dismissal, salary weeks	14.8	61	
1.3	Business environment	53.2	122	○
1.3.1	Ease of starting a business*	85.9	66	
1.3.2	Ease of resolving insolvency*	43.9	79	
1.3.3	Ease of paying taxes*	29.8	125	○
2	**Human capital & research**	**15.4**	**112**	
2.1	Education	36.1	95	
2.1.1	Expenditure on education, % GDP[d]	5.6	34	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	29.0	23	●
2.1.3	School life expectancy, years[d]	7.9	114	○
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	27.4	100	
2.2	Tertiary education	6.0	[120]	
2.2.1	Tertiary enrolment, % gross[d]	7.4	110	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	4.0	77	
2.3.1	Researchers, FTE/mn pop.[d]	361.1	63	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.5	58	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**31.1**	**103**	
3.1	Information & communication technologies (ICTs)	28.8	102	
3.1.1	ICT access*	35.1	103	
3.1.2	ICT use*	14.2	101	
3.1.3	Government's online service*	30.7	97	
3.1.4	E-participation*	35.3	85	
3.2	General infrastructure	28.9	85	
3.2.1	Electricity output, kWh/cap	262.6	110	
3.2.2	Logistics performance*	2.6	96	
3.2.3	Gross capital formation, % GDP	26.9	32	●
3.3	Ecological sustainability	35.6	93	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.4	65	
3.3.2	Environmental performance*	63.7	98	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	86	
4	**Market sophistication**	**32.1**	**114**	
4.1	Credit	21.5	105	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	33.2	88	
4.1.3	Microfinance gross loans, % GDP	1.9	18	●
4.2	Investment	28.8	98	
4.2.1	Ease of protecting minority investors*	38.3	115	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	43	
4.3	Trade, competition, & market scale	46.0	112	
4.3.1	Applied tariff rate, weighted mean, %	8.1	104	
4.3.2	Intensity of local competition†	65.8	78	
4.3.3	Domestic market scale, bn PPP$	34.2	102	
5	**Business sophistication**	**25.0**	**100**	
5.1	Knowledge workers	8.8	123	○
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	17.4	84	
5.1.3	GERD performed by business, % of GDP[d]	0.0	84	○
5.1.4	GERD financed by business, %[d]	4.1	81	
5.1.5	Females employed w/advanced degrees, % total[d]	0.7	85	○
5.2	Innovation linkages	46.9	12	●
5.2.1	University/industry research collaboration†	44.0	63	
5.2.2	State of cluster development†	43.4	72	
5.2.3	GERD financed by abroad, %[d]	40.5	10	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	19.2	105	
5.3.1	Intellectual property payments, % total trade[d]	0.0	109	○
5.3.2	High-tech imports less re-imports, % total trade	4.7	101	
5.3.3	ICT services imports, % total trade[d]	2.3	13	●
5.3.4	FDI net inflows, % GDP	2.2	73	
5.3.5	Research talent, % in business enterprise[d]	0.1	81	○
6	**Knowledge & technology outputs**	**21.3**	**81**	
6.1	Knowledge creation	8.3	72	
6.1.1	Patents by origin/bn PPP$ GDP	0.8	69	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	36	●
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	11.0	62	
6.1.5	Citable documents H index	89.0	85	
6.2	Knowledge impact	28.3	98	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.7	46	●
6.2.2	New businesses/th pop. 15–64	0.3	91	
6.2.3	Computer software spending, % GDP	0.3	47	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.7	93	
6.2.5	High- & medium-high-tech manufactures, %	16.6	62	
6.3	Knowledge diffusion	27.2	49	●
6.3.1	Intellectual property receipts, % total trade[d]	0.0	65	
6.3.2	High-tech exports less re-exports, % total trade	0.7	67	
6.3.3	ICT services exports, % total trade[d]	5.2	9	●
6.3.4	FDI net outflows, % GDP[d]	0.3	71	
7	**Creative outputs**	**20.4**	**101**	
7.1	Intangible assets	35.6	96	
7.1.1	Trademarks by origin/bn PPP$ GDP	12.9	92	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.4	84	
7.1.3	ICTs & business model creation†	60.8	54	
7.1.4	ICTs & organizational model creation†	56.2	52	●
7.2	Creative goods & services	9.5	95	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.2	37	
7.2.2	National feature films/mn pop. 15–69	0.4	93	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	0.8	71	
7.2.5	Creative goods exports, % total trade	0.1	83	
7.3	Online creativity	0.8	107	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.1	96	
7.3.2	Country-code TLDs/th pop. 15–69	0.2	105	
7.3.3	Wikipedia edits/mn pop. 15–69	51.4	110	
7.3.4	Video uploads on YouTube/pop. 15–69	1.4	69	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Serbia

Key indicators

Population (millions)	8.9
GDP (US$ billions)	36.5
GDP per capita, PPP$	13,671.4
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**33.8**	**65**	
Innovation Output Sub-Index		26.6	63	
Innovation Input Sub-Index		40.9	68	
Innovation Efficiency Ratio		0.6	70	
Global Innovation Index 2015 (out of 141)		36.5	63	
1	**Institutions**	**65.7**	**56**	
1.1	Political environment	54.4	57	
1.1.1	Political stability & safety*	67.3	54	
1.1.2	Government effectiveness*	41.6	64	
1.2	Regulatory environment	72.9	42	
1.2.1	Regulatory quality*	48.3	65	
1.2.2	Rule of law*	43.2	71	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	69.8	65	
1.3.1	Ease of starting a business*	88.9	54	
1.3.2	Ease of resolving insolvency*	58.5	47	
1.3.3	Ease of paying taxes*	61.9	99	
2	**Human capital & research**	**32.8**	**56**	
2.1	Education	45.2	69	
2.1.1	Expenditure on education, % GDP	4.4	70	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	13.1	90	○
2.1.3	School life expectancy, years	14.4	55	
2.1.4	PISA scales in reading, maths, & science	446.6	41	
2.1.5	Pupil-teacher ratio, secondary	8.7	14	●
2.2	Tertiary education	43.4	35	
2.2.1	Tertiary enrolment, % gross	58.1	43	
2.2.2	Graduates in science & engineering, %	26.2	21	●
2.2.3	Tertiary inbound mobility, %	3.7	46	
2.3	Research & development (R&D)	9.8	59	
2.3.1	Researchers, FTE/mn pop.	1,464.8	40	
2.3.2	Gross expenditure on R&D, % GDP	0.8	44	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	4.3	70	
3	**Infrastructure**	**43.7**	**61**	
3.1	Information & communication technologies (ICTs)	50.1	65	
3.1.1	ICT access*	72.8	40	
3.1.2	ICT use*	46.9	57	
3.1.3	Government's online service*	39.4	81	
3.1.4	E-participation*	41.2	77	
3.2	General infrastructure	31.0	78	
3.2.1	Electricity output, kWh/cap	5,478.6	36	
3.2.2	Logistics performance*	3.0	61	
3.2.3	Gross capital formation, % GDP	17.3	107	○
3.3	Ecological sustainability	50.1	40	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.8	100	○
3.3.2	Environmental performance*	78.7	47	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	9.4	8	●
4	**Market sophistication**	**34.3**	**109**	○
4.1	Credit	26.2	89	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	43.8	76	
4.1.3	Microfinance gross loans, % GDP	0.2	53	
4.2	Investment	28.0	101	○
4.2.1	Ease of protecting minority investors*	55.0	72	
4.2.2	Market capitalization, % GDP[4]	3.9	90	○
4.2.3	Total value of stocks traded, % GDP[4]	0.7	61	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	48.9	107	○
4.3.1	Applied tariff rate, weighted mean, %	n/a	n/a	
4.3.2	Intensity of local competition†	54.6	114	○
4.3.3	Domestic market scale, bn PPP$	95.8	75	
5	**Business sophistication**	**28.1**	**84**	
5.1	Knowledge workers	33.7	80	
5.1.1	Knowledge-intensive employment, %	29.1	46	
5.1.2	Firms offering formal training, % firms	37.8	40	
5.1.3	GERD performed by business, % of GDP	0.2	48	
5.1.4	GERD financed by business, %	8.2	72	
5.1.5	Females employed w/advanced degrees, % total[4]	12.2	54	
5.2	Innovation linkages	22.3	99	
5.2.1	University/industry research collaboration†	37.3	89	
5.2.2	State of cluster development†	35.4	103	○
5.2.3	GERD financed by abroad, %	12.5	39	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	43	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	57	
5.3	Knowledge absorption	28.4	64	
5.3.1	Intellectual property payments, % total trade	1.0	28	●
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	1.7	26	●
5.3.4	FDI net inflows, % GDP	4.6	32	
5.3.5	Research talent, % in business enterprise	10.9	64	○
6	**Knowledge & technology outputs**	**27.7**	**50**	
6.1	Knowledge creation	20.9	44	
6.1.1	Patents by origin/bn PPP$ GDP	2.2	44	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	44	
6.1.3	Utility models by origin/bn PPP$ GDP	0.7	30	
6.1.4	Scientific & technical articles/bn PPP$ GDP	49.0	8	●
6.1.5	Citable documents H index	100.0	79	
6.2	Knowledge impact	31.9	83	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	1.6	53	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	27.5	12	●
6.2.5	High- & medium-high-tech manufactures, %	21.0	55	
6.3	Knowledge diffusion	30.2	39	
6.3.1	Intellectual property receipts, % total trade	0.2	34	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	2.9	26	●
6.3.4	FDI net outflows, % GDP[4]	0.8	55	
7	**Creative outputs**	**25.5**	**82**	
7.1	Intangible assets	30.8	106	○
7.1.1	Trademarks by origin/bn PPP$ GDP	27.8	70	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.6	56	
7.1.3	ICTs & business model creation†	48.1	102	○
7.1.4	ICTs & organizational model creation†	40.4	106	○
7.2	Creative goods & services	23.1	61	
7.2.1	Cultural & creative services exports, % of total trade	0.2	42	
7.2.2	National feature films/mn pop. 15–69	2.8	50	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.7	30	
7.2.5	Creative goods exports, % total trade	0.8	43	
7.3	Online creativity	17.3	45	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	1.6	90	
7.3.2	Country-code TLDs/th pop. 15–69	4.9	54	
7.3.3	Wikipedia edits/mn pop. 15–69	4,693.0	29	●
7.3.4	Video uploads on YouTube/pop. 15–69	28.1	44	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Singapore

Key indicators

Population (millions)	5.6
GDP (US$ billions)	292.7
GDP per capita, PPP$	85,253.2
Income group	High income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**59.2**	**6**	
Innovation Output Sub-Index		45.4	20	
Innovation Input Sub-Index		72.9	1	●
Innovation Efficiency Ratio		0.6	78	○
Global Innovation Index 2015 (out of 141)		59.4	7	
1	**Institutions**	**94.9**	**1**	●
1.1	Political environment	96.7	1	●
1.1.1	Political stability & safety*	93.4	7	
1.1.2	Government effectiveness*	100.0	1	●
1.2	Regulatory environment	98.6	1	●
1.2.1	Regulatory quality*	100.0	1	●
1.2.2	Rule of law*	94.4	11	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	89.3	8	
1.3.1	Ease of starting a business*	96.5	10	
1.3.2	Ease of resolving insolvency*	74.8	25	
1.3.3	Ease of paying taxes*	96.6	5	
2	**Human capital & research**	**67.1**	**2**	●
2.1	Education	40.4	87	○
2.1.1	Expenditure on education, % GDP	2.9	101	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[4]	16.7	71	○
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	555.7	2	●
2.1.5	Pupil-teacher ratio, secondary[4]	14.9	63	○
2.2	Tertiary education	100.0	[1]	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	19.2	1	●
2.3	Research & development (R&D)	60.9	15	
2.3.1	Researchers, FTE/mn pop.[4]	6,665.2	6	
2.3.2	Gross expenditure on R&D, % GDP[4]	2.0	16	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	121.0	27	
2.3.4	QS university ranking, average score top 3*	62.7	16	
3	**Infrastructure**	**69.1**	**1**	●
3.1	Information & communication technologies (ICTs)	88.0	6	
3.1.1	ICT access*	86.4	14	
3.1.2	ICT use*	76.1	15	
3.1.3	Government's online service*	99.2	2	●
3.1.4	E-participation*	90.2	10	
3.2	General infrastructure	57.5	8	
3.2.1	Electricity output, kWh/cap	8,882.2	16	
3.2.2	Logistics performance*	4.0	5	
3.2.3	Gross capital formation, % GDP	26.6	33	
3.3	Ecological sustainability	61.8	10	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	14.1	8	
3.3.2	Environmental performance*	87.0	14	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.4	27	
4	**Market sophistication**	**71.5**	**5**	
4.1	Credit	63.2	12	
4.1.1	Ease of getting credit*	75.0	18	
4.1.2	Domestic credit to private sector, % GDP	131.5	14	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	76.1	3	●
4.2.1	Ease of protecting minority investors*	83.3	1	●
4.2.2	Market capitalization, % GDP	244.5	1	●
4.2.3	Total value of stocks traded, % GDP	65.2	12	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	14	
4.3	Trade, competition, & market scale	75.2	18	
4.3.1	Applied tariff rate, weighted mean, %	0.0	1	●
4.3.2	Intensity of local competition†	76.3	20	
4.3.3	Domestic market scale, bn PPP$	454.3	38	
5	**Business sophistication**	**62.1**	**1**	●
5.1	Knowledge workers	67.9	6	
5.1.1	Knowledge-intensive employment, %	53.1	2	●
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP[4]	1.2	16	
5.1.4	GERD financed by business, %[4]	52.7	17	
5.1.5	Females employed w/advanced degrees, % total[4]	22.7	14	
5.2	Innovation linkages	47.5	10	
5.2.1	University/industry research collaboration†	76.3	5	
5.2.2	State of cluster development†	68.8	12	
5.2.3	GERD financed by abroad, %[4]	5.8	63	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.1	6	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.8	20	
5.3	Knowledge absorption	71.0	1	●
5.3.1	Intellectual property payments, % total trade	4.1	1	●
5.3.2	High-tech imports less re-imports, % total trade	20.1	4	
5.3.3	ICT services imports, % total trade	1.4	38	
5.3.4	FDI net inflows, % GDP	21.9	1	●
5.3.5	Research talent, % in business enterprise[4]	50.9	20	
6	**Knowledge & technology outputs**	**49.6**	**10**	
6.1	Knowledge creation	29.0	33	
6.1.1	Patents by origin/bn PPP$ GDP	2.9	37	
6.1.2	PCT patent applications/bn PPP$ GDP	1.9	19	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	26.1	29	
6.1.5	Citable documents H index	349.0	27	
6.2	Knowledge impact	52.4	13	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.3	82	○
6.2.2	New businesses/th pop. 15–64	9.5	11	
6.2.3	Computer software spending, % GDP	0.4	24	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	12.7	31	
6.2.5	High- & medium-high-tech manufactures, %	69.3	1	●
6.3	Knowledge diffusion	67.5	2	●
6.3.1	Intellectual property receipts, % total trade	0.6	20	
6.3.2	High-tech exports less re-exports, % total trade	26.8	1	●
6.3.3	ICT services exports, % total trade	1.0	79	○
6.3.4	FDI net outflows, % GDP	13.2	1	●
7	**Creative outputs**	**41.1**	**33**	
7.1	Intangible assets	48.4	44	
7.1.1	Trademarks by origin/bn PPP$ GDP	20.0	80	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.8	53	○
7.1.3	ICTs & business model creation†	79.5	6	
7.1.4	ICTs & organizational model creation†	74.5	11	
7.2	Creative goods & services	35.1	25	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	3.1	46	○
7.2.3	Global ent. & media market/th pop. 15–69	36.8	20	
7.2.4	Printing & publishing manufactures, %	0.8	72	○
7.2.5	Creative goods exports, % total trade	4.8	10	
7.3	Online creativity	32.6	29	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	27.9	23	
7.3.2	Country-code TLDs/th pop. 15–69	14.7	35	
7.3.3	Wikipedia edits/mn pop. 15–69	2,562.1	48	
7.3.4	Video uploads on YouTube/pop. 15–69	69.1	10	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Slovakia

Key indicators

Population (millions)	5.4
GDP (US$ billions)	86.6
GDP per capita, PPP$	29,720.1
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**41.7**	**37**	
Innovation Output Sub-Index		35.4	38	
Innovation Input Sub-Index		48.0	42	
Innovation Efficiency Ratio		0.7	36	
Global Innovation Index 2015 (out of 141)		43.0	36	
1	**Institutions**	**75.0**	**35**	
1.1	Political environment	75.7	26	
1.1.1	Political stability & safety*	88.3	17	●
1.1.2	Government effectiveness*	63.2	38	
1.2	Regulatory environment	70.8	46	
1.2.1	Regulatory quality*	67.0	35	
1.2.2	Rule of law*	58.9	45	
1.2.3	Cost of redundancy dismissal, salary weeks	18.8	80	
1.3	Business environment	78.5	36	
1.3.1	Ease of starting a business*	88.5	56	
1.3.2	Ease of resolving insolvency*	70.0	31	
1.3.3	Ease of paying taxes*	76.8	60	
2	**Human capital & research**	**32.8**	**57**	
2.1	Education	47.3	65	
2.1.1	Expenditure on education, % GDP	3.9	82	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	18.4	63	
2.1.3	School life expectancy, years	15.1	45	
2.1.4	PISA scales in reading, maths, & science	471.9	37	
2.1.5	Pupil-teacher ratio, secondary◴	11.2	36	
2.2	Tertiary education	38.0	52	
2.2.1	Tertiary enrolment, % gross	54.4	48	
2.2.2	Graduates in science & engineering, %	20.5	50	
2.2.3	Tertiary inbound mobility, %	4.9	32	
2.3	Research & development (R&D)	13.2	51	
2.3.1	Researchers, FTE/mn pop.	2,718.5	30	
2.3.2	Gross expenditure on R&D, % GDP	0.9	37	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**53.3**	**32**	
3.1	Information & communication technologies (ICTs)	60.2	43	
3.1.1	ICT access*	70.4	46	
3.1.2	ICT use*	58.6	34	
3.1.3	Government's online service*	48.8	65	
3.1.4	E-participation*	62.7	40	
3.2	General infrastructure	37.8	62	
3.2.1	Electricity output, kWh/cap	4,892.1	42	
3.2.2	Logistics performance*	3.3	41	
3.2.3	Gross capital formation, % GDP	21.3	72	
3.3	Ecological sustainability	62.0	9	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.9	56	
3.3.2	Environmental performance*	85.4	24	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	11.8	6	●
4	**Market sophistication**	**44.2**	**56**	
4.1	Credit	41.8	40	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	50.2	65	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	23.0	124	○
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP	4.9	88	○
4.2.3	Total value of stocks traded, % GDP◴	0.2	75	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	50	
4.3	Trade, competition, & market scale	67.8	45	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	75.6	26	
4.3.3	Domestic market scale, bn PPP$	153.2	65	
5	**Business sophistication**	**34.5**	**52**	
5.1	Knowledge workers	41.9	50	
5.1.1	Knowledge-intensive employment, %	31.9	42	
5.1.2	Firms offering formal training, % firms	43.5	31	
5.1.3	GERD performed by business, % of GDP	0.3	42	
5.1.4	GERD financed by business, %	32.2	46	
5.1.5	Females employed w/advanced degrees, % total	12.0	55	
5.2	Innovation linkages	34.2	50	
5.2.1	University/industry research collaboration†	39.3	80	
5.2.2	State of cluster development†	48.0	53	
5.2.3	GERD financed by abroad, %	23.7	16	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	42	
5.3	Knowledge absorption	27.5	68	
5.3.1	Intellectual property payments, % total trade	0.6	49	
5.3.2	High-tech imports less re-imports, % total trade	14.8	13	●
5.3.3	ICT services imports, % total trade	0.8	69	
5.3.4	FDI net inflows, % GDP	0.1	123	○
5.3.5	Research talent, % in business enterprise	17.9	57	○
6	**Knowledge & technology outputs**	**32.3**	**37**	
6.1	Knowledge creation	22.9	40	
6.1.1	Patents by origin/bn PPP$ GDP	1.6	55	
6.1.2	PCT patent applications/bn PPP$ GDP	0.2	47	
6.1.3	Utility models by origin/bn PPP$ GDP	2.2	13	
6.1.4	Scientific & technical articles/bn PPP$ GDP	20.2	36	
6.1.5	Citable documents H index	180.0	41	
6.2	Knowledge impact	49.7	19	●
6.2.1	Growth rate of PPP$ GDP/worker, %	1.0	65	
6.2.2	New businesses/th pop. 15–64	3.1	37	
6.2.3	Computer software spending, % GDP	0.3	40	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	30.1	8	●
6.2.5	High- & medium-high-tech manufactures, %	57.9	3	●
6.3	Knowledge diffusion	24.3	67	
6.3.1	Intellectual property receipts, % total trade	0.0	70	○
6.3.2	High-tech exports less re-exports, % total trade	9.2	21	●
6.3.3	ICT services exports, % total trade	1.0	78	
6.3.4	FDI net outflows, % GDP	0.4	68	
7	**Creative outputs**	**38.6**	**38**	
7.1	Intangible assets	47.6	48	
7.1.1	Trademarks by origin/bn PPP$ GDP	70.1	23	
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.6	34	
7.1.3	ICTs & business model creation†	60.4	56	
7.1.4	ICTs & organizational model creation†	57.6	43	
7.2	Creative goods & services	37.4	23	●
7.2.1	Cultural & creative services exports, % of total trade	0.0	80	○
7.2.2	National feature films/mn pop. 15–69	5.3	35	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	0.6	81	○
7.2.5	Creative goods exports, % total trade	10.3	2	●
7.3	Online creativity	21.7	39	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.4	61	
7.3.2	Country-code TLDs/th pop. 15–69	29.0	24	●
7.3.3	Wikipedia edits/mn pop. 15–69	3,369.6	38	
7.3.4	Video uploads on YouTube/pop. 15–69	29.5	41	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Slovenia

Key indicators

Population (millions)	2.1
GDP (US$ billions)	42.8
GDP per capita, PPP$	31,007.4
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**46.0**	**32**	
Innovation Output Sub-Index		38.9	33	
Innovation Input Sub-Index		53.0	31	
Innovation Efficiency Ratio		0.7	39	
Global Innovation Index 2015 (out of 141)		48.5	28	
1	**Institutions**	**80.8**	**23**	
1.1	Political environment	74.8	31	
1.1.1	Political stability & safety*	82.6	28	
1.1.2	Government effectiveness*	67.1	34	
1.2	Regulatory environment	80.5	28	
1.2.1	Regulatory quality*	61.2	42	
1.2.2	Rule of law*	71.5	31	
1.2.3	Cost of redundancy dismissal, salary weeks	10.7	38	
1.3	Business environment	87.2	13	●
1.3.1	Ease of starting a business*	94.5	18	
1.3.2	Ease of resolving insolvency*	83.4	11	●
1.3.3	Ease of paying taxes*	83.7	31	
2	**Human capital & research**	**50.4**	**24**	
2.1	Education	63.0	15	
2.1.1	Expenditure on education, % GDP	5.7	32	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	30.8	17	
2.1.3	School life expectancy, years	17.6	12	●
2.1.4	PISA scales in reading, maths, & science	498.9	21	
2.1.5	Pupil-teacher ratio, secondary[d]	10.1	28	
2.2	Tertiary education	46.7	26	
2.2.1	Tertiary enrolment, % gross	85.2	8	●
2.2.2	Graduates in science & engineering, %[d]	24.7	30	
2.2.3	Tertiary inbound mobility, %	2.6	59	
2.3	Research & development (R&D)	41.3	26	
2.3.1	Researchers, FTE/mn pop.	4,149.9	20	
2.3.2	Gross expenditure on R&D, % GDP	2.4	12	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	97.2	31	
2.3.4	QS university ranking, average score top 3*	8.5	63	
3	**Infrastructure**	**50.7**	**42**	
3.1	Information & communication technologies (ICTs)	53.8	54	
3.1.1	ICT access*	79.4	24	
3.1.2	ICT use*	54.2	41	
3.1.3	Government's online service*	42.5	76	
3.1.4	E-participation*	39.2	80	○
3.2	General infrastructure	42.5	37	
3.2.1	Electricity output, kWh/cap	8,330.1	20	
3.2.2	Logistics performance*	3.4	37	
3.2.3	Gross capital formation, % GDP	19.8	87	○
3.3	Ecological sustainability	55.9	22	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.7	59	
3.3.2	Environmental performance*	89.0	5	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.9	14	
4	**Market sophistication**	**40.5**	**84**	○
4.1	Credit	27.8	83	○
4.1.1	Ease of getting credit*	35.0	101	○
4.1.2	Domestic credit to private sector, % GDP	55.0	56	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	32.6	83	○
4.2.1	Ease of protecting minority investors*	75.0	7	●
4.2.2	Market capitalization, % GDP	15.2	72	○
4.2.3	Total value of stocks traded, % GDP	1.5	52	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	55	○
4.3	Trade, competition, & market scale	61.1	62	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	68.7	62	
4.3.3	Domestic market scale, bn PPP$	61.6	89	○
5	**Business sophistication**	**42.5**	**27**	
5.1	Knowledge workers	61.5	15	
5.1.1	Knowledge-intensive employment, %	41.7	21	
5.1.2	Firms offering formal training, % firms	41.5	36	
5.1.3	GERD performed by business, % of GDP	1.8	11	
5.1.4	GERD financed by business, %	68.4	5	●
5.1.5	Females employed w/advanced degrees, % total	18.8	27	
5.2	Innovation linkages	31.6	60	
5.2.1	University/industry research collaboration†	49.3	43	
5.2.2	State of cluster development†	40.9	85	○
5.2.3	GERD financed by abroad, %	9.3	47	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	1.7	21	
5.3	Knowledge absorption	34.4	38	
5.3.1	Intellectual property payments, % total trade	0.7	44	
5.3.2	High-tech imports less re-imports, % total trade	5.7	84	○
5.3.3	ICT services imports, % total trade	1.8	24	
5.3.4	FDI net inflows, % GDP	2.1	77	
5.3.5	Research talent, % in business enterprise	54.1	19	
6	**Knowledge & technology outputs**	**33.9**	**34**	
6.1	Knowledge creation	23.6	39	
6.1.1	Patents by origin/bn PPP$ GDP	2.0	47	
6.1.2	PCT patent applications/bn PPP$ GDP	1.3	27	
6.1.3	Utility models by origin/bn PPP$ GDP[d]	0.2	44	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	58.4	3	●
6.1.5	Citable documents H index	189.0	40	
6.2	Knowledge impact	55.4	7	●
6.2.1	Growth rate of PPP$ GDP/worker, %	2.0	39	
6.2.2	New businesses/th pop. 15–64	4.4	27	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	27.2	13	●
6.2.5	High- & medium-high-tech manufactures, %	48.0	9	●
6.3	Knowledge diffusion	22.6	76	
6.3.1	Intellectual property receipts, % total trade	0.2	33	
6.3.2	High-tech exports less re-exports, % total trade	4.5	35	
6.3.3	ICT services exports, % total trade	1.7	58	
6.3.4	FDI net outflows, % GDP	(0.1)	104	○
7	**Creative outputs**	**44.0**	**27**	
7.1	Intangible assets	55.9	20	
7.1.1	Trademarks by origin/bn PPP$ GDP[d]	111.6	9	●
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	6.4	22	
7.1.3	ICTs & business model creation†	59.0	60	
7.1.4	ICTs & organizational model creation†	57.3	45	
7.2	Creative goods & services	37.3	24	
7.2.1	Cultural & creative services exports, % of total trade[d]	0.9	13	
7.2.2	National feature films/mn pop. 15–69	8.6	17	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	1.8	28	
7.2.5	Creative goods exports, % total trade	0.8	46	
7.3	Online creativity	27.0	34	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	22.7	28	
7.3.2	Country-code TLDs/th pop. 15–69	28.3	25	
7.3.3	Wikipedia edits/mn pop. 15–69	3,298.3	39	
7.3.4	Video uploads on YouTube/pop. 15–69	32.9	36	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

South Africa

Key indicators

Population (millions)	54.5
GDP (US$ billions)	313.0
GDP per capita, PPP$	13,165.2
Income group	Upper-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.8**	**54**	
Innovation Output Sub-Index		25.6	71	
Innovation Input Sub-Index		46.1	47	
Innovation Efficiency Ratio		0.6	99	○
Global Innovation Index 2015 (out of 141)		37.4	60	
1	**Institutions**	**69.1**	**46**	
1.1	Political environment	54.6	56	
1.1.1	Political stability & safety*	61.0	72	
1.1.2	Government effectiveness*	48.2	51	
1.2	Regulatory environment	74.6	38	
1.2.1	Regulatory quality*	52.7	59	
1.2.2	Rule of law*	51.1	53	
1.2.3	Cost of redundancy dismissal, salary weeks	9.3	28	
1.3	Business environment	78.1	38	
1.3.1	Ease of starting a business*	81.2	89	
1.3.2	Ease of resolving insolvency*	64.3	38	
1.3.3	Ease of paying taxes*	88.8	19	●
2	**Human capital & research**	**33.1**	**55**	
2.1	Education	44.4	74	
2.1.1	Expenditure on education, % GDP	6.1	24	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.0	61	
2.1.3	School life expectancy, years	13.2	68	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	25.0	94	○
2.2	Tertiary education	27.4	89	
2.2.1	Tertiary enrolment, % gross	19.7	92	○
2.2.2	Graduates in science & engineering, %	19.0	63	
2.2.3	Tertiary inbound mobility, %	4.1	37	
2.3	Research & development (R&D)	27.7	40	
2.3.1	Researchers, FTE/mn pop.[d]	404.7	62	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.7	45	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	46.0	37	
2.3.4	QS university ranking, average score top 3*	46.6	32	
3	**Infrastructure**	**37.4**	**85**	
3.1	Information & communication technologies (ICTs)	39.7	84	
3.1.1	ICT access*	53.1	74	
3.1.2	ICT use*	33.7	73	
3.1.3	Government's online service*	38.6	83	
3.1.4	E-participation*	33.3	89	○
3.2	General infrastructure	38.6	54	
3.2.1	Electricity output, kWh/cap	4,762.8	43	
3.2.2	Logistics performance*	3.4	33	
3.2.3	Gross capital formation, % GDP	20.0	85	
3.3	Ecological sustainability	33.8	101	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.2	110	○
3.3.2	Environmental performance*	70.5	74	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.3	55	
4	**Market sophistication**	**58.7**	**17**	●
4.1	Credit	39.9	44	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	151.5	7	●
4.1.3	Microfinance gross loans, % GDP[d]	0.0	77	○
4.2	Investment	66.0	10	●
4.2.1	Ease of protecting minority investors*	71.7	14	●
4.2.2	Market capitalization, % GDP	266.8	1	●
4.2.3	Total value of stocks traded, % GDP	92.7	6	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	49	
4.3	Trade, competition, & market scale	70.3	33	
4.3.1	Applied tariff rate, weighted mean, %	4.0	71	
4.3.2	Intensity of local competition†	72.5	42	
4.3.3	Domestic market scale, bn PPP$	707.1	28	●
5	**Business sophistication**	**32.2**	**56**	
5.1	Knowledge workers	36.4	70	
5.1.1	Knowledge-intensive employment, %	24.8	56	
5.1.2	Firms offering formal training, % firms[d]	36.8	41	
5.1.3	GERD performed by business, % of GDP[d]	0.3	43	
5.1.4	GERD financed by business, %[d]	38.3	39	
5.1.5	Females employed w/advanced degrees, % total	10.2	62	
5.2	Innovation linkages	31.7	59	
5.2.1	University/industry research collaboration†	58.1	30	
5.2.2	State of cluster development†	53.6	32	
5.2.3	GERD financed by abroad, %[d]	13.1	35	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	44	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.4	35	
5.3	Knowledge absorption	28.6	63	
5.3.1	Intellectual property payments, % total trade	1.5	15	●
5.3.2	High-tech imports less re-imports, % total trade	9.7	34	
5.3.3	ICT services imports, % total trade	0.9	64	
5.3.4	FDI net inflows, % GDP	1.6	88	
5.3.5	Research talent, % in business enterprise[d]	21.3	52	
6	**Knowledge & technology outputs**	**24.7**	**63**	
6.1	Knowledge creation	15.7	52	
6.1.1	Patents by origin/bn PPP$ GDP	1.1	62	
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	38	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	15.6	46	
6.1.5	Citable documents H index	292.0	33	
6.2	Knowledge impact	35.4	67	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.4)	94	○
6.2.2	New businesses/th pop. 15–64[d]	6.5	18	●
6.2.3	Computer software spending, % GDP	0.4	25	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.3	61	
6.2.5	High- & medium-high-tech manufactures, %[d]	28.2	42	
6.3	Knowledge diffusion	22.9	73	
6.3.1	Intellectual property receipts, % total trade	0.1	50	
6.3.2	High-tech exports less re-exports, % total trade	2.5	48	
6.3.3	ICT services exports, % total trade	0.5	94	○
6.3.4	FDI net outflows, % GDP	2.0	32	
7	**Creative outputs**	**26.5**	**77**	
7.1	Intangible assets	38.2	83	
7.1.1	Trademarks by origin/bn PPP$ GDP	29.0	68	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.1	64	
7.1.3	ICTs & business model creation†	59.2	59	
7.1.4	ICTs & organizational model creation†	56.1	53	
7.2	Creative goods & services	24.7	55	
7.2.1	Cultural & creative services exports, % of total trade	0.1	47	
7.2.2	National feature films/mn pop. 15–69	0.7	83	○
7.2.3	Global ent. & media market/th pop. 15–69	8.1	38	
7.2.4	Printing & publishing manufactures, %[d]	2.4	15	●
7.2.5	Creative goods exports, % total trade	0.8	42	
7.3	Online creativity	4.8	77	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	3.5	60	
7.3.2	Country-code TLDs/th pop. 15–69	10.2	40	
7.3.3	Wikipedia edits/mn pop. 15–69	363.8	93	○
7.3.4	Video uploads on YouTube/pop. 15–69	3.0	67	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Spain

Key indicators

Population (millions)	46.1
GDP (US$ billions)	1,199.7
GDP per capita, PPP$	34,819.5
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**49.2**	**28**	
Innovation Output Sub-Index		41.1	28	
Innovation Input Sub-Index		57.3	22	
Innovation Efficiency Ratio		0.7	48	
Global Innovation Index 2015 (out of 141)		49.1	27	
1	**Institutions**	**75.3**	**33**	
1.1	Political environment	70.9	37	
1.1.1	Political stability & safety*	70.7	48	
1.1.2	Government effectiveness*	71.1	25	
1.2	Regulatory environment	74.3	39	
1.2.1	Regulatory quality*	64.0	37	
1.2.2	Rule of law*	70.5	32	
1.2.3	Cost of redundancy dismissal, salary weeks	17.4	76	○
1.3	Business environment	80.5	29	
1.3.1	Ease of starting a business*	86.3	63	○
1.3.2	Ease of resolving insolvency*	75.8	23	
1.3.3	Ease of paying taxes*	79.5	50	
2	**Human capital & research**	**49.7**	**25**	
2.1	Education	56.4	36	
2.1.1	Expenditure on education, % GDP	4.4	71	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	25.8	30	
2.1.3	School life expectancy, years	17.6	13	●
2.1.4	PISA scales in reading, maths, & science	489.6	27	
2.1.5	Pupil-teacher ratio, secondary◴	11.4	38	
2.2	Tertiary education	44.7	31	
2.2.1	Tertiary enrolment, % gross	87.1	6	●
2.2.2	Graduates in science & engineering, %◴	22.2	41	
2.2.3	Tertiary inbound mobility, %	2.9	55	○
2.3	Research & development (R&D)	48.2	22	
2.3.1	Researchers, FTE/mn pop.	2,640.9	33	
2.3.2	Gross expenditure on R&D, % GDP	1.2	30	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	926.8	14	●
2.3.4	QS university ranking, average score top 3*	56.3	21	
3	**Infrastructure**	**62.6**	**10**	●
3.1	Information & communication technologies (ICTs)	79.3	14	●
3.1.1	ICT access*	78.0	29	
3.1.2	ICT use*	66.2	26	
3.1.3	Government's online service*	94.5	4	●
3.1.4	E-participation*	78.4	19	
3.2	General infrastructure	43.6	36	
3.2.1	Electricity output, kWh/cap	5,895.9	32	
3.2.2	Logistics performance*	3.7	18	
3.2.3	Gross capital formation, % GDP	19.8	88	○
3.3	Ecological sustainability	64.8	4	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	11.0	21	
3.3.2	Environmental performance*	88.9	6	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	8.8	12	●
4	**Market sophistication**	**62.3**	**13**	●
4.1	Credit	55.2	17	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	129.1	17	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	51.4	22	
4.2.1	Ease of protecting minority investors*	65.0	28	
4.2.2	Market capitalization, % GDP	71.9	23	
4.2.3	Total value of stocks traded, % GDP	73.1	11	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	25	
4.3	Trade, competition, & market scale	80.1	8	●
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	76.9	18	
4.3.3	Domestic market scale, bn PPP$	1,572.1	16	
5	**Business sophistication**	**36.5**	**43**	
5.1	Knowledge workers	49.4	32	
5.1.1	Knowledge-intensive employment, %	33.1	40	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.6	29	
5.1.4	GERD financed by business, %◴	46.3	26	
5.1.5	Females employed w/advanced degrees, % total	21.5	20	
5.2	Innovation linkages	27.4	75	○
5.2.1	University/industry research collaboration†	46.2	56	
5.2.2	State of cluster development†	48.7	49	
5.2.3	GERD financed by abroad, %◴	7.4	54	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	46	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.7	29	
5.3	Knowledge absorption	32.7	44	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	6.6	74	○
5.3.3	ICT services imports, % total trade	n/a	n/a	
5.3.4	FDI net inflows, % GDP	2.5	69	○
5.3.5	Research talent, % in business enterprise	36.5	35	
6	**Knowledge & technology outputs**	**38.6**	**26**	
6.1	Knowledge creation	32.6	29	
6.1.1	Patents by origin/bn PPP$ GDP	2.8	38	
6.1.2	PCT patent applications/bn PPP$ GDP	0.9	29	
6.1.3	Utility models by origin/bn PPP$ GDP	1.7	17	
6.1.4	Scientific & technical articles/bn PPP$ GDP	32.2	23	
6.1.5	Citable documents H index	591.0	12	●
6.2	Knowledge impact	45.7	27	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.1	87	○
6.2.2	New businesses/th pop. 15–64	3.0	38	
6.2.3	Computer software spending, % GDP	0.6	6	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	22.9	15	●
6.2.5	High- & medium-high-tech manufactures, %	34.4	31	
6.3	Knowledge diffusion	37.5	29	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	3.8	36	
6.3.3	ICT services exports, % total trade	n/a	n/a	
6.3.4	FDI net outflows, % GDP	2.3	28	
7	**Creative outputs**	**43.6**	**28**	
7.1	Intangible assets	55.9	19	
7.1.1	Trademarks by origin/bn PPP$ GDP	58.7	33	
7.1.2	Industrial designs by origin/bn PPP$ GDP	13.7	9	●
7.1.3	ICTs & business model creation†	68.9	29	
7.1.4	ICTs & organizational model creation†	57.5	44	
7.2	Creative goods & services	26.9	48	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	6.9	25	
7.2.3	Global ent. & media market/th pop. 15–69	25.0	25	
7.2.4	Printing & publishing manufactures, %	1.4	41	
7.2.5	Creative goods exports, % total trade	0.8	44	
7.3	Online creativity	35.8	26	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	29.7	22	
7.3.2	Country-code TLDs/th pop. 15–69	19.5	31	
7.3.3	Wikipedia edits/mn pop. 15–69	5,678.2	20	
7.3.4	Video uploads on YouTube/pop. 15–69	52.1	18	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Sri Lanka

Key indicators

Population (millions)	20.7
GDP (US$ billions)	82.1
GDP per capita, PPP$	10,566.2
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**28.9**	**91**	
Innovation Output Sub-Index		23.8	78	
Innovation Input Sub-Index		34.1	98	
Innovation Efficiency Ratio		0.7	54	
Global Innovation Index 2015 (out of 141)		30.8	85	
1	**Institutions**	**44.3**	**116**	○
1.1	Political environment	49.1	68	
1.1.1	Political stability & safety*	56.6	83	
1.1.2	Government effectiveness*	41.5	66	
1.2	Regulatory environment	21.5	125	○
1.2.1	Regulatory quality*	42.7	76	
1.2.2	Rule of law*	43.4	69	
1.2.3	Cost of redundancy dismissal, salary weeks	58.5	126	○
1.3	Business environment	62.2	88	
1.3.1	Ease of starting a business*	85.0	75	
1.3.2	Ease of resolving insolvency*	46.4	70	
1.3.3	Ease of paying taxes*	55.2	110	○
2	**Human capital & research**	**18.3**	**107**	
2.1	Education	29.3	111	○
2.1.1	Expenditure on education, % GDP	1.7	117	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	6.9	105	○
2.1.3	School life expectancy, years	14.0	60	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	17.3	75	
2.2	Tertiary education	23.7	99	
2.2.1	Tertiary enrolment, % gross	20.7	91	
2.2.2	Graduates in science & engineering, %	19.9	57	
2.2.3	Tertiary inbound mobility, %	0.3	94	○
2.3	Research & development (R&D)	2.1	90	
2.3.1	Researchers, FTE/mn pop.[d]	110.9	82	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.1	102	○
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	5.7	67	
3	**Infrastructure**	**44.9**	**58**	
3.1	Information & communication technologies (ICTs)	46.5	74	
3.1.1	ICT access*	41.7	94	
3.1.2	ICT use*	14.4	100	
3.1.3	Government's online service*	65.4	37	●
3.1.4	E-participation*	64.7	33	●
3.2	General infrastructure	32.9	69	
3.2.1	Electricity output, kWh/cap	587.1	100	
3.2.2	Logistics performance*	2.7	84	
3.2.3	Gross capital formation, % GDP	29.8	21	●
3.3	Ecological sustainability	55.3	23	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	17.2	2	●
3.3.2	Environmental performance*	65.6	91	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.8	70	
4	**Market sophistication**	**38.1**	**97**	
4.1	Credit	18.2	110	○
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	26.8	100	
4.1.3	Microfinance gross loans, % GDP	0.0	67	
4.2	Investment	34.1	74	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	30.0	50	
4.2.3	Total value of stocks traded, % GDP	3.3	47	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	62.0	58	
4.3.1	Applied tariff rate, weighted mean, %[d]	6.3	93	
4.3.2	Intensity of local competition†	77.8	16	●
4.3.3	Domestic market scale, bn PPP$	218.2	59	
5	**Business sophistication**	**24.8**	**102**	
5.1	Knowledge workers	24.0	100	
5.1.1	Knowledge-intensive employment, %	16.9	82	
5.1.2	Firms offering formal training, % firms[d]	18.4	83	○
5.1.3	GERD performed by business, % of GDP[d]	0.0	70	
5.1.4	GERD financed by business, %[d]	40.7	34	●
5.1.5	Females employed w/advanced degrees, % total[d]	7.6	70	
5.2	Innovation linkages	22.2	100	
5.2.1	University/industry research collaboration†	34.6	100	
5.2.2	State of cluster development†	45.9	60	
5.2.3	GERD financed by abroad, %[d]	5.0	67	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	33	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	92	
5.3	Knowledge absorption	28.1	67	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	4.8	98	
5.3.3	ICT services imports, % total trade	2.0	18	●
5.3.4	FDI net inflows, % GDP	1.2	96	
5.3.5	Research talent, % in business enterprise[d]	30.7	41	
6	**Knowledge & technology outputs**	**22.4**	**76**	
6.1	Knowledge creation	5.5	91	
6.1.1	Patents by origin/bn PPP$ GDP[d]	1.6	53	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	71	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.9	110	○
6.1.5	Citable documents H index	107.0	74	
6.2	Knowledge impact	33.2	79	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.4	11	●
6.2.2	New businesses/th pop. 15–64[d]	0.5	89	
6.2.3	Computer software spending, % GDP	0.3	28	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.3	73	
6.2.5	High- & medium-high-tech manufactures, %[d]	6.3	88	○
6.3	Knowledge diffusion	28.4	43	●
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.4	84	
6.3.3	ICT services exports, % total trade	3.7	17	●
6.3.4	FDI net outflows, % GDP	0.1	81	
7	**Creative outputs**	**25.2**	**84**	
7.1	Intangible assets	38.9	80	
7.1.1	Trademarks by origin/bn PPP$ GDP[d]	27.4	71	
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	1.3	59	
7.1.3	ICTs & business model creation†	61.1	52	
7.1.4	ICTs & organizational model creation†	57.0	47	
7.2	Creative goods & services	21.2	69	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	1.0	71	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	1.9	27	●
7.2.5	Creative goods exports, % total trade	0.3	71	
7.3	Online creativity	1.7	98	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.8	100	
7.3.2	Country-code TLDs/th pop. 15–69	0.2	102	
7.3.3	Wikipedia edits/mn pop. 15–69	536.6	88	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Sweden

Key indicators

Population (millions)	9.8
GDP (US$ billions)	492.6
GDP per capita, PPP$	47,922.2
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**63.6**	**2**	●
Innovation Output Sub-Index		58.7	2	●
Innovation Input Sub-Index		68.5	5	●
Innovation Efficiency Ratio		0.9	10	
Global Innovation Index 2015 (out of 141)		62.4	3	
1	**Institutions**	**88.3**	**11**	
1.1	Political environment	89.2	10	
1.1.1	Political stability & safety*	89.6	13	
1.1.2	Government effectiveness*	88.7	10	
1.2	Regulatory environment	90.2	14	
1.2.1	Regulatory quality*	89.4	9	
1.2.2	Rule of law*	96.8	6	●
1.2.3	Cost of redundancy dismissal, salary weeks	14.4	59	○
1.3	Business environment	85.6	18	
1.3.1	Ease of starting a business*	94.6	16	
1.3.2	Ease of resolving insolvency*	78.8	18	
1.3.3	Ease of paying taxes*	83.5	33	
2	**Human capital & research**	**64.8**	**5**	●
2.1	Education	69.1	9	
2.1.1	Expenditure on education, % GDP	7.7	5	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	31.1	16	
2.1.3	School life expectancy, years	18.1	9	
2.1.4	PISA scales in reading, maths, & science	482.1	34	○
2.1.5	Pupil-teacher ratio, secondary◴	9.5	20	
2.2	Tertiary education	46.9	25	
2.2.1	Tertiary enrolment, % gross	63.4	35	
2.2.2	Graduates in science & engineering, %	25.7	24	
2.2.3	Tertiary inbound mobility, %	5.8	29	
2.3	Research & development (R&D)	78.4	4	●
2.3.1	Researchers, FTE/mn pop.	6,868.1	5	
2.3.2	Gross expenditure on R&D, % GDP	3.2	5	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	1,996.3	11	
2.3.4	QS university ranking, average score top 3*	71.6	13	
3	**Infrastructure**	**66.3**	**5**	●
3.1	Information & communication technologies (ICTs)	75.7	20	
3.1.1	ICT access*	89.0	10	
3.1.2	ICT use*	83.2	6	●
3.1.3	Government's online service*	70.1	28	
3.1.4	E-participation*	60.8	45	○
3.2	General infrastructure	64.0	5	●
3.2.1	Electricity output, kWh/cap	15,889.2	7	
3.2.2	Logistics performance*	4.0	6	●
3.2.3	Gross capital formation, % GDP	24.5	45	
3.3	Ecological sustainability	59.3	15	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.6	61	○
3.3.2	Environmental performance*	90.4	3	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	8.9	10	
4	**Market sophistication**	**66.2**	**9**	
4.1	Credit	53.3	18	
4.1.1	Ease of getting credit*	55.0	63	○
4.1.2	Domestic credit to private sector, % GDP	131.8	13	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	72.2	7	
4.2.1	Ease of protecting minority investors*	71.7	14	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	11	
4.3	Trade, competition, & market scale	73.0	23	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	74.3	32	
4.3.3	Domestic market scale, bn PPP$	450.5	39	
5	**Business sophistication**	**56.8**	**5**	●
5.1	Knowledge workers	77.6	2	●
5.1.1	Knowledge-intensive employment, %	49.4	5	●
5.1.2	Firms offering formal training, % firms	70.3	3	●
5.1.3	GERD performed by business, % of GDP	2.1	5	
5.1.4	GERD financed by business, %◴	61.0	8	
5.1.5	Females employed w/advanced degrees, % total	23.3	12	
5.2	Innovation linkages	45.7	17	
5.2.1	University/industry research collaboration†	72.1	11	
5.2.2	State of cluster development†	63.7	18	
5.2.3	GERD financed by abroad, %◴	6.7	59	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	21	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	7.7	4	●
5.3	Knowledge absorption	47.1	13	
5.3.1	Intellectual property payments, % total trade	1.6	13	
5.3.2	High-tech imports less re-imports, % total trade	9.0	48	○
5.3.3	ICT services imports, % total trade	3.2	6	●
5.3.4	FDI net inflows, % GDP	(0.4)	127	○
5.3.5	Research talent, % in business enterprise	66.7	6	
6	**Knowledge & technology outputs**	**63.9**	**2**	●
6.1	Knowledge creation	78.7	2	●
6.1.1	Patents by origin/bn PPP$ GDP	13.0	9	
6.1.2	PCT patent applications/bn PPP$ GDP	8.3	1	●
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	52.9	6	●
6.1.5	Citable documents H index	614.0	11	
6.2	Knowledge impact	49.1	20	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.9	69	○
6.2.2	New businesses/th pop. 15–64	6.9	16	
6.2.3	Computer software spending, % GDP	0.6	17	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	11.1	34	
6.2.5	High- & medium-high-tech manufactures, %	47.3	10	
6.3	Knowledge diffusion	64.0	4	●
6.3.1	Intellectual property receipts, % total trade	3.7	1	●
6.3.2	High-tech exports less re-exports, % total trade	8.8	24	
6.3.3	ICT services exports, % total trade	6.7	6	●
6.3.4	FDI net outflows, % GDP	3.6	14	
7	**Creative outputs**	**53.4**	**9**	
7.1	Intangible assets	55.7	21	
7.1.1	Trademarks by origin/bn PPP$ GDP	52.2	41	
7.1.2	Industrial designs by origin/bn PPP$ GDP	5.0	27	
7.1.3	ICTs & business model creation†	77.3	9	
7.1.4	ICTs & organizational model creation†	75.7	9	
7.2	Creative goods & services	42.0	14	
7.2.1	Cultural & creative services exports, % of total trade◴	0.7	17	
7.2.2	National feature films/mn pop. 15–69	9.0	14	
7.2.3	Global ent. & media market/th pop. 15–69	70.5	5	
7.2.4	Printing & publishing manufactures, %	1.4	38	○
7.2.5	Creative goods exports, % total trade	1.7	26	
7.3	Online creativity	60.2	12	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	45.7	17	
7.3.2	Country-code TLDs/th pop. 15–69	73.8	9	
7.3.3	Wikipedia edits/mn pop. 15–69	7,625.1	12	
7.3.4	Video uploads on YouTube/pop. 15–69	64.8	14	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Switzerland

Key indicators

Population (millions)	8.3
GDP (US$ billions)	664.6
GDP per capita, PPP$	58,551.5
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**66.3**	**1**	●
Innovation Output Sub-Index		64.2	1	●
Innovation Input Sub-Index		68.4	6	
Innovation Efficiency Ratio		0.9	5	
Global Innovation Index 2015 (out of 141)		68.3	1	
1	**Institutions**	**90.3**	**9**	
1.1	Political environment	96.0	3	●
1.1.1	Political stability & safety*	93.8	5	
1.1.2	Government effectiveness*	98.2	2	●
1.2	Regulatory environment	94.7	9	
1.2.1	Regulatory quality*	89.8	8	
1.2.2	Rule of law*	97.4	5	
1.2.3	Cost of redundancy dismissal, salary weeks	10.1	34	
1.3	Business environment	80.1	31	
1.3.1	Ease of starting a business*	88.5	57	○
1.3.2	Ease of resolving insolvency*	62.6	41	
1.3.3	Ease of paying taxes*	89.1	18	
2	**Human capital & research**	**63.3**	**6**	
2.1	Education	57.6	32	
2.1.1	Expenditure on education, % GDP	5.0	47	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	26.1	28	
2.1.3	School life expectancy, years[d]	15.8	35	
2.1.4	PISA scales in reading, maths, & science	518.4	11	
2.1.5	Pupil-teacher ratio, secondary[d]	9.3	17	
2.2	Tertiary education	55.7	11	
2.2.1	Tertiary enrolment, % gross	56.3	46	
2.2.2	Graduates in science & engineering, %	22.1	44	○
2.2.3	Tertiary inbound mobility, %	16.9	7	
2.3	Research & development (R&D)	76.6	6	
2.3.1	Researchers, FTE/mn pop.[d]	4,481.1	14	
2.3.2	Gross expenditure on R&D, % GDP[d]	3.0	8	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	5,207.0	3	●
2.3.4	QS university ranking, average score top 3*	87.2	3	●
3	**Infrastructure**	**61.0**	**15**	
3.1	Information & communication technologies (ICTs)	64.9	39	
3.1.1	ICT access*	92.0	6	
3.1.2	ICT use*	80.1	9	
3.1.3	Government's online service*	50.4	64	○
3.1.4	E-participation*	37.3	84	○
3.2	General infrastructure	52.4	14	
3.2.1	Electricity output, kWh/cap	8,546.4	18	
3.2.2	Logistics performance*	3.8	14	
3.2.3	Gross capital formation, % GDP	23.8	51	
3.3	Ecological sustainability	65.6	3	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	13.9	9	
3.3.2	Environmental performance*	86.9	16	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.2	18	
4	**Market sophistication**	**69.8**	**7**	
4.1	Credit	63.7	11	
4.1.1	Ease of getting credit*	60.0	53	○
4.1.2	Domestic credit to private sector, % GDP	171.1	6	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	70.3	9	
4.2.1	Ease of protecting minority investors*	50.0	86	○
4.2.2	Market capitalization, % GDP	213.3	1	●
4.2.3	Total value of stocks traded, % GDP	105.3	5	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	13	
4.3	Trade, competition, & market scale	75.2	19	
4.3.1	Applied tariff rate, weighted mean, %	0.0	1	●
4.3.2	Intensity of local competition†	75.3	29	
4.3.3	Domestic market scale, bn PPP$	473.3	37	
5	**Business sophistication**	**57.6**	**3**	●
5.1	Knowledge workers	71.0	3	●
5.1.1	Knowledge-intensive employment, %	52.1	3	●
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP[d]	2.1	7	
5.1.4	GERD financed by business, %[d]	60.8	10	
5.1.5	Females employed w/advanced degrees, % total	17.0	30	
5.2	Innovation linkages	51.7	6	
5.2.1	University/industry research collaboration†	79.8	3	●
5.2.2	State of cluster development†	71.7	6	
5.2.3	GERD financed by abroad, %[d]	12.1	41	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	13	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	6.9	5	
5.3	Knowledge absorption	50.0	9	
5.3.1	Intellectual property payments, % total trade	3.1	4	●
5.3.2	High-tech imports less re-imports, % total trade	8.1	56	○
5.3.3	ICT services imports, % total trade	3.3	5	
5.3.4	FDI net inflows, % GDP	3.2	53	○
5.3.5	Research talent, % in business enterprise[d]	46.2	28	
6	**Knowledge & technology outputs**	**67.0**	**1**	●
6.1	Knowledge creation	88.2	1	●
6.1.1	Patents by origin/bn PPP$ GDP	17.6	1	●
6.1.2	PCT patent applications/bn PPP$ GDP	8.9	1	●
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	55.8	4	●
6.1.5	Citable documents H index	686.0	9	
6.2	Knowledge impact	55.5	6	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.3	83	○
6.2.2	New businesses/th pop. 15–64[d]	2.5	40	
6.2.3	Computer software spending, % GDP	0.8	3	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	23.7	14	
6.2.5	High- & medium-high-tech manufactures, %	66.1	2	●
6.3	Knowledge diffusion	57.3	7	
6.3.1	Intellectual property receipts, % total trade	4.1	1	●
6.3.2	High-tech exports less re-exports, % total trade	14.2	11	
6.3.3	ICT services exports, % total trade	3.0	25	
6.3.4	FDI net outflows, % GDP	2.6	25	
7	**Creative outputs**	**61.4**	**5**	
7.1	Intangible assets	61.1	13	
7.1.1	Trademarks by origin/bn PPP$ GDP	73.0	20	
7.1.2	Industrial designs by origin/bn PPP$ GDP	9.0	14	
7.1.3	ICTs & business model creation†	78.3	8	
7.1.4	ICTs & organizational model creation†	70.9	17	
7.2	Creative goods & services	57.1	2	●
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	17.4	5	
7.2.3	Global ent. & media market/th pop. 15–69	85.9	2	●
7.2.4	Printing & publishing manufactures, %	1.3	45	○
7.2.5	Creative goods exports, % total trade	3.7	12	
7.3	Online creativity	66.2	5	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	64.9	12	
7.3.2	Country-code TLDs/th pop. 15–69	100.0	1	●
7.3.3	Wikipedia edits/mn pop. 15–69	4,555.6	32	
7.3.4	Video uploads on YouTube/pop. 15–69	66.2	12	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Tajikistan

Key indicators

Population (millions)	8.5
GDP (US$ billions)	7.8
GDP per capita, PPP$	2,749.4
Income group	Lower-middle income
Region	Central and Southern Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**29.6**	**86**	
Innovation Output Sub-Index		25.7	69	
Innovation Input Sub-Index		33.5	102	
Innovation Efficiency Ratio		0.8	29	●
Global Innovation Index 2015 (out of 141)		27.5	114	
1	**Institutions**	**46.6**	**109**	
1.1	Political environment	32.2	107	
1.1.1	Political stability & safety*	46.0	96	
1.1.2	Government effectiveness*	18.3	111	
1.2	Regulatory environment	53.3	101	
1.2.1	Regulatory quality*	19.7	120	
1.2.2	Rule of law*	23.1	119	
1.2.3	Cost of redundancy dismissal, salary weeks	15.5	66	
1.3	Business environment	54.3	115	
1.3.1	Ease of starting a business*	90.3	47	●
1.3.2	Ease of resolving insolvency*	29.0	118	
1.3.3	Ease of paying taxes*	43.5	119	
2	**Human capital & research**	**26.3**	**84**	
2.1	Education	44.6	71	
2.1.1	Expenditure on education, % GDP	4.0	81	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	11.3	94	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[4]	15.4	67	
2.2	Tertiary education	33.7	69	
2.2.1	Tertiary enrolment, % gross	24.5	86	
2.2.2	Graduates in science & engineering, %	28.1	12	●
2.2.3	Tertiary inbound mobility, %	0.6	88	
2.3	Research & development (R&D)	0.6	110	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP[4]	0.1	100	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**21.6**	**123**	
3.1	Information & communication technologies (ICTs)	9.0	126	○
3.1.1	ICT access*	n/a	n/a	
3.1.2	ICT use*	n/a	n/a	
3.1.3	Government's online service*	6.3	125	○
3.1.4	E-participation*	11.8	122	
3.2	General infrastructure	17.0	126	○
3.2.1	Electricity output, kWh/cap	2,084.7	77	
3.2.2	Logistics performance*	2.5	104	
3.2.3	Gross capital formation, % GDP	13.0	119	
3.3	Ecological sustainability	38.7	84	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.2	66	
3.3.2	Environmental performance*	73.1	66	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.0	125	○
4	**Market sophistication**	**50.4**	**32**	●
4.1	Credit	40.7	43	●
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP	21.5	106	
4.1.3	Microfinance gross loans, % GDP	6.1	5	●
4.2	Investment	65.0	12	
4.2.1	Ease of protecting minority investors*	65.0	28	●
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	45.6	113	
4.3.1	Applied tariff rate, weighted mean, %	5.7	90	
4.3.2	Intensity of local competition†	59.8	102	
4.3.3	Domestic market scale, bn PPP$	22.4	115	
5	**Business sophistication**	**22.7**	**113**	
5.1	Knowledge workers	26.8	94	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	33.1	47	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[4]	1.6	84	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	21.0	108	
5.2.1	University/industry research collaboration†	37.9	85	
5.2.2	State of cluster development†	33.2	110	
5.2.3	GERD financed by abroad, %[4]	0.2	96	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	20.2	99	
5.3.1	Intellectual property payments, % total trade	0.0	114	○
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	1.0	57	●
5.3.4	FDI net inflows, % GDP	2.8	62	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**27.0**	**54**	●
6.1	Knowledge creation	24.3	37	●
6.1.1	Patents by origin/bn PPP$ GDP	0.0	112	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP[4]	3.2	8	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	3.0	108	
6.1.5	Citable documents H index	28.0	125	○
6.2	Knowledge impact	34.0	77	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.7	9	●
6.2.2	New businesses/th pop. 15–64[4]	0.3	94	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.2	126	○
6.2.5	High- & medium-high-tech manufactures, %	5.8	89	
6.3	Knowledge diffusion	22.8	74	
6.3.1	Intellectual property receipts, % total trade	0.0	80	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	3.8	15	●
6.3.4	FDI net outflows, % GDP[4]	(1.9)	114	
7	**Creative outputs**	**24.5**	**86**	
7.1	Intangible assets	28.7	114	
7.1.1	Trademarks by origin/bn PPP$ GDP[4]	12.0	95	
7.1.2	Industrial designs by origin/bn PPP$ GDP[4]	0.0	107	○
7.1.3	ICTs & business model creation†	49.1	99	
7.1.4	ICTs & organizational model creation†	45.1	89	
7.2	Creative goods & services	40.1	17	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	1.8	58	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	2.4	16	●
7.2.5	Creative goods exports, % total trade	n/a	n/a	
7.3	Online creativity	0.4	111	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.1	125	○
7.3.2	Country-code TLDs/th pop. 15–69	0.4	95	
7.3.3	Wikipedia edits/mn pop. 15–69	97.5	109	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Tanzania, United Republic of

Key indicators

Population (millions)	53.5
GDP (US$ billions)	44.9
GDP per capita, PPP$	2,904.0
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**26.4**	**105**	
Innovation Output Sub-Index		23.6	80	
Innovation Input Sub-Index		29.1	117	
Innovation Efficiency Ratio		0.8	22	●
Global Innovation Index 2015 (out of 141)		27.0	117	
1	**Institutions**	**54.1**	**83**	
1.1	Political environment	35.4	101	
1.1.1	Political stability & safety*	49.5	92	
1.1.2	Government effectiveness*	21.2	104	
1.2	Regulatory environment	67.0	65	●
1.2.1	Regulatory quality*	36.2	90	
1.2.2	Rule of law*	36.9	87	
1.2.3	Cost of redundancy dismissal, salary weeks	9.3	28	●
1.3	Business environment	59.9	96	
1.3.1	Ease of starting a business*	79.6	97	
1.3.2	Ease of resolving insolvency*	41.0	87	
1.3.3	Ease of paying taxes*	59.3	103	
2	**Human capital & research**	**9.7**	**126**	○
2.1	Education	23.0	123	
2.1.1	Expenditure on education, % GDP	3.5	93	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	12.1	93	
2.1.3	School life expectancy, years	8.4	111	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary◴	26.4	97	
2.2	Tertiary education	2.6	[124]	
2.2.1	Tertiary enrolment, % gross	3.6	119	○
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	3.5	81	
2.3.1	Researchers, FTE/mn pop.◴	18.5	96	○
2.3.2	Gross expenditure on R&D, % GDP◴	0.5	60	●
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	2.5	71	●
3	**Infrastructure**	**26.8**	**111**	
3.1	Information & communication technologies (ICTs)	24.2	107	
3.1.1	ICT access*	24.8	119	○
3.1.2	ICT use*	2.7	123	○
3.1.3	Government's online service*	29.9	101	
3.1.4	E-participation*	39.2	80	
3.2	General infrastructure	28.6	89	
3.2.1	Electricity output, kWh/cap	113.2	115	○
3.2.2	Logistics performance*	2.3	117	
3.2.3	Gross capital formation, % GDP	30.9	15	●
3.3	Ecological sustainability	27.5	119	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	4.3	108	
3.3.2	Environmental performance*	58.3	105	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	110	
4	**Market sophistication**	**31.9**	**116**	
4.1	Credit	20.8	106	
4.1.1	Ease of getting credit*	25.0	118	
4.1.2	Domestic credit to private sector, % GDP	13.8	121	
4.1.3	Microfinance gross loans, % GDP	2.7	16	●
4.2	Investment	23.7	122	
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP◴	0.1	80	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	58	
4.3	Trade, competition, & market scale	51.1	97	
4.3.1	Applied tariff rate, weighted mean, %	8.4	106	
4.3.2	Intensity of local competition†	58.8	105	
4.3.3	Domestic market scale, bn PPP$	128.2	70	●
5	**Business sophistication**	**22.8**	**112**	
5.1	Knowledge workers	13.3	121	
5.1.1	Knowledge-intensive employment, %◴	2.6	105	○
5.1.2	Firms offering formal training, % firms	30.7	58	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %◴	0.1	93	○
5.1.5	Females employed w/advanced degrees, % total◴	0.7	86	○
5.2	Innovation linkages	33.2	55	●
5.2.1	University/industry research collaboration†	39.5	79	
5.2.2	State of cluster development†	41.0	82	
5.2.3	GERD financed by abroad, %◴	42.0	9	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	63	
5.2.5	Patent families 2+ offices/bn PPP$ GDP◴	0.0	103	
5.3	Knowledge absorption	22.0	94	
5.3.1	Intellectual property payments, % total trade◴	0.0	107	
5.3.2	High-tech imports less re-imports, % total trade	7.8	58	●
5.3.3	ICT services imports, % total trade◴	0.5	99	
5.3.4	FDI net inflows, % GDP	4.3	37	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**17.0**	**108**	
6.1	Knowledge creation	6.2	85	
6.1.1	Patents by origin/bn PPP$ GDP	n/a	n/a	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	90	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.6	82	
6.1.5	Citable documents H index	113.0	70	●
6.2	Knowledge impact	42.5	37	●
6.2.1	Growth rate of PPP$ GDP/worker, %	4.3	12	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.6	114	
6.2.5	High- & medium-high-tech manufactures, %◴	10.0	77	
6.3	Knowledge diffusion	2.2	126	○
6.3.1	Intellectual property receipts, % total trade◴	0.0	103	○
6.3.2	High-tech exports less re-exports, % total trade	0.3	91	
6.3.3	ICT services exports, % total trade◴	0.6	93	
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**30.3**	**61**	●
7.1	Intangible assets	43.5	60	●
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	47.4	104	
7.1.4	ICTs & organizational model creation†	39.7	109	
7.2	Creative goods & services	34.2	31	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %◴	2.8	8	●
7.2.5	Creative goods exports, % total trade	0.1	91	
7.3	Online creativity	0.2	119	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.2	118	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	107	
7.3.3	Wikipedia edits/mn pop. 15–69	38.6	113	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Thailand

Key indicators

Population (millions)	68.0
GDP (US$ billions)	395.3
GDP per capita, PPP$	16,097.4
Income group	Upper-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**36.5**	**52**	
Innovation Output Sub-Index		30.0	50	
Innovation Input Sub-Index		43.0	57	
Innovation Efficiency Ratio		0.7	53	
Global Innovation Index 2015 (out of 141)		38.1	55	
1	**Institutions**	**54.7**	**81**	
1.1	Political environment	44.4	82	
1.1.1	Political stability & safety*	40.3	107	○
1.1.2	Government effectiveness*	48.5	50	
1.2	Regulatory environment	46.0	111	○
1.2.1	Regulatory quality*	51.3	60	
1.2.2	Rule of law*	43.4	70	
1.2.3	Cost of redundancy dismissal, salary weeks	36.0	120	○
1.3	Business environment	73.9	54	
1.3.1	Ease of starting a business*	85.1	73	
1.3.2	Ease of resolving insolvency*	58.8	46	
1.3.3	Ease of paying taxes*	77.7	57	
2	**Human capital & research**	**30.7**	**70**	
2.1	Education	43.3	78	
2.1.1	Expenditure on education, % GDP	4.9	53	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.7	58	
2.1.3	School life expectancy, years	13.6	65	
2.1.4	PISA scales in reading, maths, & science	437.3	44	
2.1.5	Pupil-teacher ratio, secondary[d]	19.9	83	
2.2	Tertiary education	25.2	92	
2.2.1	Tertiary enrolment, % gross	51.4	52	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	0.8	83	○
2.3	Research & development (R&D)	23.5	43	
2.3.1	Researchers, FTE/mn pop.[d]	543.5	59	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.4	72	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	41.4	38	
2.3.4	QS university ranking, average score top 3*	38.2	36	
3	**Infrastructure**	**42.8**	**68**	
3.1	Information & communication technologies (ICTs)	48.4	71	
3.1.1	ICT access*	52.0	77	
3.1.2	ICT use*	42.8	60	
3.1.3	Government's online service*	44.1	73	
3.1.4	E-participation*	54.9	54	
3.2	General infrastructure	40.1	46	
3.2.1	Electricity output, kWh/cap	2,472.9	70	
3.2.2	Logistics performance*	3.4	34	
3.2.3	Gross capital formation, % GDP	24.7	42	
3.3	Ecological sustainability	39.8	78	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.2	87	
3.3.2	Environmental performance*	69.5	81	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	3.1	30	
4	**Market sophistication**	**51.4**	**28**	
4.1	Credit	34.2	60	
4.1.1	Ease of getting credit*	45.0	81	
4.1.2	Domestic credit to private sector, % GDP	146.8	8	●
4.1.3	Microfinance gross loans, % GDP[d]	0.0	82	○
4.2	Investment	48.8	24	●
4.2.1	Ease of protecting minority investors*	63.3	35	
4.2.2	Market capitalization, % GDP	106.3	9	●
4.2.3	Total value of stocks traded, % GDP	76.7	8	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	77	○
4.3	Trade, competition, & market scale	71.2	31	
4.3.1	Applied tariff rate, weighted mean, %[d]	4.8	84	
4.3.2	Intensity of local competition†	72.7	41	
4.3.3	Domestic market scale, bn PPP$	1,069.6	20	●
5	**Business sophistication**	**35.3**	**49**	
5.1	Knowledge workers	46.6	37	
5.1.1	Knowledge-intensive employment, %	13.8	90	○
5.1.2	Firms offering formal training, % firms[d]	75.3	2	●
5.1.3	GERD performed by business, % of GDP[d]	0.2	52	
5.1.4	GERD financed by business, %[d]	51.7	18	●
5.1.5	Females employed w/advanced degrees, % total[d]	7.5	71	○
5.2	Innovation linkages	25.2	84	
5.2.1	University/industry research collaboration†	49.2	44	
5.2.2	State of cluster development†	51.2	38	
5.2.3	GERD financed by abroad, %[d]	2.5	75	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	29	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	85	
5.3	Knowledge absorption	33.9	40	
5.3.1	Intellectual property payments, % total trade	1.5	17	●
5.3.2	High-tech imports less re-imports, % total trade	14.9	12	●
5.3.3	ICT services imports, % total trade	0.3	115	○
5.3.4	FDI net inflows, % GDP	0.9	99	
5.3.5	Research talent, % in business enterprise[d]	36.1	36	
6	**Knowledge & technology outputs**	**29.0**	**46**	
6.1	Knowledge creation	15.2	54	
6.1.1	Patents by origin/bn PPP$ GDP	0.9	67	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	59	
6.1.3	Utility models by origin/bn PPP$ GDP	1.6	18	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.2	86	
6.1.5	Citable documents H index	213.0	38	
6.2	Knowledge impact	41.1	44	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.1	24	
6.2.2	New businesses/th pop. 15–64	0.9	75	
6.2.3	Computer software spending, % GDP	0.3	31	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	8.4	43	
6.2.5	High- & medium-high-tech manufactures, %[d]	42.3	20	
6.3	Knowledge diffusion	30.7	38	
6.3.1	Intellectual property receipts, % total trade	0.1	57	
6.3.2	High-tech exports less re-exports, % total trade	14.4	10	●
6.3.3	ICT services exports, % total trade	0.2	113	○
6.3.4	FDI net outflows, % GDP	1.9	33	
7	**Creative outputs**	**31.1**	**57**	
7.1	Intangible assets	40.4	76	
7.1.1	Trademarks by origin/bn PPP$ GDP	25.7	73	
7.1.2	Industrial designs by origin/bn PPP$ GDP	2.8	42	
7.1.3	ICTs & business model creation†	63.6	41	
7.1.4	ICTs & organizational model creation†	56.5	49	
7.2	Creative goods & services	34.9	27	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69[d]	1.0	74	
7.2.3	Global ent. & media market/th pop. 15–69	4.7	46	
7.2.4	Printing & publishing manufactures, %[d]	0.8	76	○
7.2.5	Creative goods exports, % total trade	9.6	5	●
7.3	Online creativity	8.7	65	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	5.7	53	
7.3.2	Country-code TLDs/th pop. 15–69	0.4	94	
7.3.3	Wikipedia edits/mn pop. 15–69	944.0	74	
7.3.4	Video uploads on YouTube/pop. 15–69	21.5	48	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

The Former Yugoslav Republic of Macedonia

Key indicators

Population (millions)	2.1
GDP (US$ billions)	9.9
GDP per capita, PPP$	14,009.1
Income group	Upper-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.4**	**58**	
Innovation Output Sub-Index		28.5	55	
Innovation Input Sub-Index		42.3	62	
Innovation Efficiency Ratio		0.7	56	
Global Innovation Index 2015 (out of 141)		38.0	56	
1	**Institutions**	**71.4**	**39**	
1.1	Political environment	56.1	50	
1.1.1	Political stability & safety*	69.1	49	
1.1.2	Government effectiveness*	43.2	60	
1.2	Regulatory environment	70.7	47	
1.2.1	Regulatory quality*	56.4	52	
1.2.2	Rule of law*	46.3	61	
1.2.3	Cost of redundancy dismissal, salary weeks	13.0	51	
1.3	Business environment	87.3	12	●
1.3.1	Ease of starting a business*	99.9	2	●
1.3.2	Ease of resolving insolvency*	67.7	34	●
1.3.3	Ease of paying taxes*	94.2	7	●
2	**Human capital & research**	**33.4**	**54**	
2.1	Education	63.6	13	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years[d]	12.9	77	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	10.5	31	●
2.2	Tertiary education	31.8	77	
2.2.1	Tertiary enrolment, % gross	39.4	64	
2.2.2	Graduates in science & engineering, %	21.2	47	
2.2.3	Tertiary inbound mobility, %	2.2	63	
2.3	Research & development (R&D)	4.8	74	
2.3.1	Researchers, FTE/mn pop.	838.4	49	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.4	64	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**34.5**	**94**	
3.1	Information & communication technologies (ICTs)	40.3	83	
3.1.1	ICT access*	67.5	51	
3.1.2	ICT use*	47.6	55	
3.1.3	Government's online service*	24.4	106	○
3.1.4	E-participation*	21.6	111	○
3.2	General infrastructure	15.5	127	○
3.2.1	Electricity output, kWh/cap	2,888.2	64	
3.2.2	Logistics performance*	2.5	107	○
3.2.3	Gross capital formation, % GDP	n/a	n/a	
3.3	Ecological sustainability	47.8	46	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	7.2	66	
3.3.2	Environmental performance*	78.0	49	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	4.9	22	●
4	**Market sophistication**	**40.7**	**81**	
4.1	Credit	29.0	81	
4.1.1	Ease of getting credit*	65.0	39	
4.1.2	Domestic credit to private sector, % GDP	49.6	67	
4.1.3	Microfinance gross loans, % GDP	0.3	46	
4.2	Investment	36.4	65	
4.2.1	Ease of protecting minority investors*	71.7	14	●
4.2.2	Market capitalization, % GDP[d]	5.7	87	○
4.2.3	Total value of stocks traded, % GDP[d]	0.3	68	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	56.8	81	
4.3.1	Applied tariff rate, weighted mean, %[d]	1.8	48	
4.3.2	Intensity of local competition†	74.5	30	●
4.3.3	Domestic market scale, bn PPP$	27.7	108	○
5	**Business sophistication**	**31.5**	**65**	
5.1	Knowledge workers	39.0	60	
5.1.1	Knowledge-intensive employment, %	26.3	50	
5.1.2	Firms offering formal training, % firms	46.9	29	
5.1.3	GERD performed by business, % of GDP[d]	0.0	72	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	11.9	57	
5.2	Innovation linkages	34.1	51	
5.2.1	University/industry research collaboration†	45.2	58	
5.2.2	State of cluster development†	44.3	68	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.1	63	
5.3	Knowledge absorption	21.5	96	
5.3.1	Intellectual property payments, % total trade	0.8	37	
5.3.2	High-tech imports less re-imports, % total trade	6.7	72	
5.3.3	ICT services imports, % total trade	1.4	35	●
5.3.4	FDI net inflows, % GDP	0.5	113	○
5.3.5	Research talent, % in business enterprise	11.7	62	
6	**Knowledge & technology outputs**	**21.9**	**78**	
6.1	Knowledge creation	6.2	83	
6.1.1	Patents by origin/bn PPP$ GDP	0.0	114	○
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	67	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.6	54	
6.1.5	Citable documents H index	74.0	95	
6.2	Knowledge impact	42.0	40	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.1	38	
6.2.2	New businesses/th pop. 15–64	3.7	32	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	16.1	23	●
6.2.5	High- & medium-high-tech manufactures, %[d]	19.6	60	
6.3	Knowledge diffusion	17.6	110	○
6.3.1	Intellectual property receipts, % total trade	0.2	38	
6.3.2	High-tech exports less re-exports, % total trade	2.1	50	
6.3.3	ICT services exports, % total trade	2.5	37	
6.3.4	FDI net outflows, % GDP	(2.1)	115	○
7	**Creative outputs**	**35.1**	**46**	
7.1	Intangible assets	50.7	32	●
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP[d]	4.0	32	
7.1.3	ICTs & business model creation†	61.3	50	
7.1.4	ICTs & organizational model creation†	54.9	61	
7.2	Creative goods & services	25.5	53	
7.2.1	Cultural & creative services exports, % of total trade	0.2	43	
7.2.2	National feature films/mn pop. 15–69	1.9	55	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	2.6	12	●
7.2.5	Creative goods exports, % total trade	0.2	77	
7.3	Online creativity	13.2	53	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	6.9	50	
7.3.2	Country-code TLDs/th pop. 15–69	1.6	71	
7.3.3	Wikipedia edits/mn pop. 15–69	3,131.7	43	
7.3.4	Video uploads on YouTube/pop. 15–69	21.3	49	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Togo

Key indicators

Population (millions)	7.3
GDP (US$ billions)	4.2
GDP per capita, PPP$	1,483.4
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**18.4**	**126**	○
Innovation Output Sub-Index		9.7	126	○
Innovation Input Sub-Index		27.1	125	○
Innovation Efficiency Ratio		0.4	124	○
Global Innovation Index 2015 (out of 141)		18.4	140	
1	**Institutions**	**48.8**	**100**	
1.1	Political environment	31.4	108	
1.1.1	Political stability & safety*	58.8	78	●
1.1.2	Government effectiveness*	4.1	126	○
1.2	Regulatory environment	57.3	88	
1.2.1	Regulatory quality*	24.4	113	
1.2.2	Rule of law*	25.3	114	
1.2.3	Cost of redundancy dismissal, salary weeks	13.1	53	●
1.3	Business environment	57.7	104	
1.3.1	Ease of starting a business*	78.4	100	
1.3.2	Ease of resolving insolvency*	43.1	83	
1.3.3	Ease of paying taxes*	51.7	112	
2	**Human capital & research**	**14.9**	**113**	
2.1	Education	35.8	96	
2.1.1	Expenditure on education, % GDP	4.8	56	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap◴	15.4	80	
2.1.3	School life expectancy, years◴	12.0	90	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary◴	26.2	96	
2.2	Tertiary education	7.9	116	
2.2.1	Tertiary enrolment, % gross	10.1	105	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %◴	1.4	75	
2.3	Research & development (R&D)	1.1	102	
2.3.1	Researchers, FTE/mn pop.◴	35.9	93	
2.3.2	Gross expenditure on R&D, % GDP◴	0.2	84	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**18.1**	**127**	○
3.1	Information & communication technologies (ICTs)	12.5	125	○
3.1.1	ICT access*	25.9	117	
3.1.2	ICT use*	3.3	118	
3.1.3	Government's online service*	11.0	121	○
3.1.4	E-participation*	9.8	123	○
3.2	General infrastructure	22.5	115	
3.2.1	Electricity output, kWh/cap	16.3	119	○
3.2.2	Logistics performance*	2.3	118	
3.2.3	Gross capital formation, % GDP	24.6	44	●
3.3	Ecological sustainability	19.4	125	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	2.6	116	○
3.3.2	Environmental performance*	46.1	116	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.2	105	
4	**Market sophistication**	**30.2**	**120**	
4.1	Credit	27.2	84	
4.1.1	Ease of getting credit*	30.0	106	
4.1.2	Domestic credit to private sector, % GDP	34.1	84	
4.1.3	Microfinance gross loans, % GDP	3.2	13	●
4.2	Investment	38.3	59	
4.2.1	Ease of protecting minority investors*	38.3	115	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	25.1	127	○
4.3.1	Applied tariff rate, weighted mean, %	9.4	112	
4.3.2	Intensity of local competition†	n/a	n/a	
4.3.3	Domestic market scale, bn PPP$	10.2	125	○
5	**Business sophistication**	**23.4**	**108**	
5.1	Knowledge workers	36.4	71	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms◴	31.0	56	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	15.4	[125]	
5.2.1	University/industry research collaboration†	n/a	n/a	
5.2.2	State of cluster development†	n/a	n/a	
5.2.3	GERD financed by abroad, %◴	12.1	42	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	n/a	n/a	
5.3	Knowledge absorption	18.5	108	
5.3.1	Intellectual property payments, % total trade◴	0.1	95	
5.3.2	High-tech imports less re-imports, % total trade◴	2.0	120	○
5.3.3	ICT services imports, % total trade◴	0.6	90	
5.3.4	FDI net inflows, % GDP	6.5	20	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**16.0**	**114**	
6.1	Knowledge creation	4.4	98	
6.1.1	Patents by origin/bn PPP$ GDP	0.3	86	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	7.1	76	●
6.1.5	Citable documents H index	37.0	124	○
6.2	Knowledge impact	1.7	[125]	
6.2.1	Growth rate of PPP$ GDP/worker, %	n/a	n/a	
6.2.2	New businesses/th pop. 15–64	0.3	94	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.9	107	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	41.9	22	●
6.3.1	Intellectual property receipts, % total trade◴	0.0	97	
6.3.2	High-tech exports less re-exports, % total trade◴	0.0	114	
6.3.3	ICT services exports, % total trade◴	0.9	84	
6.3.4	FDI net outflows, % GDP◴	10.7	1	●
7	**Creative outputs**	**3.5**	**126**	○
7.1	Intangible assets	6.6	126	○
7.1.1	Trademarks by origin/bn PPP$ GDP	17.4	86	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	90	
7.1.3	ICTs & business model creation†	n/a	n/a	
7.1.4	ICTs & organizational model creation†	n/a	n/a	
7.2	Creative goods & services	0.6	[127]	
7.2.1	Cultural & creative services exports, % of total trade◴	0.0	76	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade◴	0.0	105	
7.3	Online creativity	0.3	115	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.7	102	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	123	○
7.3.3	Wikipedia edits/mn pop. 15–69	13.6	123	○
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Tunisia

Key indicators

Population (millions)	11.3
GDP (US$ billions)	43.6
GDP per capita, PPP$	11,428.2
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**30.6**	**77**	
Innovation Output Sub-Index		23.0	84	
Innovation Input Sub-Index		38.1	82	
Innovation Efficiency Ratio		0.6	86	
Global Innovation Index 2015 (out of 141)		33.5	76	
1	**Institutions**	**58.3**	**70**	
1.1	Political environment	37.6	96	
1.1.1	Political stability & safety*	39.6	110	○
1.1.2	Government effectiveness*	35.5	76	
1.2	Regulatory environment	66.0	69	
1.2.1	Regulatory quality*	36.1	91	
1.2.2	Rule of law*	44.2	68	
1.2.3	Cost of redundancy dismissal, salary weeks	12.1	45	
1.3	Business environment	71.2	62	
1.3.1	Ease of starting a business*	83.6	78	
1.3.2	Ease of resolving insolvency*	54.5	54	
1.3.3	Ease of paying taxes*	75.5	66	
2	**Human capital & research**	**38.0**	**45**	
2.1	Education	51.0	55	
2.1.1	Expenditure on education, % GDP	6.2	23	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	24.4	35	●
2.1.3	School life expectancy, years	14.7	53	
2.1.4	PISA scales in reading, maths, & science	396.6	56	○
2.1.5	Pupil-teacher ratio, secondary[d]	13.6	54	
2.2	Tertiary education	55.1	14	●
2.2.1	Tertiary enrolment, % gross	34.6	74	
2.2.2	Graduates in science & engineering, %	44.1	3	●
2.2.3	Tertiary inbound mobility, %	1.8	67	
2.3	Research & development (R&D)	7.9	66	
2.3.1	Researchers, FTE/mn pop.[d]	1,393.1	42	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.7	50	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**41.6**	**70**	
3.1	Information & communication technologies (ICTs)	53.0	55	
3.1.1	ICT access*	50.0	80	
3.1.2	ICT use*	33.7	72	
3.1.3	Government's online service*	63.8	39	●
3.1.4	E-participation*	64.7	33	●
3.2	General infrastructure	24.7	107	
3.2.1	Electricity output, kWh/cap	1,687.9	81	
3.2.2	Logistics performance*	2.6	103	○
3.2.3	Gross capital formation, % GDP	21.5	70	
3.3	Ecological sustainability	47.1	47	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.0	29	●
3.3.2	Environmental performance*	77.3	52	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.1	60	
4	**Market sophistication**	**29.0**	**123**	○
4.1	Credit	22.4	103	
4.1.1	Ease of getting credit*	35.0	101	
4.1.2	Domestic credit to private sector, % GDP	76.5	37	●
4.1.3	Microfinance gross loans, % GDP	0.3	48	
4.2	Investment	24.4	114	○
4.2.1	Ease of protecting minority investors*	50.0	86	
4.2.2	Market capitalization, % GDP	19.2	67	
4.2.3	Total value of stocks traded, % GDP[d]	2.8	49	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	41	
4.3	Trade, competition, & market scale	40.0	120	○
4.3.1	Applied tariff rate, weighted mean, %[d]	15.9	127	○
4.3.2	Intensity of local competition†	62.5	86	
4.3.3	Domestic market scale, bn PPP$	124.7	71	
5	**Business sophistication**	**23.7**	**107**	
5.1	Knowledge workers	31.4	85	
5.1.1	Knowledge-intensive employment, %[d]	20.9	67	
5.1.2	Firms offering formal training, % firms	28.9	60	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %[d]	18.7	65	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	20.2	110	○
5.2.1	University/industry research collaboration†	32.0	107	○
5.2.2	State of cluster development†	38.8	91	
5.2.3	GERD financed by abroad, %[d]	4.4	71	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	107	○
5.3	Knowledge absorption	19.4	103	
5.3.1	Intellectual property payments, % total trade[d]	0.1	104	○
5.3.2	High-tech imports less re-imports, % total trade[d]	8.2	55	
5.3.3	ICT services imports, % total trade[d]	0.5	102	
5.3.4	FDI net inflows, % GDP	2.1	78	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**19.9**	**89**	
6.1	Knowledge creation	14.8	56	
6.1.1	Patents by origin/bn PPP$ GDP	1.1	61	
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	69	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	28.5	26	●
6.1.5	Citable documents H index	109.0	73	
6.2	Knowledge impact	33.1	80	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.7	73	
6.2.2	New businesses/th pop. 15–64[d]	1.5	55	
6.2.3	Computer software spending, % GDP	0.3	36	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.6	57	
6.2.5	High- & medium-high-tech manufactures, %[d]	32.4	35	
6.3	Knowledge diffusion	11.9	122	○
6.3.1	Intellectual property receipts, % total trade[d]	0.1	49	
6.3.2	High-tech exports less re-exports, % total trade[d]	3.3	39	●
6.3.3	ICT services exports, % total trade[d]	1.7	56	
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**26.1**	**81**	
7.1	Intangible assets	38.1	85	
7.1.1	Trademarks by origin/bn PPP$ GDP	n/a	n/a	
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.3	58	
7.1.3	ICTs & business model creation†	51.2	89	
7.1.4	ICTs & organizational model creation†	40.6	105	○
7.2	Creative goods & services	24.4	58	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	1.0	73	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	0.7	78	
7.2.5	Creative goods exports, % total trade[d]	2.6	19	●
7.3	Online creativity	3.6	83	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.9	67	
7.3.2	Country-code TLDs/th pop. 15–69	0.2	101	
7.3.3	Wikipedia edits/mn pop. 15–69	499.9	89	
7.3.4	Video uploads on YouTube/pop. 15–69	7.8	62	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Turkey

Key indicators

Population (millions)	78.7
GDP (US$ billions)	733.6
GDP per capita, PPP$	20,437.8
Income group	Upper-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**39.0**	**42**	
	Innovation Output Sub-Index	35.5	37	
	Innovation Input Sub-Index	42.5	59	
	Innovation Efficiency Ratio	0.8	13	●
	Global Innovation Index 2015 (out of 141)	37.8	58	
1	**Institutions**	**54.6**	**82**	
1.1	Political environment	43.1	88	
1.1.1	Political stability & safety*	36.5	116	○
1.1.2	Government effectiveness*	49.6	47	
1.2	Regulatory environment	54.2	96	
1.2.1	Regulatory quality*	54.8	54	
1.2.2	Rule of law*	48.0	59	
1.2.3	Cost of redundancy dismissal, salary weeks	29.8	115	○
1.3	Business environment	66.6	74	
1.3.1	Ease of starting a business*	85.2	72	
1.3.2	Ease of resolving insolvency*	35.1	104	○
1.3.3	Ease of paying taxes*	79.4	51	
2	**Human capital & research**	**39.2**	**43**	
2.1	Education	50.0	57	
2.1.1	Expenditure on education, % GDP[4]	2.9	103	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	16.4	24	
2.1.4	PISA scales in reading, maths, & science	462.3	40	
2.1.5	Pupil-teacher ratio, secondary[4]	20.1	84	
2.2	Tertiary education	39.1	49	
2.2.1	Tertiary enrolment, % gross	79.0	16	●
2.2.2	Graduates in science & engineering, %[4]	20.9	49	
2.2.3	Tertiary inbound mobility, %	1.1	79	
2.3	Research & development (R&D)	28.6	38	
2.3.1	Researchers, FTE/mn pop.	1,156.5	45	
2.3.2	Gross expenditure on R&D, % GDP	1.0	35	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	50.8	36	
2.3.4	QS university ranking, average score top 3*	33.5	39	
3	**Infrastructure**	**43.6**	**62**	
3.1	Information & communication technologies (ICTs)	50.7	63	
3.1.1	ICT access*	60.0	66	
3.1.2	ICT use*	37.7	66	
3.1.3	Government's online service*	55.9	53	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	38.2	60	
3.2.1	Electricity output, kWh/cap	3,265.5	59	
3.2.2	Logistics performance*	3.5	29	
3.2.3	Gross capital formation, % GDP	20.6	78	
3.3	Ecological sustainability	42.1	66	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	9.1	43	
3.3.2	Environmental performance*	67.7	86	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.5	52	
4	**Market sophistication**	**47.7**	**46**	
4.1	Credit	26.2	91	
4.1.1	Ease of getting credit*	50.0	69	
4.1.2	Domestic credit to private sector, % GDP	74.6	39	
4.1.3	Microfinance gross loans, % GDP[4]	0.0	79	○
4.2	Investment	38.6	56	
4.2.1	Ease of protecting minority investors*	68.3	20	●
4.2.2	Market capitalization, % GDP	27.5	53	
4.2.3	Total value of stocks traded, % GDP	46.3	16	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	64	
4.3	Trade, competition, & market scale	78.3	12	●
4.3.1	Applied tariff rate, weighted mean, %	2.8	58	
4.3.2	Intensity of local competition†	81.2	9	●
4.3.3	Domestic market scale, bn PPP$	1,514.9	17	●
5	**Business sophistication**	**27.6**	**86**	
5.1	Knowledge workers	32.8	83	
5.1.1	Knowledge-intensive employment, %	19.7	71	
5.1.2	Firms offering formal training, % firms	28.4	61	
5.1.3	GERD performed by business, % of GDP	0.5	36	
5.1.4	GERD financed by business, %	50.9	20	
5.1.5	Females employed w/advanced degrees, % total	7.4	72	○
5.2	Innovation linkages	22.9	93	
5.2.1	University/industry research collaboration†	44.8	59	
5.2.2	State of cluster development†	48.6	50	
5.2.3	GERD financed by abroad, %	1.1	87	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	56	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	39	
5.3	Knowledge absorption	27.0	72	
5.3.1	Intellectual property payments, % total trade	0.3	72	
5.3.2	High-tech imports less re-imports, % total trade	8.9	49	
5.3.3	ICT services imports, % total trade	0.1	118	○
5.3.4	FDI net inflows, % GDP	1.6	89	
5.3.5	Research talent, % in business enterprise	46.7	26	
6	**Knowledge & technology outputs**	**29.1**	**45**	
6.1	Knowledge creation	27.0	35	
6.1.1	Patents by origin/bn PPP$ GDP	3.4	33	
6.1.2	PCT patent applications/bn PPP$ GDP	0.6	30	
6.1.3	Utility models by origin/bn PPP$ GDP	2.3	11	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	16.8	44	
6.1.5	Citable documents H index	266.0	36	
6.2	Knowledge impact	38.6	53	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.2	58	
6.2.2	New businesses/th pop. 15–64	1.1	64	
6.2.3	Computer software spending, % GDP	0.6	9	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	5.9	55	
6.2.5	High- & medium-high-tech manufactures, %[4]	28.2	43	
6.3	Knowledge diffusion	21.7	81	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	1.2	62	
6.3.3	ICT services exports, % total trade	0.1	116	○
6.3.4	FDI net outflows, % GDP	0.9	50	
7	**Creative outputs**	**42.0**	**31**	
7.1	Intangible assets	67.5	5	●
7.1.1	Trademarks by origin/bn PPP$ GDP	131.2	4	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	27.2	1	●
7.1.3	ICTs & business model creation†	61.2	51	
7.1.4	ICTs & organizational model creation†	52.0	68	
7.2	Creative goods & services	23.0	63	
7.2.1	Cultural & creative services exports, % of total trade	0.0	72	○
7.2.2	National feature films/mn pop. 15–69	1.6	60	
7.2.3	Global ent. & media market/th pop. 15–69	5.5	42	
7.2.4	Printing & publishing manufactures, %[4]	1.1	57	
7.2.5	Creative goods exports, % total trade	3.0	14	●
7.3	Online creativity	9.8	62	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	13.2	35	
7.3.2	Country-code TLDs/th pop. 15–69	2.5	65	
7.3.3	Wikipedia edits/mn pop. 15–69	793.9	81	
7.3.4	Video uploads on YouTube/pop. 15–69	17.9	56	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[4] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Uganda

Key indicators

Population (millions)	39.0
GDP (US$ billions)	24.7
GDP per capita, PPP$	2,002.6
Income group	Low income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**27.1**	**99**	
Innovation Output Sub-Index		18.6	105	
Innovation Input Sub-Index		35.6	91	
Innovation Efficiency Ratio		0.5	106	
Global Innovation Index 2015 (out of 141)		27.6	111	
1	**Institutions**	**53.7**	**85**	
1.1	Political environment	33.9	103	
1.1.1	Political stability & safety*	39.7	108	
1.1.2	Government effectiveness*	28.0	91	
1.2	Regulatory environment	67.6	61	
1.2.1	Regulatory quality*	35.7	92	
1.2.2	Rule of law*	37.4	86	
1.2.3	Cost of redundancy dismissal, salary weeks	8.7	21	●
1.3	Business environment	59.6	97	
1.3.1	Ease of starting a business*	67.8	120	
1.3.2	Ease of resolving insolvency*	39.8	92	
1.3.3	Ease of paying taxes*	71.3	79	
2	**Human capital & research**	**19.8**	**102**	
2.1	Education	27.1	114	
2.1.1	Expenditure on education, % GDP	2.2	112	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	19.4	59	
2.1.3	School life expectancy, years[d]	10.0	105	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	21.3	87	
2.2	Tertiary education	29.7	82	
2.2.1	Tertiary enrolment, % gross[d]	4.5	115	○
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	10.7	12	●
2.3	Research & development (R&D)	2.6	87	
2.3.1	Researchers, FTE/mn pop.[d]	38.1	91	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.5	61	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**37.8**	**83**	
3.1	Information & communication technologies (ICTs)	15.8	123	○
3.1.1	ICT access*	23.5	120	○
3.1.2	ICT use*	11.0	106	
3.1.3	Government's online service*	15.0	116	
3.1.4	E-participation*	13.7	120	○
3.2	General infrastructure	57.9	[7]	
3.2.1	Electricity output, kWh/cap	n/a	n/a	
3.2.2	Logistics performance*	n/a	n/a	
3.2.3	Gross capital formation, % GDP	33.4	10	●
3.3	Ecological sustainability	39.6	79	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	n/a	n/a	
3.3.2	Environmental performance*	57.6	107	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.5	79	
4	**Market sophistication**	**35.0**	**107**	
4.1	Credit	29.6	77	
4.1.1	Ease of getting credit*	65.0	39	●
4.1.2	Domestic credit to private sector, % GDP	14.4	118	
4.1.3	Microfinance gross loans, % GDP	1.6	23	●
4.2	Investment	24.3	116	
4.2.1	Ease of protecting minority investors*	51.7	83	
4.2.2	Market capitalization, % GDP[d]	31.4	48	
4.2.3	Total value of stocks traded, % GDP[d]	0.0	81	○
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	62	
4.3	Trade, competition, & market scale	51.0	100	
4.3.1	Applied tariff rate, weighted mean, %	8.6	110	
4.3.2	Intensity of local competition†	71.4	49	●
4.3.3	Domestic market scale, bn PPP$	75.1	81	
5	**Business sophistication**	**31.9**	**61**	
5.1	Knowledge workers	17.7	115	
5.1.1	Knowledge-intensive employment, %[d]	4.1	101	○
5.1.2	Firms offering formal training, % firms	34.7	45	
5.1.3	GERD performed by business, % of GDP[d]	0.2	55	
5.1.4	GERD financed by business, %[d]	13.7	67	
5.1.5	Females employed w/advanced degrees, % total[d]	2.7	82	
5.2	Innovation linkages	45.8	16	●
5.2.1	University/industry research collaboration†	44.7	60	
5.2.2	State of cluster development†	41.5	81	
5.2.3	GERD financed by abroad, %[d]	57.3	3	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	89	
5.3	Knowledge absorption	32.3	45	●
5.3.1	Intellectual property payments, % total trade	0.2	83	
5.3.2	High-tech imports less re-imports, % total trade	6.2	77	
5.3.3	ICT services imports, % total trade	1.2	54	
5.3.4	FDI net inflows, % GDP	4.2	38	●
5.3.5	Research talent, % in business enterprise[d]	50.6	23	●
6	**Knowledge & technology outputs**	**19.0**	**92**	
6.1	Knowledge creation	6.9	77	
6.1.1	Patents by origin/bn PPP$ GDP	0.1	109	
6.1.2	PCT patent applications/bn PPP$ GDP[d]	0.1	75	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	11.6	60	
6.1.5	Citable documents H index	118.0	67	
6.2	Knowledge impact	31.6	86	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.2	60	
6.2.2	New businesses/th pop. 15–64[d]	1.2	63	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.4	100	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	18.5	107	
6.3.1	Intellectual property receipts, % total trade	0.2	32	●
6.3.2	High-tech exports less re-exports, % total trade	0.2	99	
6.3.3	ICT services exports, % total trade	0.8	86	
6.3.4	FDI net outflows, % GDP[d]	0.2	74	
7	**Creative outputs**	**18.3**	**107**	
7.1	Intangible assets	36.1	93	
7.1.1	Trademarks by origin/bn PPP$ GDP	14.3	89	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	55.3	75	
7.1.4	ICTs & organizational model creation†	45.6	87	
7.2	Creative goods & services	0.9	[123]	
7.2.1	Cultural & creative services exports, % of total trade	0.0	81	○
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	99	
7.3	Online creativity	0.2	118	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.3	114	
7.3.2	Country-code TLDs/th pop. 15–69	0.1	116	
7.3.3	Wikipedia edits/mn pop. 15–69	46.5	111	
7.3.4	Video uploads on YouTube/pop. 15–69	0.2	73	○

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Ukraine

Key indicators

Population (millions)	44.8
GDP (US$ billions)	90.5
GDP per capita, PPP$	7,518.8
Income group	Lower-middle income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.7**	**56**	
Innovation Output Sub-Index		32.5	40	
Innovation Input Sub-Index		38.9	76	
Innovation Efficiency Ratio		0.8	12	●
Global Innovation Index 2015 (out of 141)		36.5	64	
1	**Institutions**	**48.7**	**101**	
1.1	Political environment	21.7	123	○
1.1.1	Political stability & safety*	14.9	125	○
1.1.2	Government effectiveness*	28.5	88	
1.2	Regulatory environment	59.2	84	
1.2.1	Regulatory quality*	29.2	105	
1.2.2	Rule of law*	27.5	110	
1.2.3	Cost of redundancy dismissal, salary weeks	13.0	49	
1.3	Business environment	65.2	79	
1.3.1	Ease of starting a business*	93.9	29	
1.3.2	Ease of resolving insolvency*	31.1	113	○
1.3.3	Ease of paying taxes*	70.7	81	
2	**Human capital & research**	**40.8**	**40**	
2.1	Education	60.9	20	●
2.1.1	Expenditure on education, % GDP	6.7	18	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	30.4	18	●
2.1.3	School life expectancy, years	15.3	40	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	11.8	42	
2.2	Tertiary education	47.1	24	●
2.2.1	Tertiary enrolment, % gross	82.3	10	●
2.2.2	Graduates in science & engineering, %	25.5	27	
2.2.3	Tertiary inbound mobility, %	2.8	57	
2.3	Research & development (R&D)	14.4	50	
2.3.1	Researchers, FTE/mn pop.◴	1,165.2	44	
2.3.2	Gross expenditure on R&D, % GDP	0.7	54	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	29.2	45	
3	**Infrastructure**	**32.3**	**99**	
3.1	Information & communication technologies (ICTs)	38.6	87	
3.1.1	ICT access*	62.7	62	
3.1.2	ICT use*	21.7	92	
3.1.3	Government's online service*	26.8	105	
3.1.4	E-participation*	43.1	74	
3.2	General infrastructure	24.3	110	
3.2.1	Electricity output, kWh/cap	4,258.2	49	
3.2.2	Logistics performance*	3.0	59	
3.2.3	Gross capital formation, % GDP	11.6	123	○
3.3	Ecological sustainability	34.1	100	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	3.0	115	○
3.3.2	Environmental performance*	79.7	44	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.5	81	
4	**Market sophistication**	**42.1**	**75**	
4.1	Credit	34.7	58	
4.1.1	Ease of getting credit*	75.0	18	●
4.1.2	Domestic credit to private sector, % GDP	76.2	38	
4.1.3	Microfinance gross loans, % GDP	0.0	81	○
4.2	Investment	24.5	113	○
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP◴	11.8	76	
4.2.3	Total value of stocks traded, % GDP◴	0.7	63	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	42	
4.3	Trade, competition, & market scale	67.1	46	
4.3.1	Applied tariff rate, weighted mean, %◴	2.1	51	
4.3.2	Intensity of local competition†	60.9	94	
4.3.3	Domestic market scale, bn PPP$	371.8	46	
5	**Business sophistication**	**30.6**	**73**	
5.1	Knowledge workers	42.4	48	
5.1.1	Knowledge-intensive employment, %◴	33.7	39	
5.1.2	Firms offering formal training, % firms	22.6	76	
5.1.3	GERD performed by business, % of GDP	0.4	40	
5.1.4	GERD financed by business, %	35.2	44	
5.1.5	Females employed w/advanced degrees, % total◴	28.1	4	●
5.2	Innovation linkages	23.7	88	
5.2.1	University/industry research collaboration†	41.7	72	
5.2.2	State of cluster development†	32.5	113	○
5.2.3	GERD financed by abroad, %	19.8	21	●
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	74	○
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.3	43	
5.3	Knowledge absorption	25.6	82	
5.3.1	Intellectual property payments, % total trade	0.8	38	
5.3.2	High-tech imports less re-imports, % total trade	6.7	73	
5.3.3	ICT services imports, % total trade	0.9	68	
5.3.4	FDI net inflows, % GDP	0.6	110	
5.3.5	Research talent, % in business enterprise◴	35.3	38	
6	**Knowledge & technology outputs**	**34.1**	**33**	
6.1	Knowledge creation	46.2	16	●
6.1.1	Patents by origin/bn PPP$ GDP	6.6	19	●
6.1.2	PCT patent applications/bn PPP$ GDP	0.4	41	
6.1.3	Utility models by origin/bn PPP$ GDP	24.9	1	●
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.6	57	
6.1.5	Citable documents H index	174.0	44	
6.2	Knowledge impact	30.4	90	
6.2.1	Growth rate of PPP$ GDP/worker, %	(0.4)	96	○
6.2.2	New businesses/th pop. 15–64◴	0.9	74	
6.2.3	Computer software spending, % GDP	0.4	20	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.5	71	
6.2.5	High- & medium-high-tech manufactures, %	26.5	45	
6.3	Knowledge diffusion	25.6	61	
6.3.1	Intellectual property receipts, % total trade	0.2	35	
6.3.2	High-tech exports less re-exports, % total trade	2.9	45	
6.3.3	ICT services exports, % total trade	3.0	23	●
6.3.4	FDI net outflows, % GDP	0.4	62	
7	**Creative outputs**	**31.0**	**58**	
7.1	Intangible assets	49.0	42	
7.1.1	Trademarks by origin/bn PPP$ GDP	68.2	24	
7.1.2	Industrial designs by origin/bn PPP$ GDP	13.3	10	●
7.1.3	ICTs & business model creation†	47.0	106	
7.1.4	ICTs & organizational model creation†	51.0	71	
7.2	Creative goods & services	12.2	87	
7.2.1	Cultural & creative services exports, % of total trade	0.2	40	
7.2.2	National feature films/mn pop. 15–69	0.4	94	○
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	0.7	79	
7.2.5	Creative goods exports, % total trade	0.6	56	
7.3	Online creativity	13.8	51	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	4.6	57	
7.3.2	Country-code TLDs/th pop. 15–69	6.0	48	
7.3.3	Wikipedia edits/mn pop. 15–69	1,472.1	64	
7.3.4	Video uploads on YouTube/pop. 15–69	33.7	34	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

United Arab Emirates

Key indicators

Population (millions)	9.2
GDP (US$ billions)	345.5
GDP per capita, PPP$	67,616.9
Income group	High income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**39.4**	**41**	
Innovation Output Sub-Index		24.2	75	
Innovation Input Sub-Index		54.5	25	
Innovation Efficiency Ratio		0.4	117	○
Global Innovation Index 2015 (out of 141)		40.1	47	
1	**Institutions**	**80.9**	**22**	
1.1	Political environment	81.6	18	
1.1.1	Political stability & safety*	83.1	27	
1.1.2	Government effectiveness*	80.1	19	
1.2	Regulatory environment	83.4	22	
1.2.1	Regulatory quality*	69.0	33	
1.2.2	Rule of law*	64.8	37	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	77.7	39	
1.3.1	Ease of starting a business*	90.0	50	
1.3.2	Ease of resolving insolvency*	43.7	81	
1.3.3	Ease of paying taxes*	99.4	1	●
2	**Human capital & research**	**40.7**	**41**	
2.1	Education	43.8	76	
2.1.1	Expenditure on education, % GDP	n/a	n/a	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	18.3	65	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	468.7	38	
2.1.5	Pupil-teacher ratio, secondary	13.3	52	
2.2	Tertiary education	49.2	20	
2.2.1	Tertiary enrolment, % gross	22.0	89	○
2.2.2	Graduates in science & engineering, %	20.4	51	
2.2.3	Tertiary inbound mobility, %	44.8	1	●
2.3	Research & development (R&D)	29.1	37	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	0.7	48	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	32.5	41	
2.3.4	QS university ranking, average score top 3*	32.5	40	
3	**Infrastructure**	**57.5**	**23**	
3.1	Information & communication technologies (ICTs)	80.2	12	●
3.1.1	ICT access*	78.6	26	
3.1.2	ICT use*	69.9	20	
3.1.3	Government's online service*	88.2	12	●
3.1.4	E-participation*	84.3	13	●
3.2	General infrastructure	52.5	13	●
3.2.1	Electricity output, kWh/cap	11,360.6	10	●
3.2.2	Logistics performance*	3.5	26	
3.2.3	Gross capital formation, % GDP	24.2	46	
3.3	Ecological sustainability	39.9	77	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	71	
3.3.2	Environmental performance*	69.4	82	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.3	42	
4	**Market sophistication**	**48.7**	**42**	
4.1	Credit	34.9	57	
4.1.1	Ease of getting credit*	45.0	81	○
4.1.2	Domestic credit to private sector, % GDP	65.4	47	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	38.6	55	
4.2.1	Ease of protecting minority investors*	60.0	47	
4.2.2	Market capitalization, % GDP	50.5	32	
4.2.3	Total value of stocks traded, % GDP	35.9	20	
4.2.4	Venture capital deals/bn PPP$ GDP	0.1	34	
4.3	Trade, competition, & market scale	72.7	26	
4.3.1	Applied tariff rate, weighted mean, %	3.6	66	
4.3.2	Intensity of local competition†	82.6	7	●
4.3.3	Domestic market scale, bn PPP$	617.1	31	
5	**Business sophistication**	**44.8**	**24**	
5.1	Knowledge workers	56.5	25	
5.1.1	Knowledge-intensive employment, %	36.1	32	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	0.5	33	
5.1.4	GERD financed by business, %	74.3	4	●
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	53.0	5	●
5.2.1	University/industry research collaboration†	62.1	21	
5.2.2	State of cluster development†	74.8	1	●
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	9	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.1	68	
5.3	Knowledge absorption	24.8	85	
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	5.5	89	○
5.3.3	ICT services imports, % total trade	n/a	n/a	
5.3.4	FDI net inflows, % GDP	2.5	67	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**20.8**	**86**	
6.1	Knowledge creation	3.7	102	○
6.1.1	Patents by origin/bn PPP$ GDP	0.1	108	○
6.1.2	PCT patent applications/bn PPP$ GDP	0.1	58	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	3.2	106	○
6.1.5	Citable documents H index	112.0	72	
6.2	Knowledge impact	31.8	85	
6.2.1	Growth rate of PPP$ GDP/worker, %	1.5	51	
6.2.2	New businesses/th pop. 15–64	1.4	58	
6.2.3	Computer software spending, % GDP	0.3	57	○
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	7.1	48	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	26.9	53	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.1	111	○
6.3.3	ICT services exports, % total trade	n/a	n/a	
6.3.4	FDI net outflows, % GDP	0.8	54	
7	**Creative outputs**	**27.6**	**70**	
7.1	Intangible assets	45.7	56	
7.1.1	Trademarks by origin/bn PPP$ GDP	11.3	96	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.1	102	○
7.1.3	ICTs & business model creation†	79.1	7	●
7.1.4	ICTs & organizational model creation†	74.8	10	●
7.2	Creative goods & services	4.1	[109]	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	12.1	29	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	121	○
7.3	Online creativity	14.8	49	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	11.9	38	
7.3.2	Country-code TLDs/th pop. 15–69	6.8	45	
7.3.3	Wikipedia edits/mn pop. 15–69	1,889.2	54	
7.3.4	Video uploads on YouTube/pop. 15–69	26.6	47	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

United Kingdom

Key indicators

Population (millions)	64.7
GDP (US$ billions)	2,849.3
GDP per capita, PPP$	41,158.9
Income group	High income
Region	Europe

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**61.9**	**3**	●
Innovation Output Sub-Index		56.3	4	●
Innovation Input Sub-Index		67.5	7	
Innovation Efficiency Ratio		0.8	14	
Global Innovation Index 2015 (out of 141)		62.4	2	
1	**Institutions**	**87.6**	**13**	
1.1	Political environment	78.9	22	
1.1.1	Political stability & safety*	73.8	45	○
1.1.2	Government effectiveness*	83.9	14	
1.2	Regulatory environment	94.7	8	
1.2.1	Regulatory quality*	90.1	7	
1.2.2	Rule of law*	94.2	13	
1.2.3	Cost of redundancy dismissal, salary weeks	9.3	28	
1.3	Business environment	89.3	7	
1.3.1	Ease of starting a business*	94.6	17	
1.3.2	Ease of resolving insolvency*	82.0	12	
1.3.3	Ease of paying taxes*	91.3	15	
2	**Human capital & research**	**62.6**	**7**	
2.1	Education	58.4	28	
2.1.1	Expenditure on education, % GDP	5.7	31	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	22.5	47	○
2.1.3	School life expectancy, years	17.8	10	
2.1.4	PISA scales in reading, maths, & science	502.5	17	
2.1.5	Pupil-teacher ratio, secondary◴	15.9	71	○
2.2	Tertiary education	60.1	6	
2.2.1	Tertiary enrolment, % gross	56.9	45	○
2.2.2	Graduates in science & engineering, %	25.2	29	
2.2.3	Tertiary inbound mobility, %	17.5	6	
2.3	Research & development (R&D)	69.4	10	
2.3.1	Researchers, FTE/mn pop.	4,252.4	17	
2.3.2	Gross expenditure on R&D, % GDP	1.7	21	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	2,813.4	7	
2.3.4	QS university ranking, average score top 3*	97.8	2	●
3	**Infrastructure**	**66.4**	**4**	●
3.1	Information & communication technologies (ICTs)	90.6	2	●
3.1.1	ICT access*	92.4	4	●
3.1.2	ICT use*	84.2	3	●
3.1.3	Government's online service*	89.8	11	
3.1.4	E-participation*	96.1	4	
3.2	General infrastructure	44.4	34	
3.2.1	Electricity output, kWh/cap	5,149.3	39	
3.2.2	Logistics performance*	4.0	4	●
3.2.3	Gross capital formation, % GDP	17.5	104	○
3.3	Ecological sustainability	64.2	6	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	12.8	12	
3.3.2	Environmental performance*	87.4	12	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	6.5	17	
4	**Market sophistication**	**71.6**	**4**	●
4.1	Credit	64.7	10	
4.1.1	Ease of getting credit*	75.0	18	
4.1.2	Domestic credit to private sector, % GDP	138.9	11	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	65.8	11	
4.2.1	Ease of protecting minority investors*	78.3	4	
4.2.2	Market capitalization, % GDP	106.5	8	
4.2.3	Total value of stocks traded, % GDP	41.6	18	
4.2.4	Venture capital deals/bn PPP$ GDP	0.2	7	
4.3	Trade, competition, & market scale	84.3	5	
4.3.1	Applied tariff rate, weighted mean, %	1.0	9	
4.3.2	Intensity of local competition†	83.7	3	●
4.3.3	Domestic market scale, bn PPP$	2,569.2	10	
5	**Business sophistication**	**49.2**	**14**	
5.1	Knowledge workers	61.5	16	
5.1.1	Knowledge-intensive employment, %	47.4	8	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP	1.1	20	
5.1.4	GERD financed by business, %	46.5	25	
5.1.5	Females employed w/advanced degrees, % total	21.7	18	
5.2	Innovation linkages	50.1	8	
5.2.1	University/industry research collaboration†	77.8	4	●
5.2.2	State of cluster development†	71.7	7	
5.2.3	GERD financed by abroad, %	18.9	24	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	11	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.2	16	
5.3	Knowledge absorption	36.1	33	
5.3.1	Intellectual property payments, % total trade	1.0	27	
5.3.2	High-tech imports less re-imports, % total trade	12.3	23	
5.3.3	ICT services imports, % total trade	1.5	33	
5.3.4	FDI net inflows, % GDP	1.5	92	○
5.3.5	Research talent, % in business enterprise	38.2	33	○
6	**Knowledge & technology outputs**	**50.2**	**9**	
6.1	Knowledge creation	58.7	9	
6.1.1	Patents by origin/bn PPP$ GDP	7.8	16	
6.1.2	PCT patent applications/bn PPP$ GDP	2.0	18	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	41.1	14	
6.1.5	Citable documents H index	1,015.0	1	●
6.2	Knowledge impact	55.4	8	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.7	72	○
6.2.2	New businesses/th pop. 15–64◴	12.9	9	
6.2.3	Computer software spending, % GDP	0.6	8	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	15.6	24	
6.2.5	High- & medium-high-tech manufactures, %	41.4	21	
6.3	Knowledge diffusion	36.4	34	
6.3.1	Intellectual property receipts, % total trade	1.8	11	
6.3.2	High-tech exports less re-exports, % total trade	8.9	23	
6.3.3	ICT services exports, % total trade	2.5	39	
6.3.4	FDI net outflows, % GDP	(2.6)	116	○
7	**Creative outputs**	**62.5**	**3**	●
7.1	Intangible assets	62.9	9	
7.1.1	Trademarks by origin/bn PPP$ GDP	51.5	42	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	80.9	2	●
7.1.4	ICTs & organizational model creation†	79.4	1	●
7.2	Creative goods & services	48.6	7	
7.2.1	Cultural & creative services exports, % of total trade	0.8	15	
7.2.2	National feature films/mn pop. 15–69	5.3	34	
7.2.3	Global ent. & media market/th pop. 15–69	64.4	6	
7.2.4	Printing & publishing manufactures, %	2.2	21	
7.2.5	Creative goods exports, % total trade	2.9	15	
7.3	Online creativity	75.8	4	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	65.8	11	
7.3.2	Country-code TLDs/th pop. 15–69	83.9	7	
7.3.3	Wikipedia edits/mn pop. 15–69	9,652.4	4	●
7.3.4	Video uploads on YouTube/pop. 15–69	82.4	4	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

United States of America

Key indicators

Population (millions)	321.8
GDP (US$ billions)	17,947.0
GDP per capita, PPP$	55,805.2
Income group	High income
Region	Northern America

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**61.4**	**4**	
Innovation Output Sub-Index		54.1	7	
Innovation Input Sub-Index		68.7	3	●
Innovation Efficiency Ratio		0.8	25	
Global Innovation Index 2015 (out of 141)		60.1	5	
1	**Institutions**	**85.7**	**17**	
1.1	Political environment	78.9	21	
1.1.1	Political stability & safety*	78.3	38	
1.1.2	Government effectiveness*	79.5	20	
1.2	Regulatory environment	90.9	13	
1.2.1	Regulatory quality*	76.2	19	
1.2.2	Rule of law*	87.4	18	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	Business environment	87.4	11	
1.3.1	Ease of starting a business*	91.2	41	
1.3.2	Ease of resolving insolvency*	90.1	5	
1.3.3	Ease of paying taxes*	80.8	47	
2	**Human capital & research**	**57.0**	**14**	
2.1	Education	54.9	39	
2.1.1	Expenditure on education, % GDP[d]	5.2	43	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	22.8	44	
2.1.3	School life expectancy, years	16.5	20	
2.1.4	PISA scales in reading, maths, & science	492.1	25	
2.1.5	Pupil-teacher ratio, secondary[d]	14.7	62	
2.2	Tertiary education	38.5	50	
2.2.1	Tertiary enrolment, % gross	88.8	5	
2.2.2	Graduates in science & engineering, %	14.9	85	○
2.2.3	Tertiary inbound mobility, %	3.9	41	
2.3	Research & development (R&D)	77.7	5	
2.3.1	Researchers, FTE/mn pop.[d]	4,018.6	21	
2.3.2	Gross expenditure on R&D, % GDP[d]	2.7	10	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	7,293.4	2	●
2.3.4	QS university ranking, average score top 3*	99.1	1	●
3	**Infrastructure**	**61.7**	**13**	
3.1	Information & communication technologies (ICTs)	85.9	8	
3.1.1	ICT access*	78.2	27	
3.1.2	ICT use*	78.6	11	
3.1.3	Government's online service*	94.5	4	
3.1.4	E-participation*	92.2	9	
3.2	General infrastructure	56.5	11	
3.2.1	Electricity output, kWh/cap	13,515.1	8	
3.2.2	Logistics performance*	3.9	9	
3.2.3	Gross capital formation, % GDP	20.3	80	○
3.3	Ecological sustainability	42.8	60	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.7	79	○
3.3.2	Environmental performance*	84.7	26	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	88	○
4	**Market sophistication**	**86.6**	**1**	●
4.1	Credit	86.5	1	●
4.1.1	Ease of getting credit*	95.0	2	●
4.1.2	Domestic credit to private sector, % GDP	197.1	3	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	Investment	80.0	1	●
4.2.1	Ease of protecting minority investors*	64.7	34	
4.2.2	Market capitalization, % GDP	151.2	5	
4.2.3	Total value of stocks traded, % GDP	236.9	1	●
4.2.4	Venture capital deals/bn PPP$ GDP	0.4	1	●
4.3	Trade, competition, & market scale	93.4	1	●
4.3.1	Applied tariff rate, weighted mean, %	1.5	42	
4.3.2	Intensity of local competition†	83.6	4	
4.3.3	Domestic market scale, bn PPP$	17,348.1	2	●
5	**Business sophistication**	**52.4**	**11**	
5.1	Knowledge workers	63.8	10	
5.1.1	Knowledge-intensive employment, %[d]	38.0	26	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	GERD performed by business, % of GDP[d]	1.9	10	
5.1.4	GERD financed by business, %[d]	60.9	9	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	45.1	19	
5.2.1	University/industry research collaboration†	80.8	2	●
5.2.2	State of cluster development†	74.8	2	●
5.2.3	GERD financed by abroad, %[d]	4.5	70	○
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	17	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	2.7	13	
5.3	Knowledge absorption	48.4	12	
5.3.1	Intellectual property payments, % total trade	1.6	12	
5.3.2	High-tech imports less re-imports, % total trade	16.4	9	
5.3.3	ICT services imports, % total trade	1.3	44	
5.3.4	FDI net inflows, % GDP	0.8	104	○
5.3.5	Research talent, % in business enterprise[d]	68.7	5	
6	**Knowledge & technology outputs**	**56.5**	**4**	
6.1	Knowledge creation	67.0	5	
6.1.1	Patents by origin/bn PPP$ GDP	16.4	6	
6.1.2	PCT patent applications/bn PPP$ GDP	3.2	14	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	19.9	38	
6.1.5	Citable documents H index	1,648.0	1	●
6.2	Knowledge impact	55.6	5	
6.2.1	Growth rate of PPP$ GDP/worker, %	0.8	70	○
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	1.1	1	●
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.9	88	○
6.2.5	High- & medium-high-tech manufactures, %[d]	43.3	15	
6.3	Knowledge diffusion	47.0	12	
6.3.1	Intellectual property receipts, % total trade	5.1	1	●
6.3.2	High-tech exports less re-exports, % total trade	6.8	26	
6.3.3	ICT services exports, % total trade	1.3	71	○
6.3.4	FDI net outflows, % GDP	2.1	31	
7	**Creative outputs**	**51.6**	**13**	
7.1	Intangible assets	48.3	45	
7.1.1	Trademarks by origin/bn PPP$ GDP	20.8	78	○
7.1.2	Industrial designs by origin/bn PPP$ GDP	1.2	62	
7.1.3	ICTs & business model creation†	75.4	14	
7.1.4	ICTs & organizational model creation†	79.4	2	●
7.2	Creative goods & services	49.8	6	
7.2.1	Cultural & creative services exports, % of total trade	1.7	1	●
7.2.2	National feature films/mn pop. 15–69	3.3	45	
7.2.3	Global ent. & media market/th pop. 15–69	77.7	3	●
7.2.4	Printing & publishing manufactures, %[d]	1.9	26	
7.2.5	Creative goods exports, % total trade	1.7	27	
7.3	Online creativity	60.2	11	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	100.0	1	●
7.3.2	Country-code TLDs/th pop. 15–69	2.6	63	
7.3.3	Wikipedia edits/mn pop. 15–69	5,148.4	25	
7.3.4	Video uploads on YouTube/pop. 15–69	100.0	1	●

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Uruguay

Key indicators

Population (millions)	3.4
GDP (US$ billions)	53.8
GDP per capita, PPP$	21,506.5
Income group	High income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**34.3**	**62**	
Innovation Output Sub-Index		26.2	66	
Innovation Input Sub-Index		42.3	61	
Innovation Efficiency Ratio		0.6	81	
Global Innovation Index 2015 (out of 141)		35.8	68	
1	**Institutions**	**69.0**	**47**	
1.1	Political environment	70.1	38	●
1.1.1	Political stability & safety*	87.7	19	●
1.1.2	Government effectiveness*	52.4	44	
1.2	Regulatory environment	67.7	60	
1.2.1	Regulatory quality*	57.7	49	
1.2.2	Rule of law*	64.0	38	●
1.2.3	Cost of redundancy dismissal, salary weeks	20.8	88	
1.3	Business environment	69.2	68	
1.3.1	Ease of starting a business*	89.9	51	
1.3.2	Ease of resolving insolvency*	52.4	59	
1.3.3	Ease of paying taxes*	65.3	91	
2	**Human capital & research**	**29.3**	**78**	
2.1	Education	43.3	77	
2.1.1	Expenditure on education, % GDP[d]	4.4	72	
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	10.7	97	○
2.1.3	School life expectancy, years[d]	15.5	37	
2.1.4	PISA scales in reading, maths, & science	412.2	52	○
2.1.5	Pupil-teacher ratio, secondary[d]	11.3	37	
2.2	Tertiary education	37.8	53	
2.2.1	Tertiary enrolment, % gross[d]	63.1	36	●
2.2.2	Graduates in science & engineering, %[d]	15.6	83	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	6.9	70	
2.3.1	Researchers, FTE/mn pop.	504.2	60	
2.3.2	Gross expenditure on R&D, % GDP[d]	0.3	75	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	15.0	60	
3	**Infrastructure**	**51.8**	**37**	●
3.1	Information & communication technologies (ICTs)	77.2	18	●
3.1.1	ICT access*	71.5	44	
3.1.2	ICT use*	54.1	42	
3.1.3	Government's online service*	85.0	14	●
3.1.4	E-participation*	98.0	3	●
3.2	General infrastructure	26.7	97	
3.2.1	Electricity output, kWh/cap	3,419.9	55	
3.2.2	Logistics performance*	2.7	86	
3.2.3	Gross capital formation, % GDP	19.4	91	
3.3	Ecological sustainability	51.7	32	●
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	12.5	13	●
3.3.2	Environmental performance*	74.0	61	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.1	46	
4	**Market sophistication**	**35.9**	**104**	
4.1	Credit	23.1	97	
4.1.1	Ease of getting credit*	60.0	53	
4.1.2	Domestic credit to private sector, % GDP	26.9	99	
4.1.3	Microfinance gross loans, % GDP	0.0	71	○
4.2	Investment	30.0	94	
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP[d]	0.0	84	○
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	54.6	87	
4.3.1	Applied tariff rate, weighted mean, %	4.7	83	
4.3.2	Intensity of local competition†	62.3	88	
4.3.3	Domestic market scale, bn PPP$	71.7	82	
5	**Business sophistication**	**25.6**	**95**	
5.1	Knowledge workers	34.2	77	
5.1.1	Knowledge-intensive employment, %	20.9	66	
5.1.2	Firms offering formal training, % firms[d]	48.6	27	●
5.1.3	GERD performed by business, % of GDP[d]	0.0	73	○
5.1.4	GERD financed by business, %[d]	10.2	70	
5.1.5	Females employed w/advanced degrees, % total	13.7	45	
5.2	Innovation linkages	22.6	95	
5.2.1	University/industry research collaboration†	43.2	68	
5.2.2	State of cluster development†	38.6	92	
5.2.3	GERD financed by abroad, %[d]	5.4	64	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	79	
5.3	Knowledge absorption	19.9	100	
5.3.1	Intellectual property payments, % total trade	0.3	73	
5.3.2	High-tech imports less re-imports, % total trade	9.3	44	
5.3.3	ICT services imports, % total trade	0.4	105	○
5.3.4	FDI net inflows, % GDP	4.9	31	●
5.3.5	Research talent, % in business enterprise	1.0	76	○
6	**Knowledge & technology outputs**	**21.3**	**80**	
6.1	Knowledge creation	8.7	68	
6.1.1	Patents by origin/bn PPP$ GDP	0.5	74	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.3	36	
6.1.4	Scientific & technical articles/bn PPP$ GDP	12.6	56	
6.1.5	Citable documents H index	124.0	63	
6.2	Knowledge impact	35.3	69	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.9	28	●
6.2.2	New businesses/th pop. 15–64[d]	2.5	41	
6.2.3	Computer software spending, % GDP	0.2	60	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	13.0	29	●
6.2.5	High- & medium-high-tech manufactures, %[d]	12.9	70	
6.3	Knowledge diffusion	20.1	97	
6.3.1	Intellectual property receipts, % total trade	0.0	86	○
6.3.2	High-tech exports less re-exports, % total trade	1.3	59	
6.3.3	ICT services exports, % total trade	2.2	43	
6.3.4	FDI net outflows, % GDP	0.1	82	
7	**Creative outputs**	**31.1**	**56**	
7.1	Intangible assets	43.0	64	
7.1.1	Trademarks by origin/bn PPP$ GDP	53.4	39	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.3	92	○
7.1.3	ICTs & business model creation†	65.0	38	
7.1.4	ICTs & organizational model creation†	55.3	57	
7.2	Creative goods & services	17.6	76	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	4.8	37	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	1.4	39	
7.2.5	Creative goods exports, % total trade	0.1	92	
7.3	Online creativity	20.9	41	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	7.0	49	
7.3.2	Country-code TLDs/th pop. 15–69	11.4	38	●
7.3.3	Wikipedia edits/mn pop. 15–69	6,005.2	18	●
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Venezuela, Bolivarian Republic of

Key indicators

Population (millions)	31.1
GDP (US$ billions)	239.6
GDP per capita, PPP$	16,672.7
Income group	High income
Region	Latin America and the Caribbean

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**22.3**	**120**	
Innovation Output Sub-Index		14.1	119	
Innovation Input Sub-Index		30.5	112	
Innovation Efficiency Ratio		0.5	114	
Global Innovation Index 2015 (out of 141)		22.8	132	
1	**Institutions**	**16.0**	**128**	○
1.1	Political environment	23.6	121	
1.1.1	Political stability & safety*	42.3	102	
1.1.2	Government effectiveness*	4.9	125	
1.2	Regulatory environment	0.0	128	○
1.2.1	Regulatory quality*	0.0	128	○
1.2.2	Rule of law*	0.0	128	○
1.2.3	Cost of redundancy dismissal, salary weeks[d]	82.3	126	○
1.3	Business environment	24.4	128	○
1.3.1	Ease of starting a business*	40.4	128	○
1.3.2	Ease of resolving insolvency*	19.1	126	○
1.3.3	Ease of paying taxes*	13.6	127	○
2	**Human capital & research**	**37.5**	**46**	●
2.1	Education	51.8	54	
2.1.1	Expenditure on education, % GDP[d]	6.9	13	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	16.6	72	
2.1.3	School life expectancy, years[d]	14.0	59	
2.1.4	PISA scales in reading, maths, & science[d]	413.4	50	
2.1.5	Pupil-teacher ratio, secondary	7.9	6	●
2.2	Tertiary education	35.0	65	
2.2.1	Tertiary enrolment, % gross[d]	77.0	19	●
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	0.1	104	
2.3	Research & development (R&D)	25.8	42	●
2.3.1	Researchers, FTE/mn pop.[d]	290.9	66	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	100.8	29	●
2.3.4	QS university ranking, average score top 3*	22.1	50	●
3	**Infrastructure**	**39.4**	**76**	
3.1	Information & communication technologies (ICTs)	51.1	61	
3.1.1	ICT access*	54.4	73	
3.1.2	ICT use*	38.0	65	
3.1.3	Government's online service*	55.1	55	
3.1.4	E-participation*	56.9	51	
3.2	General infrastructure	27.7	93	
3.2.1	Electricity output, kWh/cap	4,050.0	52	
3.2.2	Logistics performance*	2.8	73	
3.2.3	Gross capital formation, % GDP	17.8	100	
3.3	Ecological sustainability	39.5	81	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.9	71	
3.3.2	Environmental performance*	76.2	55	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.1	113	
4	**Market sophistication**	**33.4**	**112**	
4.1	Credit	17.5	112	
4.1.1	Ease of getting credit*	40.0	92	
4.1.2	Domestic credit to private sector, % GDP[d]	29.9	95	
4.1.3	Microfinance gross loans, % GDP	0.2	55	
4.2	Investment	31.7	86	
4.2.1	Ease of protecting minority investors*	31.7	128	○
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	51.1	98	
4.3.1	Applied tariff rate, weighted mean, %	8.4	107	
4.3.2	Intensity of local competition†	29.1	123	○
4.3.3	Domestic market scale, bn PPP$	540.9	33	●
5	**Business sophistication**	**26.2**	**91**	
5.1	Knowledge workers	49.6	31	●
5.1.1	Knowledge-intensive employment, %[d]	19.2	74	
5.1.2	Firms offering formal training, % firms[d]	56.0	15	●
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total[d]	16.7	32	●
5.2	Innovation linkages	16.4	123	
5.2.1	University/industry research collaboration†	35.4	97	
5.2.2	State of cluster development†	22.1	122	○
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	67	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	101	
5.3	Knowledge absorption	12.7	127	○
5.3.1	Intellectual property payments, % total trade	0.6	50	
5.3.2	High-tech imports less re-imports, % total trade	n/a	n/a	
5.3.3	ICT services imports, % total trade	0.6	88	
5.3.4	FDI net inflows, % GDP[d]	0.6	112	
5.3.5	Research talent, % in business enterprise[d]	4.5	73	
6	**Knowledge & technology outputs**	**11.1**	**120**	
6.1	Knowledge creation	5.0	93	
6.1.1	Patents by origin/bn PPP$ GDP[d]	0.1	110	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	1.6	122	
6.1.5	Citable documents H index	155.0	53	●
6.2	Knowledge impact	2.8	124	
6.2.1	Growth rate of PPP$ GDP/worker, %	(8.1)	109	○
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.2	70	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.0	105	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	25.4	62	
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	n/a	n/a	
6.3.3	ICT services exports, % total trade	0.1	117	
6.3.4	FDI net outflows, % GDP[d]	0.4	66	
7	**Creative outputs**	**17.1**	**110**	
7.1	Intangible assets	29.3	111	
7.1.1	Trademarks by origin/bn PPP$ GDP[d]	22.1	77	
7.1.2	Industrial designs by origin/bn PPP$ GDP	n/a	n/a	
7.1.3	ICTs & business model creation†	36.6	121	
7.1.4	ICTs & organizational model creation†	39.5	110	
7.2	Creative goods & services	3.6	111	
7.2.1	Cultural & creative services exports, % of total trade	0.0	68	
7.2.2	National feature films/mn pop. 15–69	1.0	72	
7.2.3	Global ent. & media market/th pop. 15–69	4.8	44	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	n/a	n/a	
7.3	Online creativity	6.4	71	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.1	78	
7.3.2	Country-code TLDs/th pop. 15–69	5.2	53	●
7.3.3	Wikipedia edits/mn pop. 15–69	1,623.9	59	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Viet Nam

Key indicators

Population (millions)	93.4
GDP (US$ billions)	191.5
GDP per capita, PPP$	6,024.4
Income group	Lower-middle income
Region	South East Asia, East Asia, and Oceania

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**35.4**	**59**	
Innovation Output Sub-Index		32.3	42	
Innovation Input Sub-Index		38.4	79	
Innovation Efficiency Ratio		0.8	11	●
Global Innovation Index 2015 (out of 141)		38.3	52	
1	**Institutions**	**51.7**	**93**	
1.1	Political environment	50.0	65	
1.1.1	Political stability & safety*	62.8	66	
1.1.2	Government effectiveness*	37.3	72	
1.2	Regulatory environment	51.0	106	
1.2.1	Regulatory quality*	30.1	103	
1.2.2	Rule of law*	39.4	76	
1.2.3	Cost of redundancy dismissal, salary weeks	24.6	101	
1.3	Business environment	54.2	116	○
1.3.1	Ease of starting a business*	81.3	88	
1.3.2	Ease of resolving insolvency*	35.8	103	
1.3.3	Ease of paying taxes*	45.4	115	○
2	**Human capital & research**	**30.1**	**74**	
2.1	Education	61.0	19	
2.1.1	Expenditure on education, % GDP	6.3	21	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	28.3	84	
2.2.1	Tertiary enrolment, % gross	30.5	76	
2.2.2	Graduates in science & engineering, %	22.4	39	
2.2.3	Tertiary inbound mobility, %	0.1	103	○
2.3	Research & development (R&D)	1.1	99	
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP◴	0.2	89	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**36.7**	**90**	
3.1	Information & communication technologies (ICTs)	41.3	82	
3.1.1	ICT access*	44.3	89	
3.1.2	ICT use*	30.1	78	
3.1.3	Government's online service*	41.7	78	
3.1.4	E-participation*	49.0	64	
3.2	General infrastructure	34.5	65	
3.2.1	Electricity output, kWh/cap	1,416.0	87	
3.2.2	Logistics performance*	3.2	46	
3.2.3	Gross capital formation, % GDP	23.9	49	
3.3	Ecological sustainability	34.4	99	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	6.8	77	
3.3.2	Environmental performance*	58.5	104	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.6	50	
4	**Market sophistication**	**43.0**	**64**	
4.1	Credit	38.1	48	
4.1.1	Ease of getting credit*	70.0	27	●
4.1.2	Domestic credit to private sector, % GDP	100.3	25	●
4.1.3	Microfinance gross loans, % GDP	0.4	37	
4.2	Investment	22.9	125	○
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	24.7	56	
4.2.3	Total value of stocks traded, % GDP	11.7	31	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	66	
4.3	Trade, competition, & market scale	68.0	44	
4.3.1	Applied tariff rate, weighted mean, %	3.5	63	
4.3.2	Intensity of local competition†	67.3	69	
4.3.3	Domestic market scale, bn PPP$	512.6	35	●
5	**Business sophistication**	**30.6**	**72**	
5.1	Knowledge workers	27.8	93	
5.1.1	Knowledge-intensive employment, %	10.3	94	○
5.1.2	Firms offering formal training, % firms◴	43.5	31	
5.1.3	GERD performed by business, % of GDP◴	0.0	68	
5.1.4	GERD financed by business, %◴	28.4	54	
5.1.5	Females employed w/advanced degrees, % total	6.6	74	○
5.2	Innovation linkages	22.2	101	
5.2.1	University/industry research collaboration†	37.8	86	
5.2.2	State of cluster development†	47.0	56	
5.2.3	GERD financed by abroad, %◴	4.0	72	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	42	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	90	
5.3	Knowledge absorption	41.9	20	●
5.3.1	Intellectual property payments, % total trade	n/a	n/a	
5.3.2	High-tech imports less re-imports, % total trade	19.8	6	●
5.3.3	ICT services imports, % total trade	0.1	120	○
5.3.4	FDI net inflows, % GDP	4.9	29	●
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**31.9**	**39**	
6.1	Knowledge creation	6.8	80	
6.1.1	Patents by origin/bn PPP$ GDP	1.0	66	
6.1.2	PCT patent applications/bn PPP$ GDP	0.0	81	○
6.1.3	Utility models by origin/bn PPP$ GDP	0.5	34	
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.0	95	
6.1.5	Citable documents H index	133.0	58	
6.2	Knowledge impact	46.7	25	●
6.2.1	Growth rate of PPP$ GDP/worker, %	4.5	10	●
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.3	33	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	7.4	47	
6.2.5	High- & medium-high-tech manufactures, %◴	26.2	48	
6.3	Knowledge diffusion	42.3	20	●
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	22.5	4	●
6.3.3	ICT services exports, % total trade	0.1	119	○
6.3.4	FDI net outflows, % GDP◴	1.1	45	
7	**Creative outputs**	**32.6**	**52**	
7.1	Intangible assets	46.3	54	
7.1.1	Trademarks by origin/bn PPP$ GDP	75.8	17	●
7.1.2	Industrial designs by origin/bn PPP$ GDP	3.4	36	
7.1.3	ICTs & business model creation†	57.7	66	
7.1.4	ICTs & organizational model creation†	53.4	65	
7.2	Creative goods & services	31.5	40	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69◴	1.2	68	
7.2.3	Global ent. & media market/th pop. 15–69	0.5	58	○
7.2.4	Printing & publishing manufactures, %◴	1.3	49	
7.2.5	Creative goods exports, % total trade	5.1	9	●
7.3	Online creativity	6.4	72	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	2.7	70	
7.3.2	Country-code TLDs/th pop. 15–69	3.2	60	
7.3.3	Wikipedia edits/mn pop. 15–69	267.7	95	
7.3.4	Video uploads on YouTube/pop. 15–69	17.9	55	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
◴ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Yemen

Key indicators

Population (millions)	26.8
GDP (US$ billions)	36.9
GDP per capita, PPP$	2,670.6
Income group	Lower-middle income
Region	Northern Africa and Western Asia

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**14.6**	**128**	○
Innovation Output Sub-Index		7.4	128	○
Innovation Input Sub-Index		21.7	128	○
Innovation Efficiency Ratio		0.3	126	
Global Innovation Index 2015 (out of 141)		20.8	137	
1	**Institutions**	**32.2**	**126**	
1.1	Political environment	0.0	128	○
1.1.1	Political stability & safety*	0.0	128	○
1.1.2	Government effectiveness*	0.0	128	○
1.2	Regulatory environment	41.2	117	
1.2.1	Regulatory quality*	23.8	114	
1.2.2	Rule of law*	17.9	126	
1.2.3	Cost of redundancy dismissal, salary weeks	27.4	107	
1.3	Business environment	55.3	113	
1.3.1	Ease of starting a business*	74.2	113	
1.3.2	Ease of resolving insolvency*	28.1	120	
1.3.3	Ease of paying taxes*	63.7	93	●
2	**Human capital & research**	**15.8**	**111**	
2.1	Education	32.1	106	
2.1.1	Expenditure on education, % GDP[d]	4.6	65	●
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap[d]	12.1	95	
2.1.3	School life expectancy, years[d]	9.0	108	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary[d]	16.1	72	●
2.2	Tertiary education	15.3	106	
2.2.1	Tertiary enrolment, % gross[d]	10.0	106	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %[d]	4.3	35	●
2.3	Research & development (R&D)	0.0	115	○
2.3.1	Researchers, FTE/mn pop.	n/a	n/a	
2.3.2	Gross expenditure on R&D, % GDP	n/a	n/a	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**18.0**	**128**	○
3.1	Information & communication technologies (ICTs)	29.1	101	
3.1.1	ICT access*	n/a	n/a	
3.1.2	ICT use*	n/a	n/a	
3.1.3	Government's online service*	30.7	97	
3.1.4	E-participation*	27.5	103	
3.2	General infrastructure	0.4	128	○
3.2.1	Electricity output, kWh/cap	348.3	107	
3.2.2	Logistics performance*	2.2	123	○
3.2.3	Gross capital formation, % GDP	2.3	125	○
3.3	Ecological sustainability	24.5	122	
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	10.1	26	●
3.3.2	Environmental performance*	n/a	n/a	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP[d]	0.0	127	○
4	**Market sophistication**	**33.8**	**111**	
4.1	Credit	0.4	128	○
4.1.1	Ease of getting credit*	0.0	127	○
4.1.2	Domestic credit to private sector, % GDP[d]	6.3	125	○
4.1.3	Microfinance gross loans, % GDP	0.0	69	
4.2	Investment	45.0	32	
4.2.1	Ease of protecting minority investors*	45.0	97	
4.2.2	Market capitalization, % GDP	n/a	n/a	
4.2.3	Total value of stocks traded, % GDP	n/a	n/a	
4.2.4	Venture capital deals/bn PPP$ GDP	n/a	n/a	
4.3	Trade, competition, & market scale	56.0	83	●
4.3.1	Applied tariff rate, weighted mean, %	4.1	72	●
4.3.2	Intensity of local competition†	n/a	n/a	
4.3.3	Domestic market scale, bn PPP$	104.0	74	●
5	**Business sophistication**	**8.6**	**128**	○
5.1	Knowledge workers	14.4	119	
5.1.1	Knowledge-intensive employment, %	n/a	n/a	
5.1.2	Firms offering formal training, % firms	14.3	88	
5.1.3	GERD performed by business, % of GDP	n/a	n/a	
5.1.4	GERD financed by business, %	n/a	n/a	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	0.3	[128]	
5.2.1	University/industry research collaboration†	n/a	n/a	
5.2.2	State of cluster development†	n/a	n/a	
5.2.3	GERD financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	n/a	n/a	
5.2.5	Patent families 2+ offices/bn PPP$ GDP[d]	0.0	105	
5.3	Knowledge absorption	11.1	128	○
5.3.1	Intellectual property payments, % total trade[d]	0.0	106	
5.3.2	High-tech imports less re-imports, % total trade	4.6	103	
5.3.3	ICT services imports, % total trade[d]	0.4	107	
5.3.4	FDI net inflows, % GDP[d]	(0.4)	126	
5.3.5	Research talent, % in business enterprise	n/a	n/a	
6	**Knowledge & technology outputs**	**10.6**	**124**	
6.1	Knowledge creation	1.3	127	○
6.1.1	Patents by origin/bn PPP$ GDP	0.3	88	●
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	0.0	62	○
6.1.4	Scientific & technical articles/bn PPP$ GDP	2.4	114	
6.1.5	Citable documents H index	46.0	119	
6.2	Knowledge impact	12.3	117	
6.2.1	Growth rate of PPP$ GDP/worker, %	(4.4)	108	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.4	122	
6.2.5	High- & medium-high-tech manufactures, %[d]	1.9	96	
6.3	Knowledge diffusion	18.3	108	
6.3.1	Intellectual property receipts, % total trade[d]	0.4	25	●
6.3.2	High-tech exports less re-exports, % total trade	0.0	116	
6.3.3	ICT services exports, % total trade[d]	3.4	19	●
6.3.4	FDI net outflows, % GDP	n/a	n/a	
7	**Creative outputs**	**4.2**	**125**	
7.1	Intangible assets	7.1	125	
7.1.1	Trademarks by origin/bn PPP$ GDP	19.4	82	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.2	100	
7.1.3	ICTs & business model creation†	n/a	n/a	
7.1.4	ICTs & organizational model creation†	n/a	n/a	
7.2	Creative goods & services	2.2	115	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %[d]	0.4	90	
7.2.5	Creative goods exports, % total trade	0.0	122	
7.3	Online creativity	0.5	109	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.4	111	
7.3.2	Country-code TLDs/th pop. 15–69	0.0	121	
7.3.3	Wikipedia edits/mn pop. 15–69	117.5	106	
7.3.4	Video uploads on YouTube/pop. 15–69	0.7	71	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
[d] indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Zambia

Key indicators

Population (millions)	16.2
GDP (US$ billions)	21.9
GDP per capita, PPP$	3,868.1
Income group	Lower-middle income
Region	Sub-Saharan Africa

		Score 0–100 or value (hard data)	Rank	
Global Innovation Index (out of 128)		**19.9**	**125**	○
Innovation Output Sub-Index		15.6	118	
Innovation Input Sub-Index		24.3	126	○
Innovation Efficiency Ratio		0.6	72	
Global Innovation Index 2015 (out of 141)		24.6	124	
1	**Institutions**	**47.4**	**105**	
1.1	Political environment	47.0	73	
1.1.1	Political stability & safety*	68.0	51	●
1.1.2	Government effectiveness*	26.0	96	
1.2	Regulatory environment	26.1	124	○
1.2.1	Regulatory quality*	32.0	101	
1.2.2	Rule of law*	40.8	73	
1.2.3	Cost of redundancy dismissal, salary weeks	50.6	124	○
1.3	Business environment	69.1	69	
1.3.1	Ease of starting a business*	86.7	59	●
1.3.2	Ease of resolving insolvency*	39.0	94	
1.3.3	Ease of paying taxes*	81.7	40	●
2	**Human capital & research**	**0.7**	**128**	○
2.1	Education	0.0	[128]	
2.1.1	Expenditure on education, % GDP④	1.1	118	○
2.1.2	Gov't expenditure/pupil, secondary, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	n/a	n/a	
2.1.5	Pupil-teacher ratio, secondary	n/a	n/a	
2.2	Tertiary education	n/a	n/a	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	n/a	n/a	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.3	Research & development (R&D)	1.5	96	
2.3.1	Researchers, FTE/mn pop.④	40.9	88	
2.3.2	Gross expenditure on R&D, % GDP④	0.3	79	
2.3.3	Global R&D companies, avg. expend. top 3, mn $US	0.0	45	○
2.3.4	QS university ranking, average score top 3*	0.0	73	○
3	**Infrastructure**	**19.2**	**125**	○
3.1	Information & communication technologies (ICTs)	16.1	121	○
3.1.1	ICT access*	26.3	116	○
3.1.2	ICT use*	6.2	113	
3.1.3	Government's online service*	14.2	118	
3.1.4	E-participation*	17.6	115	
3.2	General infrastructure	31.5	76	
3.2.1	Electricity output, kWh/cap	916.0	93	
3.2.2	Logistics performance*	2.5	112	
3.2.3	Gross capital formation, % GDP	30.9	14	●
3.3	Ecological sustainability	10.0	128	○
3.3.1	GDP/unit of energy use, 2005 PPP$/kg oil eq	5.1	96	
3.3.2	Environmental performance*	n/a	n/a	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.4	85	
4	**Market sophistication**	**36.6**	**100**	
4.1	Credit	26.9	87	
4.1.1	Ease of getting credit*	75.0	18	●
4.1.2	Domestic credit to private sector, % GDP	17.1	112	
4.1.3	Microfinance gross loans, % GDP	0.0	66	
4.2	Investment	23.6	123	○
4.2.1	Ease of protecting minority investors*	53.3	77	
4.2.2	Market capitalization, % GDP④	13.4	74	
4.2.3	Total value of stocks traded, % GDP④	0.8	58	
4.2.4	Venture capital deals/bn PPP$ GDP	0.0	56	
4.3	Trade, competition, & market scale	59.2	71	
4.3.1	Applied tariff rate, weighted mean, %	3.4	62	●
4.3.2	Intensity of local competition†	75.7	25	●
4.3.3	Domestic market scale, bn PPP$	61.4	90	
5	**Business sophistication**	**17.4**	**126**	○
5.1	Knowledge workers	15.2	118	
5.1.1	Knowledge-intensive employment, %④	7.3	97	
5.1.2	Firms offering formal training, % firms	28.2	63	
5.1.3	GERD performed by business, % of GDP④	0.0	82	○
5.1.4	GERD financed by business, %④	3.2	83	
5.1.5	Females employed w/advanced degrees, % total	n/a	n/a	
5.2	Innovation linkages	22.0	103	
5.2.1	University/industry research collaboration†	41.4	73	
5.2.2	State of cluster development†	51.2	37	●
5.2.3	GERD financed by abroad, %④	1.6	82	
5.2.4	JV–strategic alliance deals/bn PPP$ GDP	0.0	58	
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.0	96	
5.3	Knowledge absorption	15.1	122	○
5.3.1	Intellectual property payments, % total trade	0.0	110	○
5.3.2	High-tech imports less re-imports, % total trade	3.4	112	
5.3.3	ICT services imports, % total trade	0.4	106	
5.3.4	FDI net inflows, % GDP	5.6	24	●
5.3.5	Research talent, % in business enterprise④	4.9	72	
6	**Knowledge & technology outputs**	**15.6**	**115**	
6.1	Knowledge creation	4.5	97	
6.1.1	Patents by origin/bn PPP$ GDP	0.2	91	
6.1.2	PCT patent applications/bn PPP$ GDP	n/a	n/a	
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	4.6	100	
6.1.5	Citable documents H index	83.0	89	
6.2	Knowledge impact	34.6	73	
6.2.1	Growth rate of PPP$ GDP/worker, %	2.2	35	●
6.2.2	New businesses/th pop. 15–64	1.3	59	
6.2.3	Computer software spending, % GDP	n/a	n/a	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	0.8	111	
6.2.5	High- & medium-high-tech manufactures, %	n/a	n/a	
6.3	Knowledge diffusion	7.8	123	○
6.3.1	Intellectual property receipts, % total trade	n/a	n/a	
6.3.2	High-tech exports less re-exports, % total trade	0.2	97	
6.3.3	ICT services exports, % total trade	0.3	108	
6.3.4	FDI net outflows, % GDP	(3.6)	117	○
7	**Creative outputs**	**15.5**	**117**	
7.1	Intangible assets	30.5	107	
7.1.1	Trademarks by origin/bn PPP$ GDP	8.6	101	
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.5	80	
7.1.3	ICTs & business model creation†	52.5	84	
7.1.4	ICTs & organizational model creation†	48.8	78	
7.2	Creative goods & services	1.1	[122]	
7.2.1	Cultural & creative services exports, % of total trade	n/a	n/a	
7.2.2	National feature films/mn pop. 15–69	n/a	n/a	
7.2.3	Global ent. & media market/th pop. 15–69	n/a	n/a	
7.2.4	Printing & publishing manufactures, %	n/a	n/a	
7.2.5	Creative goods exports, % total trade	0.0	102	
7.3	Online creativity	0.1	121	○
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	0.1	122	○
7.3.2	Country-code TLDs/th pop. 15–69	0.0	127	○
7.3.3	Wikipedia edits/mn pop. 15–69	44.3	112	
7.3.4	Video uploads on YouTube/pop. 15–69	n/a	n/a	

NOTES: ● indicates a strength; ○ a weakness; * an index; † a survey question.
④ indicates that the country's data are older than the base year; see Appendix II for details, including the year of the data.
Square brackets indicate a top 10 or 100 or below sub-pillar ranking in the presence of a relevant number of missing variables; see page 172 of this appendix for details.

Appendix II

Data Tables

Data Tables

This appendix provides tables for each of the 82 indicators that make up the Global Innovation Index 2016.

Structure

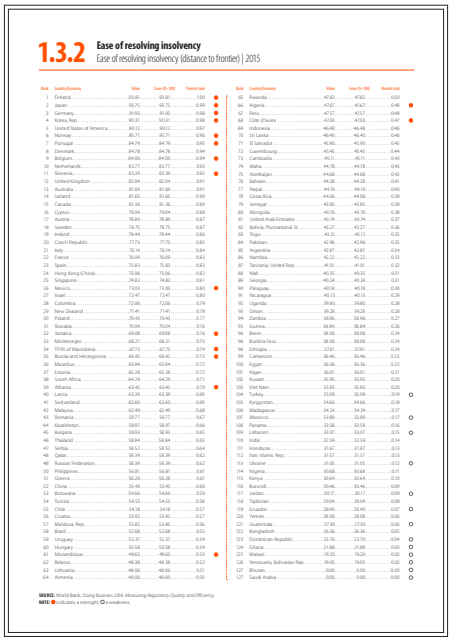
Each table is identified by indicator number, with the first digit representing the pillar, the second representing the sub-pillar, and the final digit representing the indicator within that particular sub-pillar. For example, Table 5.1.4 shows results for indicator 5.1.4, GERD financed by business enterprise, which is the fourth indicator of sub-pillar 5.1, Knowledge workers, within pillar 5, Business sophistication.

The sub-heading text provides a detailed description of each indicator and includes information on the units of each variable, the scaling factor (if any), the question asked (for survey questions), and the most frequent year for which data were available.

For each indicator for each economy, the most recent value within the period 2006–15 was used. In instances where this base year does not correspond to the most frequent year reported in the sub-heading, the year of the value appears in parentheses after the economy name. These instances are noted in the Country/Economy Profiles after the indicator name with a clock symbol.

A total of 58 variables are hard data. A total of 19 variables are composite indicators and 5 are survey questions from the World Economic Forum's Executive Opinion Survey.

The source of each indicator is indicated at the bottom of the page; details for each can be found in Appendix III, Sources and Definitions.



1.3.2 Ease of resolving insolvency

Ease of resolving insolvency (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	93.81	93.81	1.00	●	65	Rwanda	47.82	47.82	0.50	
2	Japan	93.75	93.75	0.99	●	66	Algeria	47.67	47.67	0.49	●
3	Germany	89.93	89.93	0.98	●	67	Peru	47.57	47.57	0.48	●
4	Korea, Rep.	90.31	90.31	0.98	●	68	Côte d'Ivoire	47.03	47.03	0.47	
5	United States of America	90.12	90.12	0.97		69	Indonesia	46.48	46.48	0.46	
6	Norway	85.71	85.71	0.96	●	70	Sri Lanka	46.40	46.40	0.46	
7	Portugal	84.79	84.79	0.95	●	71	El Salvador	45.90	45.90	0.45	
8	Denmark	84.78	84.78	0.94		72	Luxembourg	45.45	45.45	0.44	
9	Belgium	84.00	84.00	0.94	●	73	Cambodia	45.11	45.11	0.43	
10	Netherlands	83.77	83.77	0.93		74	Malta	44.76	44.78	0.43	
11	Slovenia	83.39	83.39	0.92	●	75	Azerbaijan	44.68	44.68	0.42	
12	United Kingdom	82.04	82.04	0.91		76	Bahrain	44.28	44.28	0.41	
13	Australia	81.69	81.69	0.91		77	Nepal	44.19	44.19	0.40	
14	Ireland	81.65	81.65	0.90		78	Costa Rica	44.06	44.06	0.39	
15	Canada	81.36	81.36	0.89		79	Senegal	43.85	43.85	0.39	
16	Cyprus	79.04	79.04	0.88		80	Mongolia	43.76	43.76	0.38	
17	Austria	78.89	78.89	0.87		81	United Arab Emirates	43.74	43.74	0.37	
18	Sweden	78.75	78.75	0.87		82	Bolivia, Plurinational St.	43.27	43.27	0.36	
19	Ireland	78.44	78.44	0.86		83	Togo	43.12	43.12	0.35	
20	Czech Republic	77.73	77.73	0.85		84	Pakistan	42.96	42.96	0.35	
21	Italy	76.14	76.14	0.84		85	Argentina	42.87	42.87	0.34	
22	France	76.09	76.09	0.83		86	Namibia	42.22	42.22	0.33	
23	Spain	75.83	75.83	0.83		87	Tanzania, United Rep.	41.01	41.01	0.32	
24	Hong Kong (China)	75.06	75.06	0.82		88	Mali	40.35	40.35	0.31	
25	Singapore	74.83	74.83	0.81		89	Georgia	40.24	40.24	0.31	
26	Mexico	73.03	73.03	0.80	●	90	Paraguay	40.18	40.18	0.30	
27	Israel	72.47	72.47	0.80		91	Nicaragua	40.13	40.13	0.29	
28	Colombia	72.06	72.06	0.79		92	Uganda	39.80	39.80	0.28	
29	New Zealand	71.41	71.41	0.78		93	Oman	39.28	39.28	0.28	
30	Poland	70.43	70.43	0.77		94	Zambia	38.96	38.96	0.27	
31	Slovakia	70.04	70.04	0.76		95	Guinea	38.84	38.84	0.26	
32	Jamaica	69.08	69.08	0.76	●	96	Benin	38.08	38.08	0.24	
33	Montenegro	68.21	68.21	0.75		96	Burkina Faso	38.08	38.08	0.24	
34	TFYR of Macedonia	67.73	67.73	0.74	●	98	Ethiopia	37.81	37.81	0.24	
35	Bosnia and Herzegovina	66.42	66.42	0.73	●	99	Cameroon	36.46	36.46	0.23	
36	Mauritius	65.94	65.94	0.72		100	Egypt	36.36	36.36	0.22	
37	Estonia	65.28	65.28	0.72		101	Niger	36.01	36.01	0.21	
38	South Africa	64.29	64.29	0.71		102	Kuwait	35.95	35.95	0.20	
39	Albania	63.42	63.42	0.70	●	103	Viet Nam	35.83	35.83	0.20	
40	Latvia	63.39	63.39	0.69		104	Turkey	35.09	35.09	0.19	○
41	Switzerland	62.60	62.60	0.69		105	Kyrgyzstan	34.66	34.66	0.18	
42	Malaysia	62.49	62.49	0.68		106	Madagascar	34.24	34.24	0.17	
43	Romania	59.77	59.77	0.67		107	Morocco	33.89	33.89	0.17	○
44	Kazakhstan	58.87	58.87	0.66		108	Panama	33.58	33.58	0.16	
45	Bulgaria	58.83	58.90	0.65		109	Lebanon	33.07	33.07	0.15	○
46	Thailand	58.84	58.84	0.65		110	India	32.59	32.59	0.14	
47	Serbia	58.52	58.52	0.64		111	Honduras	31.67	31.67	0.13	
48	Qatar	58.39	58.39	0.62		112	Iran, Islamic Rep.	31.57	31.57	0.13	○
49	Russian Federation	58.39	58.39	0.62		113	Ukraine	31.05	31.05	0.12	
50	Philippines	56.81	56.81	0.61		114	Nigeria	30.68	30.68	0.11	
51	Greece	56.28	56.28	0.61		115	Kenya	30.64	30.64	0.10	
52	China	55.45	55.45	0.60		116	Burundi	30.46	30.46	0.09	
53	Botswana	54.66	54.66	0.59		117	Jordan	30.17	30.17	0.09	○
54	Tunisia	54.53	54.53	0.58		118	Tajikistan	29.04	29.04	0.08	○
55	Chile	54.18	54.18	0.57		119	Ecuador	28.40	28.40	0.07	○
56	Croatia	53.92	53.92	0.57		120	Yemen	28.08	28.08	0.06	
57	Moldova, Rep.	53.85	53.85	0.56		120	Guatemala	27.30	27.30	0.06	○
58	Brazil	52.68	52.68	0.55		122	Bangladesh	26.36	26.36	0.05	
59	Uruguay	52.37	52.37	0.54		123	Dominican Republic	23.70	23.70	0.04	○
60	Hungary	50.58	50.58	0.54		124	Ghana	21.88	21.88	0.03	○
61	Mozambique	49.63	49.63	0.53	●	125	Malawi	19.20	19.20	0.02	○
62	Belarus	48.38	48.38	0.52		126	Venezuela, Bolivarian Rep.	19.05	19.05	0.02	○
63	Lithuania	48.06	48.06	0.51		127	Bhutan	0.00	0.00	0.00	○
64	Armenia	48.00	48.00	0.50		127	Saudi Arabia	0.00	0.00	0.00	○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*
NOTE: ● indicates a strength, ○ a weakness.

Explanation of scores

The tables list the economies by their rank order, with the best performers at the top. After the rank come the country/economy name, the original value of the specific indicator for that country (in the units specified in the sub-heading), the normalized score in the 0–100 range, and the percentage of economies with scores that fall below the normalized score (i.e., percent ranks). To the far right of each column, a solid circle indicates that an indicator is a strength for the country/economy in question, and a hollow circle indicates that it is a weakness (refer to Appendix I, Country/Economy Profiles, for details).

- Strengths (●) are all ranks of 1, 2, and 3, as well as all scores with percent ranks greater than the 10th highest percent rank among the 82 indicators in a specific economy.
- Weaknesses (○) are all scores with percent ranks lower than the 10th smallest percent rank among the 82 indicators in a specific economy.

For three hard data series (7.3.1, 7.3.2, and 7.3.4), the raw data were provided under the condition that only the normalized scores be published, and therefore the original value equals the normalized score. For indicators 1.3.1, 1.3.2, 1.3.3, 2.3.4, 3.3.2, 4.1.1, and 4.2.1, the range for both measures is the same—(0–100)—and therefore both measures are also identical.

Details on the computation methodology can be found in Appendix IV, Technical Notes.

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1.1.1 Political stability and absence of violence/terrorism

Political stability and absence of violence/terrorism index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	New Zealand	1.49	100.00	1.00	●
2	Luxembourg	1.39	97.43	0.99	●
3	Austria	1.29	95.05	0.98	●
4	Finland	1.28	94.80	0.98	
5	Switzerland	1.24	93.81	0.97	
6	Iceland	1.24	93.74	0.96	●
7	Singapore	1.23	93.36	0.95	
8	Canada	1.18	92.12	0.94	●
9	Norway	1.13	91.02	0.94	
10	Hong Kong (China)	1.13	90.90	0.93	
11	Malta	1.11	90.59	0.92	
12	Australia	1.08	89.77	0.91	
13	Sweden	1.07	89.59	0.91	
14	Ireland	1.07	89.39	0.90	
15	Netherlands	1.05	88.86	0.89	
16	Botswana	1.02	88.28	0.88	●
17	Slovakia	1.02	88.25	0.87	●
18	Japan	1.02	88.24	0.87	
19	Uruguay	1.00	87.73	0.86	●
20	Qatar	1.00	87.72	0.85	
21	Bhutan	1.00	87.64	0.84	●
22	Czech Republic	0.97	86.91	0.83	
23	Denmark	0.94	86.33	0.83	
24	Germany	0.93	86.11	0.82	
25	Mongolia	0.87	84.39	0.81	
26	Poland	0.87	84.39	0.80	●
27	United Arab Emirates	0.81	83.13	0.80	
28	Slovenia	0.79	82.59	0.79	
29	Portugal	0.79	82.58	0.78	
30	Lithuania	0.78	82.38	0.77	
31	Estonia	0.76	81.77	0.76	
32	Mauritius	0.74	81.20	0.76	
33	Belgium	0.71	80.63	0.75	
34	Hungary	0.70	80.29	0.74	
35	Cyprus	0.69	79.93	0.73	
36	Oman	0.66	79.25	0.72	●
37	Costa Rica	0.63	78.55	0.72	
38	United States of America	0.62	78.29	0.71	
39	Namibia	0.62	78.21	0.70	●
40	Croatia	0.60	77.81	0.69	
41	Latvia	0.55	76.66	0.69	
42	Italy	0.50	75.25	0.68	
43	Chile	0.49	75.15	0.67	
44	Albania	0.47	74.63	0.66	
45	United Kingdom	0.44	73.81	0.65	○
46	France	0.36	71.71	0.65	
47	Malaysia	0.34	71.31	0.64	
48	Spain	0.32	70.73	0.63	
49	TFYR of Macedonia	0.25	69.05	0.62	
50	Montenegro	0.24	68.71	0.61	
51	Zambia	0.21	67.97	0.61	●
52	Dominican Republic	0.19	67.53	0.60	●
53	Korea, Rep.	0.19	67.49	0.59	
54	Serbia	0.18	67.32	0.58	
55	Kuwait	0.14	66.24	0.57	
56	Belarus	0.12	65.93	0.57	
57	Malawi	0.12	65.81	0.56	●
58	Panama	0.10	65.26	0.55	
59	Jamaica	0.09	65.05	0.54	
60	Bulgaria	0.08	64.89	0.54	
61	Romania	0.08	64.78	0.53	
62	Argentina	0.08	64.73	0.52	
63	Kazakhstan	0.05	64.19	0.51	
64	Benin	0.05	64.09	0.50	
65	Greece	0.02	63.46	0.50	
66	Viet Nam	0.00	62.78	0.49	
67	Ecuador	−0.01	62.62	0.48	
68	Brazil	−0.01	62.51	0.47	
69	Cambodia	−0.04	61.86	0.46	
70	Nicaragua	−0.05	61.69	0.46	
71	Bosnia and Herzegovina	−0.06	61.29	0.45	
72	South Africa	−0.08	60.98	0.44	
73	Rwanda	−0.10	60.37	0.43	
74	Moldova, Rep.	−0.10	60.34	0.43	
75	Senegal	−0.13	59.69	0.42	
76	Ghana	−0.13	59.63	0.41	
77	El Salvador	−0.15	59.14	0.40	
78	Togo	−0.16	58.77	0.39	●
79	Paraguay	−0.20	57.86	0.39	
80	Armenia	−0.21	57.75	0.38	
81	Georgia	−0.23	57.05	0.37	
82	Saudi Arabia	−0.24	56.94	0.36	
83	Sri Lanka	−0.25	56.63	0.35	
84	Mozambique	−0.35	54.13	0.35	
85	Bolivia, Plurinational St.	−0.36	53.90	0.34	
86	Indonesia	−0.37	53.68	0.33	
87	Morocco	−0.39	53.04	0.32	
88	China	−0.46	51.34	0.31	
89	Azerbaijan	−0.50	50.37	0.31	
90	Honduras	−0.51	50.05	0.30	
91	Peru	−0.52	49.87	0.29	
92	Tanzania, United Rep.	−0.54	49.51	0.28	
93	Madagascar	−0.54	49.31	0.28	
94	Jordan	−0.56	48.94	0.27	
95	Guatemala	−0.64	46.89	0.26	
96	Tajikistan	−0.68	46.00	0.25	
97	Philippines	−0.70	45.38	0.24	
98	Nepal	−0.70	45.35	0.24	
99	Mexico	−0.76	44.00	0.23	
100	Kyrgyzstan	−0.78	43.33	0.22	
101	Burkina Faso	−0.79	43.26	0.21	
102	Venezuela, Bolivarian Rep.	−0.83	42.33	0.20	
103	Russian Federation	−0.84	41.95	0.20	○
104	Bangladesh	−0.88	41.06	0.19	
105	Burundi	−0.89	40.63	0.18	
106	Iran, Islamic Rep.	−0.91	40.28	0.17	
107	Thailand	−0.91	40.27	0.17	○
108	Uganda	−0.93	39.74	0.16	
109	Guinea	−0.93	39.70	0.15	
110	Tunisia	−0.93	39.64	0.14	○
111	Bahrain	−0.94	39.44	0.13	○
112	Cameroon	−0.94	39.36	0.13	
113	India	−0.96	38.95	0.12	○
114	Israel	−0.99	38.14	0.11	○
115	Côte d'Ivoire	−1.01	37.64	0.10	
116	Turkey	−1.06	36.51	0.09	○
117	Colombia	−1.12	34.98	0.09	○
118	Algeria	−1.17	33.72	0.08	
119	Ethiopia	−1.24	32.01	0.07	
120	Niger	−1.27	31.34	0.06	
121	Kenya	−1.27	31.30	0.06	○
122	Egypt	−1.58	23.49	0.05	○
123	Lebanon	−1.72	20.04	0.04	○
124	Mali	−1.74	19.62	0.03	○
125	Ukraine	−1.93	14.88	0.02	○
126	Nigeria	−2.11	10.47	0.02	○
127	Pakistan	−2.44	2.27	0.01	○
128	Yemen	−2.53	0.00	0.00	○

SOURCE: World Bank, *World Governance Indicators 2015*

NOTE: ● indicates a strength; ○ a weakness

1.1.2 Government effectiveness

Government effectiveness index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Singapore	2.19	100.00	1.00	●
2	Switzerland	2.13	98.17	0.99	●
3	Finland	2.02	95.06	0.98	●
4	New Zealand	1.93	92.63	0.98	●
5	Hong Kong (China)	1.84	90.16	0.97	
6	Netherlands	1.83	89.87	0.96	●
7	Japan	1.82	89.58	0.95	
8	Norway	1.81	89.33	0.94	●
9	Denmark	1.81	89.24	0.94	
10	Sweden	1.79	88.75	0.93	
11	Canada	1.76	87.94	0.92	
12	Germany	1.73	87.16	0.91	
13	Luxembourg	1.66	85.04	0.91	
14	United Kingdom	1.62	83.95	0.90	
15	Ireland	1.60	83.50	0.89	
16	Australia	1.59	83.24	0.88	
17	Austria	1.57	82.62	0.87	
18	Iceland	1.50	80.61	0.87	
19	United Arab Emirates	1.48	80.09	0.86	
20	United States of America	1.46	79.54	0.85	
21	France	1.40	78.03	0.84	
22	Belgium	1.40	77.92	0.83	
23	Korea, Rep.	1.18	71.74	0.83	
24	Israel	1.16	71.24	0.82	
25	Spain	1.15	71.11	0.81	
26	Chile	1.14	70.78	0.80	
27	Malaysia	1.14	70.71	0.80	
28	Cyprus	1.14	70.60	0.79	
29	Mauritius	1.13	70.47	0.78	●
30	Estonia	1.05	68.12	0.77	
31	Malta	1.03	67.57	0.76	
32	Czech Republic	1.02	67.47	0.76	
33	Portugal	1.01	67.11	0.75	
34	Slovenia	1.01	67.07	0.74	
35	Lithuania	0.99	66.67	0.73	
36	Qatar	0.99	66.62	0.72	
37	Latvia	0.97	66.12	0.72	
38	Slovakia	0.87	63.25	0.71	
39	Poland	0.82	61.96	0.70	
40	Croatia	0.69	58.32	0.69	
41	Bahrain	0.59	55.46	0.69	
42	Hungary	0.53	53.85	0.68	
43	Georgia	0.48	52.50	0.67	
44	Uruguay	0.48	52.39	0.66	
45	Costa Rica	0.40	50.15	0.65	
46	Greece	0.40	50.03	0.65	
47	Turkey	0.38	49.63	0.64	
48	Italy	0.38	49.50	0.63	
49	China	0.34	48.47	0.62	
50	Thailand	0.34	48.47	0.61	
51	South Africa	0.33	48.17	0.61	
52	Botswana	0.32	47.97	0.60	
53	Oman	0.29	47.02	0.59	
54	Montenegro	0.28	46.70	0.58	
55	Panama	0.27	46.67	0.57	
56	Bhutan	0.27	46.56	0.57	
57	Saudi Arabia	0.23	45.30	0.56	
58	Philippines	0.19	44.40	0.55	
59	Mexico	0.19	44.30	0.54	
60	TFYR of Macedonia	0.15	43.23	0.54	
61	Jamaica	0.14	42.86	0.53	
62	Jordan	0.13	42.79	0.52	
63	Namibia	0.10	41.90	0.51	
64	Serbia	0.09	41.57	0.50	
65	Bulgaria	0.09	41.55	0.50	
66	Sri Lanka	0.09	41.51	0.49	
67	Rwanda	0.02	39.73	0.48	
68	Romania	0.00	38.95	0.47	
69	Indonesia	−0.01	38.74	0.46	
70	Kazakhstan	−0.02	38.62	0.46	
71	El Salvador	−0.02	38.44	0.45	
72	Viet Nam	−0.06	37.32	0.44	
73	Albania	−0.07	37.08	0.43	
74	Russian Federation	−0.08	36.87	0.43	
75	Colombia	−0.11	36.03	0.42	
76	Tunisia	−0.13	35.48	0.41	
77	Morocco	−0.14	35.21	0.40	
78	Kuwait	−0.15	34.94	0.39	
79	Brazil	−0.15	34.75	0.39	
80	Armenia	−0.17	34.34	0.38	
81	Argentina	−0.18	33.99	0.37	
82	India	−0.20	33.37	0.36	
83	Ghana	−0.27	31.45	0.35	
84	Peru	−0.28	31.36	0.35	
85	Kenya	−0.30	30.60	0.34	
86	Azerbaijan	−0.34	29.63	0.33	
87	Lebanon	−0.38	28.63	0.32	
88	Ukraine	−0.38	28.50	0.31	
89	Moldova, Rep.	−0.38	28.44	0.31	
90	Senegal	−0.39	28.18	0.30	
91	Uganda	−0.40	27.97	0.29	
92	Iran, Islamic Rep.	−0.41	27.63	0.28	
93	Mongolia	−0.41	27.52	0.28	
94	Dominican Republic	−0.43	27.10	0.27	
95	Bosnia and Herzegovina	−0.47	26.09	0.26	
96	Zambia	−0.47	26.03	0.25	
97	Ethiopia	−0.47	25.99	0.24	
98	Belarus	−0.50	25.27	0.24	○
99	Ecuador	−0.50	25.18	0.23	
100	Benin	−0.50	25.18	0.22	
101	Algeria	−0.51	24.83	0.21	
102	Burkina Faso	−0.56	23.54	0.20	
103	Bolivia, Plurinational St.	−0.59	22.55	0.20	
104	Tanzania, United Rep.	−0.64	21.20	0.19	
105	Cambodia	−0.68	20.20	0.18	
106	Malawi	−0.69	19.95	0.17	
107	Guatemala	−0.71	19.19	0.17	
108	Mozambique	−0.73	18.76	0.16	
109	Niger	−0.74	18.55	0.15	
110	Cameroon	−0.74	18.45	0.14	
111	Tajikistan	−0.75	18.31	0.13	
112	Pakistan	−0.75	18.25	0.13	
113	Bangladesh	−0.77	17.64	0.12	
114	Côte d'Ivoire	−0.78	17.27	0.11	
115	Honduras	−0.80	16.96	0.10	○
116	Egypt	−0.82	16.28	0.09	
117	Nepal	−0.83	15.96	0.09	
118	Nicaragua	−0.83	15.86	0.08	
119	Kyrgyzstan	−0.84	15.81	0.07	
120	Paraguay	−0.92	13.35	0.06	○
121	Burundi	−1.09	8.64	0.06	
122	Mali	−1.12	8.03	0.05	
123	Nigeria	−1.19	5.92	0.04	
124	Guinea	−1.21	5.32	0.03	
125	Venezuela, Bolivarian Rep.	−1.23	4.90	0.02	
126	Togo	−1.26	4.07	0.02	○
127	Madagascar	−1.28	3.55	0.01	○
128	Yemen	−1.41	0.00	0.00	○

SOURCE: World Bank, *World Governance Indicators 2015*
NOTE: ● indicates a strength; ○ a weakness

1.2.1 Regulatory quality

Regulatory quality index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Singapore	2.23	100.00	1.00	●
2	Hong Kong (China)	2.05	95.62	0.99	●
3	New Zealand	1.94	92.92	0.98	●
4	Finland	1.90	91.91	0.98	
5	Australia	1.87	91.06	0.97	●
6	Canada	1.83	90.10	0.96	●
7	United Kingdom	1.83	90.08	0.95	
8	Switzerland	1.82	89.78	0.94	
9	Sweden	1.80	89.41	0.94	
10	Netherlands	1.78	88.78	0.93	
11	Ireland	1.75	88.22	0.92	
12	Denmark	1.72	87.26	0.91	
13	Germany	1.70	86.73	0.91	
14	Estonia	1.67	86.24	0.90	
15	Luxembourg	1.65	85.56	0.89	
16	Norway	1.64	85.31	0.88	
17	Chile	1.50	81.97	0.87	●
18	Austria	1.49	81.66	0.87	
19	United States of America	1.27	76.25	0.86	
20	Iceland	1.21	74.74	0.85	
21	Israel	1.21	74.68	0.84	
22	Lithuania	1.20	74.46	0.83	●
23	Belgium	1.17	73.80	0.83	
24	Latvia	1.17	73.72	0.82	
25	Japan	1.14	72.90	0.81	
26	Korea, Rep.	1.11	72.21	0.80	
27	Malta	1.10	72.09	0.80	
28	Cyprus	1.09	71.87	0.79	
29	France	1.09	71.63	0.78	
30	Poland	1.06	70.98	0.77	
31	Czech Republic	1.02	70.09	0.76	
32	Mauritius	1.00	69.53	0.76	
33	United Arab Emirates	0.98	68.95	0.75	
34	Georgia	0.93	67.67	0.74	
35	Slovakia	0.90	66.95	0.73	
36	Malaysia	0.84	65.47	0.72	
37	Spain	0.78	63.99	0.72	
38	Portugal	0.77	63.81	0.71	
39	Hungary	0.77	63.72	0.70	
40	Bahrain	0.70	61.97	0.69	
41	Oman	0.69	61.83	0.69	
42	Slovenia	0.66	61.16	0.68	
43	Italy	0.66	61.13	0.67	
44	Botswana	0.64	60.62	0.66	
45	Romania	0.60	59.53	0.65	
46	Bulgaria	0.57	58.97	0.65	
47	Qatar	0.57	58.78	0.64	
48	Costa Rica	0.53	57.85	0.63	
49	Uruguay	0.52	57.66	0.62	
50	Peru	0.52	57.65	0.61	
51	Colombia	0.50	57.22	0.61	
52	TFYR of Macedonia	0.47	56.42	0.60	
53	Mexico	0.43	55.37	0.59	
54	Turkey	0.41	54.85	0.58	
55	Croatia	0.40	54.73	0.57	
56	Panama	0.37	53.99	0.57	
57	Greece	0.34	53.29	0.56	
58	El Salvador	0.34	53.28	0.55	
59	South Africa	0.32	52.72	0.54	
60	Thailand	0.27	51.33	0.54	
61	Albania	0.23	50.32	0.53	
62	Armenia	0.22	50.12	0.52	
63	Rwanda	0.18	49.24	0.51	
64	Jamaica	0.16	48.78	0.50	
65	Serbia	0.14	48.33	0.50	
66	Montenegro	0.12	47.73	0.49	
67	Jordan	0.08	46.72	0.48	
68	Namibia	0.03	45.55	0.47	
69	Moldova, Rep.	0.02	45.35	0.46	
70	Saudi Arabia	−0.01	44.58	0.46	
71	Morocco	−0.01	44.46	0.45	
72	Philippines	−0.01	44.39	0.44	
73	Dominican Republic	−0.04	43.86	0.43	
74	Ghana	−0.04	43.81	0.43	
75	Brazil	−0.07	42.94	0.42	
76	Sri Lanka	−0.08	42.67	0.41	
77	Bosnia and Herzegovina	−0.09	42.50	0.40	
78	Indonesia	−0.10	42.22	0.39	
79	Kuwait	−0.13	41.50	0.39	
80	Guatemala	−0.19	40.12	0.38	
81	Lebanon	−0.22	39.28	0.37	
82	Senegal	−0.22	39.25	0.36	
83	Mongolia	−0.25	38.48	0.35	
84	China	−0.27	38.14	0.35	
85	Kazakhstan	−0.27	38.11	0.34	
86	Paraguay	−0.28	37.85	0.33	
87	Azerbaijan	−0.29	37.49	0.32	
88	Burkina Faso	−0.33	36.44	0.31	
89	Kenya	−0.34	36.41	0.31	
90	Tanzania, United Rep.	−0.34	36.24	0.30	
91	Tunisia	−0.35	36.10	0.29	
92	Uganda	−0.36	35.70	0.28	
93	Honduras	−0.38	35.40	0.28	
94	Nicaragua	−0.38	35.37	0.27	
95	Mozambique	−0.39	34.99	0.26	
96	Cambodia	−0.40	34.75	0.25	
97	Russian Federation	−0.40	34.71	0.24	○
98	Kyrgyzstan	−0.42	34.24	0.24	
99	India	−0.45	33.59	0.23	
100	Benin	−0.51	32.19	0.22	
101	Zambia	−0.52	31.96	0.21	
102	Mali	−0.56	30.94	0.20	
103	Viet Nam	−0.59	30.09	0.20	
104	Côte d'Ivoire	−0.62	29.28	0.19	
105	Ukraine	−0.63	29.24	0.18	
106	Niger	−0.66	28.36	0.17	
107	Pakistan	−0.69	27.75	0.17	
108	Malawi	−0.69	27.55	0.16	
109	Madagascar	−0.72	26.79	0.15	
110	Egypt	−0.75	26.05	0.14	
111	Burundi	−0.77	25.59	0.13	
112	Nigeria	−0.82	24.45	0.13	
113	Togo	−0.82	24.41	0.12	
114	Yemen	−0.84	23.81	0.11	
115	Nepal	−0.85	23.67	0.10	
116	Bolivia, Plurinational St.	−0.86	23.36	0.09	
117	Cameroon	−0.94	21.46	0.09	
118	Bangladesh	−0.94	21.41	0.08	
119	Ethiopia	−0.98	20.50	0.07	
120	Tajikistan	−1.01	19.71	0.06	
121	Bhutan	−1.01	19.70	0.06	
122	Ecuador	−1.02	19.50	0.05	○
123	Belarus	−1.04	18.85	0.04	○
124	Argentina	−1.08	18.01	0.03	○
125	Guinea	−1.10	17.55	0.02	
126	Algeria	−1.21	14.85	0.02	○
127	Iran, Islamic Rep.	−1.46	8.51	0.01	○
128	Venezuela, Bolivarian Rep.	−1.81	0.00	0.00	○

SOURCE: World Bank, *World Governance Indicators 2015*

NOTE: ● indicates a strength; ○ a weakness

1.2.2 Rule of law

Rule of law index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	2.12	100.00	1.00	●
2	Denmark	2.09	99.33	0.99	●
3	Norway	2.05	98.13	0.98	●
4	New Zealand	2.02	97.42	0.98	●
5	Switzerland	2.02	97.39	0.97	
6	Sweden	1.99	96.81	0.96	●
7	Netherlands	1.98	96.54	0.95	●
8	Austria	1.96	95.92	0.94	●
9	Australia	1.93	95.19	0.94	
10	Luxembourg	1.90	94.39	0.93	
11	Singapore	1.89	94.36	0.92	
12	Canada	1.89	94.31	0.91	
13	United Kingdom	1.89	94.18	0.91	
14	Hong Kong (China)	1.85	93.35	0.90	
15	Germany	1.85	93.31	0.89	
16	Ireland	1.80	92.03	0.88	
17	Iceland	1.72	90.05	0.87	
18	United States of America	1.62	87.41	0.87	
19	Japan	1.60	86.99	0.86	
20	Belgium	1.51	84.81	0.85	
21	France	1.47	83.69	0.84	
22	Chile	1.43	82.70	0.83	
23	Estonia	1.36	81.15	0.83	
24	Malta	1.21	77.20	0.82	
25	Czech Republic	1.14	75.46	0.81	
26	Portugal	1.13	75.31	0.80	
27	Israel	1.11	74.68	0.80	
28	Cyprus	1.06	73.52	0.79	
29	Qatar	0.99	71.70	0.78	
30	Korea, Rep.	0.98	71.56	0.77	
31	Slovenia	0.98	71.45	0.76	
32	Spain	0.94	70.49	0.76	
33	Mauritius	0.92	69.99	0.75	
34	Lithuania	0.91	69.72	0.74	
35	Latvia	0.87	68.69	0.73	
36	Poland	0.82	67.51	0.72	
37	United Arab Emirates	0.71	64.84	0.72	
38	Uruguay	0.68	63.96	0.71	●
39	Malaysia	0.64	63.09	0.70	
40	Botswana	0.63	62.94	0.69	●
41	Oman	0.58	61.57	0.69	
42	Costa Rica	0.51	59.87	0.68	
43	Hungary	0.50	59.52	0.67	
44	Jordan	0.48	59.13	0.66	●
45	Slovakia	0.47	58.91	0.65	
46	Bahrain	0.45	58.31	0.65	
47	Bhutan	0.35	55.81	0.64	
48	Greece	0.34	55.72	0.63	
49	Italy	0.34	55.52	0.62	
50	Croatia	0.31	54.87	0.61	
51	Saudi Arabia	0.27	53.83	0.61	
52	Georgia	0.20	52.15	0.60	
53	South Africa	0.16	51.10	0.59	
54	Romania	0.15	50.85	0.58	
55	Namibia	0.14	50.56	0.57	●
56	Rwanda	0.08	49.12	0.57	
57	Montenegro	0.07	48.75	0.56	
58	Kuwait	0.05	48.36	0.55	
59	Turkey	0.04	48.04	0.54	
60	Ghana	0.02	47.62	0.54	
61	TFYR Macedonia	–0.03	46.25	0.53	
62	Morocco	–0.06	45.69	0.52	
63	Bulgaria	–0.08	45.18	0.51	
64	Brazil	–0.08	45.07	0.50	
65	Panama	–0.09	44.93	0.50	
66	India	–0.09	44.89	0.49	
67	Senegal	–0.10	44.63	0.48	
68	Tunisia	–0.12	44.18	0.47	
69	Sri Lanka	–0.15	43.38	0.46	
70	Thailand	–0.15	43.37	0.46	
71	Serbia	–0.16	43.18	0.45	
72	Bosnia and Herzegovina	–0.20	42.04	0.44	
73	Zambia	–0.25	40.82	0.43	
74	Moldova, Rep.	–0.27	40.30	0.43	
75	Malawi	–0.30	39.68	0.42	
76	Viet Nam	–0.31	39.37	0.41	
77	Jamaica	–0.31	39.35	0.40	
78	Armenia	–0.32	39.11	0.39	
79	Philippines	–0.33	38.94	0.39	
80	China	–0.33	38.78	0.38	
81	Colombia	–0.34	38.61	0.37	
82	Indonesia	–0.35	38.49	0.36	
83	Mongolia	–0.35	38.37	0.35	
84	Albania	–0.37	37.88	0.35	
85	Dominican Republic	–0.38	37.58	0.34	
86	Uganda	–0.39	37.43	0.33	
87	Tanzania, United Rep.	–0.41	36.92	0.32	
88	Ethiopia	–0.42	36.66	0.31	
89	Mexico	–0.45	35.88	0.31	
90	Kenya	–0.45	35.88	0.30	
91	El Salvador	–0.52	34.21	0.29	
92	Burkina Faso	–0.53	33.82	0.28	
93	Kazakhstan	–0.55	33.45	0.28	
94	Benin	–0.55	33.41	0.27	
95	Peru	–0.55	33.30	0.26	
96	Egypt	–0.60	32.11	0.25	
97	Azerbaijan	–0.61	31.99	0.24	
98	Côte d'Ivoire	–0.61	31.94	0.24	
99	Mali	–0.65	30.88	0.23	
100	Nicaragua	–0.67	30.45	0.22	
101	Nepal	–0.68	30.25	0.21	
102	Paraguay	–0.68	30.07	0.20	
103	Niger	–0.69	29.91	0.20	
104	Russian Federation	–0.71	29.38	0.19	○
105	Bangladesh	–0.72	29.16	0.18	
106	Algeria	–0.73	28.84	0.17	
107	Madagascar	–0.74	28.61	0.17	
108	Lebanon	–0.76	28.20	0.16	○
109	Pakistan	–0.78	27.67	0.15	
110	Ukraine	–0.79	27.49	0.14	
111	Belarus	–0.81	26.85	0.13	○
112	Mozambique	–0.84	26.17	0.13	
113	Cameroon	–0.87	25.40	0.12	
114	Togo	–0.87	25.33	0.11	
115	Argentina	–0.91	24.54	0.10	
116	Cambodia	–0.93	24.05	0.09	
117	Burundi	–0.93	23.83	0.09	
118	Kyrgyzstan	–0.94	23.78	0.08	
119	Tajikistan	–0.96	23.13	0.07	
120	Honduras	–0.97	22.92	0.06	○
121	Guatemala	–0.99	22.52	0.06	○
122	Iran, Islamic Rep.	–1.03	21.36	0.05	○
123	Ecuador	–1.05	20.94	0.04	○
124	Bolivia, Plurinational St.	–1.08	20.29	0.03	○
125	Nigeria	–1.08	20.10	0.02	
126	Yemen	–1.17	17.93	0.02	
127	Guinea	–1.38	12.79	0.01	○
128	Venezuela, Bolivarian Rep.	–1.89	0.00	0.00	○

SOURCE: World Bank, *World Governance Indicators 2015*
NOTE: ● indicates a strength; ○ a weakness

1.2.3 Cost of redundancy dismissal

Sum of notice period and severance pay for redundancy dismissal (in salary weeks, averages for workers with 1, 5, and 10 years of tenure, with a minimum threshold of 8 weeks) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Austria	8.00	100.00	0.87	●
1	Bahrain	8.00	100.00	0.87	●
1	Cyprus	8.00	100.00	0.87	●
1	Denmark	8.00	100.00	0.87	●
1	Hong Kong (China)	8.00	100.00	0.87	●
1	Italy	8.00	100.00	0.87	●
1	Japan	8.00	100.00	0.87	●
1	Jordan	8.00	100.00	0.87	●
1	Kenya	8.00	100.00	0.87	●
1	Malta	8.00	100.00	0.87	●
1	New Zealand	8.00	100.00	0.87	●
1	Oman	8.00	100.00	0.87	●
1	Romania	8.00	100.00	0.87	●
1	Serbia	8.00	100.00	0.87	●
1	Singapore	8.00	100.00	0.87	●
1	United Arab Emirates	8.00	100.00	0.87	●
1	United States of America	8.00	100.00	0.87	●
18	Bhutan	8.29	99.43	0.87	●
19	Bulgaria	8.62	98.77	0.85	●
19	Georgia	8.62	98.77	0.85	●
21	Kazakhstan	8.67	98.68	0.80	●
21	Lebanon	8.67	98.68	0.80	●
21	Mongolia	8.67	98.68	0.80	
21	Netherlands	8.67	98.68	0.80	
21	Norway	8.67	98.68	0.80	
21	Uganda	8.67	98.68	0.80	●
27	Bosnia and Herzegovina	9.22	97.58	0.80	●
28	South Africa	9.33	97.36	0.77	
28	Tanzania, United Rep.	9.33	97.36	0.77	●
28	United Kingdom	9.33	97.36	0.77	
31	Namibia	9.67	96.70	0.76	●
32	Canada	10.00	96.04	0.76	
33	Guinea	10.06	95.91	0.75	●
34	Finland	10.11	95.82	0.73	
34	Switzerland	10.11	95.82	0.73	
36	Burkina Faso	10.47	95.10	0.72	●
37	Mauritius	10.62	94.81	0.72	
38	Slovenia	10.68	94.70	0.71	
39	Armenia	11.00	94.06	0.70	
40	Montenegro	11.22	93.63	0.69	
41	Peru	11.43	93.21	0.69	●
42	Benin	11.63	92.82	0.68	●
43	Australia	11.67	92.74	0.67	
44	France	11.84	92.39	0.66	
45	Tunisia	12.10	91.89	0.65	
46	Estonia	12.90	90.29	0.65	
47	Rwanda	12.95	90.19	0.64	
48	Iceland	13.00	90.10	0.63	
49	Latvia	13.00	90.10	0.61	
49	Ukraine	13.00	90.10	0.61	
51	TFYR of Macedonia	13.00	90.10	0.61	
52	Côte d'Ivoire	13.07	89.96	0.60	●
53	Togo	13.14	89.81	0.59	●
54	Hungary	13.41	89.28	0.58	
55	Mali	13.65	88.81	0.57	●
56	Jamaica	14.00	88.12	0.57	
57	Niger	14.01	88.10	0.56	●
58	Ireland	14.33	87.46	0.55	○
59	Sweden	14.44	87.24	0.54	○
60	Madagascar	14.67	86.80	0.54	●
61	Senegal	14.81	86.52	0.53	
62	Nicaragua	14.93	86.29	0.52	●
63	Croatia	15.11	85.92	0.51	
64	Nigeria	15.41	85.32	0.50	●
65	Brazil	15.44	85.27	0.50	
66	Tajikistan	15.53	85.09	0.49	
67	India	15.76	84.63	0.48	
68	Greece	15.89	84.38	0.47	
69	Burundi	15.89	84.38	0.46	
70	Colombia	16.67	82.84	0.46	
71	Malawi	16.67	82.84	0.45	
72	Portugal	17.00	82.18	0.44	
73	Algeria	17.33	81.52	0.43	
73	Kyrgyzstan	17.33	81.52	0.43	
75	Russian Federation	17.33	81.52	0.42	
76	Spain	17.38	81.42	0.41	○
77	Panama	18.13	79.93	0.40	
78	Costa Rica	18.70	78.81	0.39	
79	Poland	18.78	78.66	0.39	
80	Slovakia	18.78	78.66	0.38	
81	Ethiopia	19.14	77.93	0.37	
82	Cambodia	19.37	77.49	0.36	
83	Saudi Arabia	19.45	77.32	0.35	
84	Belgium	19.67	76.90	0.35	○
85	Cameroon	19.86	76.51	0.34	
86	Czech Republic	20.22	75.80	0.33	○
87	Morocco	20.69	74.87	0.32	
88	Uruguay	20.80	74.65	0.31	
89	Albania	20.83	74.60	0.31	
90	Germany	21.56	73.16	0.30	○
91	Azerbaijan	21.67	72.94	0.28	
91	Belarus	21.67	72.94	0.28	
93	Luxembourg	21.67	72.94	0.28	○
94	Botswana	21.69	72.89	0.27	
95	Mexico	22.00	72.28	0.26	
96	Moldova, Rep.	22.60	71.09	0.25	
97	El Salvador	22.86	70.58	0.24	
98	Iran, Islamic Rep.	23.11	70.08	0.24	
99	Qatar	23.22	69.86	0.23	
100	Lithuania	24.56	67.22	0.22	○
101	Viet Nam	24.56	67.22	0.21	
102	Dominican Republic	26.18	64.00	0.20	
103	Guatemala	26.96	62.45	0.20	
104	Nepal	27.19	62.00	0.18	
104	Pakistan	27.19	62.00	0.18	
106	Chile	27.40	61.59	0.17	○
107	China	27.40	61.59	0.15	○
107	Korea, Rep.	27.40	61.59	0.15	○
107	Yemen	27.40	61.59	0.15	
110	Israel	27.44	61.50	0.13	○
110	Philippines	27.44	61.50	0.13	
112	Kuwait	28.12	60.16	0.13	○
113	Paraguay	29.40	57.61	0.12	
114	Malaysia	29.44	57.54	0.11	○
115	Turkey	29.78	56.88	0.10	○
116	Argentina	30.33	55.78	0.09	
116	Honduras	30.33	55.78	0.09	○
118	Bangladesh	31.00	54.46	0.08	
119	Ecuador	31.78	52.92	0.07	○
120	Thailand	36.00	44.55	0.06	○
121	Egypt	36.83	42.90	0.06	○
122	Mozambique	37.51	41.57	0.05	
123	Ghana	49.78	17.27	0.04	○
124	Zambia	50.56	15.73	0.03	○
125	Indonesia	57.78	1.43	0.02	○
126	Bolivia, Plurinational St. (2014)	82.33	0.00	0.00	○
126	Sri Lanka	58.50	0.00	0.00	○
126	Venezuela, Bolivarian Rep. (2014)	82.33	0.00	0.00	○

SOURCE: World Bank, *Ease of Doing Business Index 2016: Measuring Regulatory Quality and Efficiency*

NOTE: ● indicates a strength; ○ a weakness

1.3.1 Ease of starting a business

Ease of starting a business (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	New Zealand	99.96	99.96	1.00	●
2	TFYR of Macedonia	99.86	99.86	0.99	●
3	Canada	98.23	98.23	0.98	●
4	Hong Kong (China)	98.12	98.12	0.98	
5	Armenia	97.78	97.78	0.97	●
6	Georgia	97.76	97.76	0.96	●
7	Azerbaijan	97.75	97.75	0.95	●
8	Lithuania	97.70	97.70	0.94	●
9	Jamaica	97.28	97.28	0.94	●
10	Singapore	96.49	96.49	0.93	
11	Australia	96.47	96.47	0.92	
12	Belarus	96.32	96.32	0.91	●
13	Portugal	96.28	96.28	0.91	●
14	Malaysia	95.34	95.34	0.90	
15	Estonia	95.06	95.06	0.89	
16	Sweden	94.62	94.62	0.88	
17	United Kingdom	94.57	94.57	0.87	
18	Slovenia	94.53	94.53	0.87	
19	Burundi	94.51	94.51	0.86	●
20	Belgium	94.50	94.50	0.85	
21	Kazakhstan	94.44	94.44	0.84	●
22	Korea, Rep.	94.36	94.36	0.83	
23	Norway	94.29	94.29	0.83	
24	Ireland	94.18	94.18	0.82	
25	Moldova, Rep.	94.17	94.17	0.81	●
26	Latvia	94.15	94.15	0.80	
27	Netherlands	94.14	94.14	0.80	
28	Denmark	94.04	94.04	0.79	
29	Ukraine	93.88	93.88	0.78	
30	France	93.14	93.14	0.77	
31	Finland	93.11	93.11	0.76	
32	Kyrgyzstan	92.94	92.94	0.76	●
33	Mongolia	92.55	92.55	0.75	
34	Mauritius	92.49	92.49	0.74	
35	Iceland	92.44	92.44	0.73	
36	Russian Federation	92.35	92.35	0.72	
37	Morocco	92.06	92.06	0.72	●
38	Panama	91.95	91.95	0.71	
39	Romania	91.94	91.94	0.70	
40	Côte d'Ivoire	91.44	91.44	0.69	●
41	United States of America	91.22	91.22	0.69	
42	Italy	91.13	91.13	0.68	
43	Bulgaria	91.10	91.10	0.67	
44	Greece	90.70	90.70	0.66	
45	Hungary	90.56	90.56	0.65	
46	Israel	90.55	90.55	0.65	
47	Tajikistan	90.26	90.26	0.64	●
48	Albania	90.09	90.09	0.63	
49	Montenegro	90.08	90.08	0.62	
50	United Arab Emirates	89.98	89.98	0.61	
51	Uruguay	89.87	89.87	0.61	
52	Chile	89.84	89.84	0.60	
53	Cyprus	89.23	89.23	0.59	
54	Mexico	88.94	88.94	0.57	
54	Serbia	88.94	88.94	0.57	
56	Slovakia	88.54	88.54	0.57	
57	Switzerland	88.47	88.47	0.56	○
58	Egypt	88.24	88.24	0.55	
59	Burkina Faso	86.69	86.69	0.54	●
59	Zambia	86.69	86.69	0.54	●
61	Luxembourg	86.46	86.46	0.53	
62	Japan	86.34	86.34	0.52	
63	Spain	86.30	86.30	0.51	○
64	Croatia	86.21	86.21	0.50	
65	Colombia	86.13	86.13	0.50	
66	Poland	85.94	85.94	0.48	
66	Senegal	85.94	85.94	0.48	
68	Iran, Islamic Rep.	85.73	85.73	0.47	
69	Jordan	85.70	85.70	0.46	
70	Bhutan	85.57	85.57	0.46	
71	Czech Republic	85.23	85.23	0.45	
72	Turkey	85.18	85.18	0.44	
73	Thailand	85.07	85.07	0.43	
74	Peru	85.02	85.02	0.43	
75	Sri Lanka	84.98	84.98	0.42	
76	Guatemala	83.87	83.87	0.41	
77	Ghana	83.73	83.73	0.40	
78	Tunisia	83.64	83.64	0.39	
79	Nepal	83.48	83.48	0.39	
80	Austria	83.45	83.45	0.38	○
81	Germany	83.37	83.37	0.37	○
82	Qatar	83.22	83.22	0.36	
83	Dominican Republic	83.12	83.12	0.35	
84	Rwanda	83.05	83.05	0.35	
85	Lebanon	82.68	82.68	0.34	
86	Benin	82.24	82.24	0.33	
87	Bangladesh	81.72	81.72	0.32	
88	Viet Nam	81.25	81.25	0.31	
89	South Africa	81.18	81.18	0.31	
90	Costa Rica	80.95	80.95	0.30	
91	Pakistan	80.94	80.94	0.29	
92	Nicaragua	80.49	80.49	0.28	
93	Mozambique	80.23	80.23	0.28	
94	El Salvador	80.19	80.19	0.27	
95	Guinea	80.02	80.02	0.26	
96	Madagascar	79.63	79.63	0.25	
97	Tanzania, United Rep.	79.58	79.58	0.24	
98	Saudi Arabia	78.66	78.66	0.24	○
99	Malta	78.43	78.43	0.23	○
100	Togo	78.37	78.37	0.22	
101	Niger	77.62	77.62	0.21	
102	Paraguay	77.52	77.52	0.20	
103	China	77.46	77.46	0.20	
104	Cameroon	77.41	77.41	0.19	
105	Nigeria	77.13	77.13	0.18	
106	Bahrain	77.09	77.09	0.17	
107	Botswana	76.21	76.21	0.17	
108	Algeria	76.08	76.08	0.16	
109	Kuwait	75.37	75.37	0.15	
110	Oman	74.98	74.98	0.14	
111	Honduras	74.92	74.92	0.13	
112	Kenya	74.47	74.47	0.13	
113	Yemen	74.22	74.22	0.12	
114	India	73.59	73.59	0.11	○
115	Argentina	73.36	73.36	0.10	
116	Malawi	69.71	69.71	0.09	
117	Namibia	68.92	68.92	0.09	○
118	Philippines	68.56	68.56	0.08	○
119	Ecuador	68.51	68.51	0.07	○
120	Uganda	67.79	67.79	0.06	
121	Mali	66.05	66.05	0.06	
122	Indonesia	66.04	66.04	0.05	○
123	Brazil	64.33	64.33	0.04	○
124	Bosnia and Herzegovina	63.52	63.52	0.03	○
125	Ethiopia	62.45	62.45	0.02	○
126	Bolivia, Plurinational St.	59.74	59.74	0.02	○
127	Cambodia	58.10	58.10	0.01	○
128	Venezuela, Bolivarian Rep.	40.38	40.38	0.00	○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*

NOTE: ● indicates a strength; ○ a weakness

1.3.2 Ease of resolving insolvency

Ease of resolving insolvency (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	93.81	93.81	1.00	●
2	Japan	93.75	93.75	0.99	●
3	Germany	91.93	91.93	0.98	●
4	Korea, Rep.	90.31	90.31	0.98	●
5	United States of America	90.12	90.12	0.97	
6	Norway	85.71	85.71	0.96	●
7	Portugal	84.79	84.79	0.95	●
8	Denmark	84.78	84.78	0.94	
9	Belgium	84.00	84.00	0.94	●
10	Netherlands	83.77	83.77	0.93	
11	Slovenia	83.39	83.39	0.92	●
12	United Kingdom	82.04	82.04	0.91	
13	Australia	81.69	81.69	0.91	
14	Iceland	81.65	81.65	0.90	
15	Canada	81.36	81.36	0.89	
16	Cyprus	79.04	79.04	0.88	
17	Austria	78.89	78.89	0.87	
18	Sweden	78.75	78.75	0.87	
19	Ireland	78.44	78.44	0.86	
20	Czech Republic	77.73	77.73	0.85	
21	Italy	76.14	76.14	0.84	
22	France	76.09	76.09	0.83	
23	Spain	75.83	75.83	0.83	
24	Hong Kong (China)	75.06	75.06	0.82	
25	Singapore	74.83	74.83	0.81	
26	Mexico	73.03	73.03	0.80	●
27	Israel	72.47	72.47	0.80	
28	Colombia	72.06	72.06	0.79	
29	New Zealand	71.41	71.41	0.78	
30	Poland	70.43	70.43	0.77	
31	Slovakia	70.04	70.04	0.76	
32	Jamaica	69.08	69.08	0.76	●
33	Montenegro	68.21	68.21	0.75	
34	TFYR of Macedonia	67.73	67.73	0.74	●
35	Bosnia and Herzegovina	66.42	66.42	0.73	●
36	Mauritius	65.94	65.94	0.72	
37	Estonia	65.28	65.28	0.72	
38	South Africa	64.29	64.29	0.71	
39	Albania	63.42	63.42	0.70	●
40	Latvia	63.39	63.39	0.69	
41	Switzerland	62.60	62.60	0.69	
42	Malaysia	62.49	62.49	0.68	
43	Romania	59.77	59.77	0.67	
44	Kazakhstan	58.97	58.97	0.66	
45	Bulgaria	58.93	58.93	0.65	
46	Thailand	58.84	58.84	0.65	
47	Serbia	58.52	58.52	0.64	
48	Qatar	58.39	58.39	0.62	
48	Russian Federation	58.39	58.39	0.62	
50	Philippines	56.81	56.81	0.61	
51	Greece	56.28	56.28	0.61	
52	China	55.43	55.43	0.60	
53	Botswana	54.66	54.66	0.59	
54	Tunisia	54.53	54.53	0.58	
55	Chile	54.18	54.18	0.57	
56	Croatia	53.92	53.92	0.57	
57	Moldova, Rep.	53.85	53.85	0.56	
58	Brazil	52.68	52.68	0.55	
59	Uruguay	52.37	52.37	0.54	
60	Hungary	50.58	50.58	0.54	
61	Mozambique	49.63	49.63	0.53	●
62	Belarus	48.38	48.38	0.52	
63	Lithuania	48.06	48.06	0.51	
64	Armenia	48.00	48.00	0.50	
65	Rwanda	47.82	47.82	0.50	
66	Algeria	47.67	47.67	0.49	●
67	Peru	47.57	47.57	0.48	
68	Côte d'Ivoire	47.03	47.03	0.47	●
69	Indonesia	46.48	46.48	0.46	
70	Sri Lanka	46.40	46.40	0.46	
71	El Salvador	45.90	45.90	0.45	
72	Luxembourg	45.45	45.45	0.44	
73	Cambodia	45.11	45.11	0.43	
74	Malta	44.78	44.78	0.43	
75	Azerbaijan	44.68	44.68	0.42	
76	Bahrain	44.28	44.28	0.41	
77	Nepal	44.19	44.19	0.40	
78	Costa Rica	44.06	44.06	0.39	
79	Senegal	43.85	43.85	0.39	
80	Mongolia	43.76	43.76	0.38	
81	United Arab Emirates	43.74	43.74	0.37	
82	Bolivia, Plurinational St.	43.27	43.27	0.36	
83	Togo	43.12	43.12	0.35	
84	Pakistan	42.96	42.96	0.35	
85	Argentina	42.87	42.87	0.34	
86	Namibia	42.22	42.22	0.33	
87	Tanzania, United Rep.	41.01	41.01	0.32	
88	Mali	40.35	40.35	0.31	
89	Georgia	40.24	40.24	0.31	
90	Paraguay	40.18	40.18	0.30	
91	Nicaragua	40.13	40.13	0.29	
92	Uganda	39.80	39.80	0.28	
93	Oman	39.28	39.28	0.28	
94	Zambia	38.96	38.96	0.27	
95	Guinea	38.84	38.84	0.26	
96	Benin	38.08	38.08	0.24	
96	Burkina Faso	38.08	38.08	0.24	
98	Ethiopia	37.81	37.81	0.24	
99	Cameroon	36.46	36.46	0.23	
100	Egypt	36.36	36.36	0.22	
101	Niger	36.01	36.01	0.21	
102	Kuwait	35.95	35.95	0.20	
103	Viet Nam	35.83	35.83	0.20	
104	Turkey	35.09	35.09	0.19	○
105	Kyrgyzstan	34.66	34.66	0.18	
106	Madagascar	34.24	34.24	0.17	
107	Morocco	33.89	33.89	0.17	○
108	Panama	33.58	33.58	0.16	
109	Lebanon	33.07	33.07	0.15	○
110	India	32.59	32.59	0.14	
111	Honduras	31.67	31.67	0.13	
112	Iran, Islamic Rep.	31.57	31.57	0.13	
113	Ukraine	31.05	31.05	0.12	○
114	Nigeria	30.68	30.68	0.11	
115	Kenya	30.64	30.64	0.10	
116	Burundi	30.46	30.46	0.09	
117	Jordan	30.17	30.17	0.09	○
118	Tajikistan	29.04	29.04	0.08	
119	Ecuador	28.40	28.40	0.07	○
120	Yemen	28.08	28.08	0.06	
121	Guatemala	27.30	27.30	0.06	○
122	Bangladesh	26.36	26.36	0.05	
123	Dominican Republic	23.70	23.70	0.04	○
124	Ghana	21.88	21.88	0.03	○
125	Malawi	19.20	19.20	0.02	○
126	Venezuela, Bolivarian Rep.	19.05	19.05	0.02	○
127	Bhutan	0.00	0.00	0.00	○
127	Saudi Arabia	0.00	0.00	0.00	○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*

NOTE: ● indicates a strength; ○ a weakness

1.3.3 Ease of paying taxes

Ease of paying taxes (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Qatar	99.44	99.44	0.99	●
1	United Arab Emirates	99.44	99.44	0.99	●
3	Saudi Arabia	99.23	99.23	0.98	●
4	Hong Kong (China)	98.71	98.71	0.98	
5	Singapore	96.56	96.56	0.97	
6	Ireland	94.97	94.97	0.96	●
7	TFYR of Macedonia	94.17	94.17	0.95	●
8	Bahrain	93.88	93.88	0.94	●
9	Canada	93.00	93.00	0.94	
10	Oman	92.91	92.91	0.93	●
11	Kuwait	92.48	92.48	0.92	●
12	Denmark	91.94	91.94	0.91	
13	Mauritius	91.92	91.92	0.91	●
14	Norway	91.36	91.36	0.90	
15	United Kingdom	91.34	91.34	0.89	
16	Finland	89.38	89.38	0.88	
17	Kazakhstan	89.18	89.18	0.87	●
18	Switzerland	89.13	89.13	0.87	
19	South Africa	88.75	88.75	0.86	●
20	Luxembourg	88.58	88.58	0.85	
21	New Zealand	88.06	88.06	0.84	
22	Malta	85.91	85.91	0.83	
23	Netherlands	85.81	85.81	0.83	
24	Latvia	85.76	85.76	0.82	
25	Bhutan	85.50	85.50	0.81	●
26	Korea, Rep.	84.53	84.53	0.80	
27	Estonia	84.33	84.33	0.80	
28	Malaysia	84.31	84.31	0.79	
29	Chile	84.00	84.00	0.78	
30	Azerbaijan	83.77	83.77	0.77	●
31	Slovenia	83.74	83.74	0.76	
32	Iceland	83.67	83.67	0.76	
33	Sweden	83.46	83.46	0.75	
34	Croatia	83.02	83.02	0.74	
35	Georgia	82.76	82.76	0.73	
36	Armenia	82.51	82.51	0.72	
37	Australia	82.35	82.35	0.72	
38	Cyprus	81.70	81.70	0.71	
39	Lebanon	81.69	81.69	0.70	
40	Zambia	81.66	81.66	0.69	●
41	Russian Federation	81.60	81.60	0.69	
42	Rwanda	81.48	81.48	0.68	●
43	Lithuania	81.42	81.42	0.67	
44	Guatemala	81.18	81.18	0.65	●
44	Peru	81.18	81.18	0.65	
46	Jordan	80.96	80.96	0.65	●
47	United States of America	80.81	80.81	0.64	
48	Romania	80.69	80.69	0.63	
49	Poland	79.63	79.63	0.62	
50	Spain	79.48	79.48	0.61	
51	Turkey	79.44	79.44	0.61	
52	Morocco	78.91	78.91	0.60	
53	Belarus	78.74	78.74	0.59	
54	Montenegro	78.57	78.57	0.58	
55	Portugal	78.54	78.54	0.57	
56	Greece	78.45	78.45	0.57	
57	Thailand	77.70	77.70	0.56	
58	Botswana	77.47	77.47	0.55	
59	Germany	77.00	77.00	0.54	
60	Slovakia	76.79	76.79	0.54	
61	Austria	76.53	76.53	0.53	○
62	Madagascar	76.32	76.32	0.52	
63	Dominican Republic	76.29	76.29	0.51	
64	Moldova, Rep.	76.28	76.28	0.50	
65	Costa Rica	75.67	75.67	0.50	
66	Tunisia	75.53	75.53	0.49	
67	Bangladesh	74.42	74.42	0.48	
68	France	74.31	74.31	0.47	○
69	Bulgaria	74.19	74.19	0.46	
70	Belgium	73.80	73.80	0.46	○
71	Mongolia	73.79	73.79	0.45	
72	Mexico	73.67	73.67	0.44	
73	Namibia	73.63	73.63	0.43	
74	Cambodia	73.06	73.06	0.42	
74	Hungary	73.06	73.06	0.42	
76	Kenya	71.96	71.96	0.41	
77	Malawi	71.82	71.82	0.40	
78	Israel	71.65	71.65	0.39	○
79	Uganda	71.32	71.32	0.39	
80	Ghana	71.24	71.24	0.38	
81	Ukraine	70.69	70.69	0.37	
82	Burundi	69.45	69.45	0.35	
82	Paraguay	69.45	69.45	0.35	
84	Ethiopia	68.95	68.95	0.35	
85	Mozambique	67.78	67.78	0.34	
86	Japan	67.16	67.16	0.33	○
87	Czech Republic	67.09	67.09	0.32	○
88	Iran, Islamic Rep.	66.78	66.78	0.31	
89	Nepal	66.50	66.50	0.31	
90	Philippines	66.23	66.23	0.30	
91	Uruguay	65.25	65.25	0.29	
92	China	64.46	64.46	0.28	
93	Yemen	63.72	63.72	0.28	●
94	Colombia	63.32	63.32	0.27	
95	Italy	62.98	62.98	0.26	○
96	Kyrgyzstan	62.94	62.94	0.25	
97	Ecuador	62.84	62.84	0.24	
98	Albania	62.01	62.01	0.24	
99	Serbia	61.87	61.87	0.23	
100	Jamaica	60.95	60.95	0.22	
101	Indonesia	60.46	60.46	0.21	
102	Mali	60.16	60.16	0.20	
103	Tanzania, United Rep.	59.25	59.25	0.20	
104	Egypt	58.87	58.87	0.19	
105	Burkina Faso	58.08	58.08	0.18	
106	Bosnia and Herzegovina	57.55	57.55	0.17	
107	Honduras	57.28	57.28	0.17	
108	Niger	56.87	56.87	0.16	
109	India	56.14	56.14	0.15	
110	Sri Lanka	55.23	55.23	0.14	○
111	El Salvador	52.73	52.73	0.13	
112	Togo	51.70	51.70	0.13	
113	Nicaragua	50.59	50.59	0.12	
114	Panama	48.60	48.60	0.11	
115	Viet Nam	45.41	45.41	0.10	○
116	Algeria	45.03	45.03	0.09	
117	Argentina	44.99	44.99	0.09	
118	Pakistan	44.46	44.46	0.08	
119	Tajikistan	43.53	43.53	0.07	
120	Côte d'Ivoire	42.73	42.73	0.06	○
121	Brazil	40.85	40.85	0.06	○
122	Benin	39.91	39.91	0.05	○
123	Cameroon	36.34	36.34	0.04	○
124	Nigeria	32.17	32.17	0.03	
125	Senegal	29.83	29.83	0.02	○
126	Guinea	28.27	28.27	0.02	
127	Venezuela, Bolivarian Rep.	13.64	13.64	0.01	○
128	Bolivia, Plurinational St.	12.18	12.18	0.00	○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*
NOTE: ● indicates a strength; ○ a weakness

2.1.1 Expenditure on education

Government expenditure on education (% of GDP) | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Botswana (2009)	9.63	100.00	0.99	●
1	Lithuania (2011)	17.70	100.00	0.99	●
3	Denmark (2011)	8.55	87.28	0.98	●
4	Namibia (2010)	8.35	84.97	0.97	●
5	Sweden	7.66	76.83	0.97	●
6	Moldova, Rep. (2014)	7.50	75.02	0.96	●
7	Norway	7.37	73.50	0.95	●
8	New Zealand	7.25	72.11	0.94	
9	Finland	7.19	71.40	0.93	
10	Bolivia, Plurinational St. (2014)	7.04	69.58	0.92	●
11	Iceland (2011)	7.04	69.57	0.91	
12	Malawi (2014)	6.88	67.71	0.91	●
13	Venezuela, Bolivarian Rep. (2009)	6.87	67.68	0.90	●
14	Kyrgyzstan (2013)	6.78	66.57	0.89	●
15	Niger (2014)	6.78	66.54	0.88	●
16	Malta	6.76	66.33	0.87	
17	Mozambique (2013)	6.72	65.81	0.86	●
18	Ukraine (2013)	6.67	65.30	0.85	●
19	Cyprus (2011)	6.64	64.98	0.85	
20	Belgium (2011)	6.37	61.71	0.84	
21	Viet Nam	6.30	60.98	0.83	●
22	Malaysia (2013)	6.29	60.85	0.82	
23	Tunisia	6.22	60.05	0.81	●
24	South Africa (2014)	6.06	58.09	0.80	●
25	Jamaica (2014)	5.98	57.24	0.79	●
26	Bhutan (2014)	5.96	56.96	0.79	●
27	Ghana (2013)	5.93	56.65	0.78	●
28	Brazil	5.91	56.42	0.77	●
29	Honduras (2013)	5.87	55.96	0.76	●
30	Ireland	5.84	55.60	0.75	
31	United Kingdom (2013)	5.72	54.14	0.74	
32	Slovenia	5.66	53.43	0.74	
33	Israel (2011)	5.63	53.12	0.73	
34	Senegal (2010)	5.60	52.74	0.72	●
35	France	5.53	51.96	0.71	
36	Netherlands	5.51	51.73	0.70	
37	Kenya (2010)	5.51	51.66	0.69	
38	Austria	5.45	50.99	0.68	
39	Burundi (2013)	5.41	50.57	0.68	●
40	Morocco (2009)	5.38	50.11	0.67	
41	Argentina (2013)	5.34	49.74	0.66	
42	Canada (2011)	5.27	48.90	0.65	
43	United States of America (2011)	5.22	48.33	0.64	
44	Mexico (2011)	5.15	47.42	0.63	
45	Saudi Arabia (2008)	5.14	47.32	0.62	
46	Portugal (2011)	5.12	47.13	0.62	
47	Switzerland	5.05	46.27	0.61	
48	Rwanda (2013)	5.03	46.03	0.60	
49	Mauritius (2014)	4.99	45.59	0.59	
50	Belarus (2014)	4.99	45.56	0.58	
51	Paraguay	4.96	45.27	0.57	●
52	Germany	4.95	45.10	0.56	
53	Thailand	4.93	44.87	0.56	
54	Australia	4.91	44.61	0.55	
55	Poland (2011)	4.86	44.08	0.54	
56	Togo (2014)	4.84	43.81	0.53	●
57	Benin (2014)	4.80	43.31	0.52	●
58	Estonia	4.79	43.28	0.51	
59	Nepal (2014)	4.72	42.45	0.50	●
60	Côte d'Ivoire (2014)	4.72	42.42	0.50	●
61	Colombia (2014)	4.67	41.85	0.49	
62	Hungary (2011)	4.65	41.55	0.48	
63	Korea, Rep.	4.62	41.23	0.47	
64	Mongolia (2011)	4.61	41.13	0.46	
65	Yemen (2008)	4.56	40.56	0.45	●
66	Chile (2013)	4.56	40.52	0.44	
67	Burkina Faso (2013)	4.53	40.15	0.44	
68	Ethiopia (2013)	4.50	39.83	0.43	
69	Nicaragua (2010)	4.49	39.77	0.42	
70	Serbia	4.43	38.99	0.41	
71	Spain	4.37	38.29	0.40	○
72	Uruguay (2011)	4.36	38.15	0.39	
73	Algeria (2008)	4.34	37.94	0.38	
74	Mali (2014)	4.33	37.91	0.38	
75	Czech Republic	4.26	37.08	0.37	○
76	Oman (2009)	4.19	36.19	0.36	
77	Ecuador	4.18	36.10	0.35	
78	Croatia (2011)	4.16	35.84	0.34	
79	Russian Federation	4.15	35.80	0.33	
80	Italy (2011)	4.14	35.64	0.32	○
81	Tajikistan	4.02	34.20	0.32	
82	Slovakia	3.94	33.25	0.31	○
83	India	3.83	31.94	0.30	
84	Japan (2013)	3.82	31.86	0.29	○
85	Egypt (2008)	3.76	31.19	0.28	
86	Kuwait (2006)	3.76	31.18	0.27	
87	Peru (2014)	3.66	29.97	0.26	
88	Bulgaria	3.59	29.18	0.26	
89	Hong Kong (China) (2014)	3.57	28.97	0.25	○
90	Guinea (2013)	3.54	28.61	0.24	
91	Qatar (2014)	3.53	28.43	0.23	
92	Albania (2013)	3.50	28.14	0.22	
93	Tanzania, United Rep. (2014)	3.48	27.91	0.21	
94	El Salvador (2011)	3.42	27.16	0.21	
95	Indonesia (2013)	3.37	26.57	0.20	
96	Panama (2011)	3.29	25.71	0.19	
97	Latvia	3.20	24.66	0.18	○
98	Iran, Islamic Rep. (2014)	3.06	22.99	0.17	
99	Cameroon (2013)	3.03	22.60	0.16	
100	Romania	2.99	22.10	0.15	○
101	Singapore (2013)	2.91	21.16	0.15	○
102	Kazakhstan (2014)	2.89	20.95	0.14	○
103	Turkey (2006)	2.86	20.66	0.13	○
104	Guatemala (2013)	2.84	20.42	0.12	
105	Philippines (2009)	2.65	18.20	0.11	○
106	Bahrain	2.64	18.11	0.10	○
107	Cambodia (2010)	2.60	17.63	0.09	
108	Lebanon (2013)	2.57	17.26	0.09	○
109	Azerbaijan (2013)	2.46	15.97	0.08	○
110	Pakistan (2014)	2.45	15.88	0.07	
111	Armenia (2014)	2.40	15.21	0.06	○
112	Uganda (2013)	2.20	12.90	0.05	○
113	Madagascar (2013)	2.08	11.49	0.04	
114	Dominican Republic (2007)	2.05	11.15	0.03	○
115	Georgia	1.98	10.35	0.03	○
116	Bangladesh (2013)	1.97	10.15	0.02	○
117	Sri Lanka	1.72	7.32	0.01	○
118	Zambia (2008)	1.10	0.00	0.00	○
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Greece	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Luxembourg	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.1.2 Government expenditure on education per pupil, secondary

Government expenditure per pupil, secondary (% of GDP per capita) | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Niger (2014)	71.02	100.00	1.00	●
2	Mozambique (2013)	70.03	98.49	0.99	●
3	Lithuania (2011)	66.59	93.27	0.98	●
4	Botswana (2007)	42.11	56.14	0.97	●
5	Malta	41.56	55.30	0.96	●
6	Rwanda (2013)	41.29	54.90	0.95	●
7	Moldova, Rep. (2014)	38.80	51.11	0.94	●
8	Belgium	38.55	50.74	0.94	●
9	Cyprus (2011)	38.30	50.35	0.93	●
10	Morocco	36.52	47.65	0.92	●
11	Bhutan (2014)	36.38	47.44	0.91	●
12	Finland (2011)	34.70	44.90	0.90	
13	Kyrgyzstan (2013)	33.19	42.60	0.89	●
14	Portugal (2011)	32.56	41.65	0.88	●
15	Ghana (2013)	31.62	40.22	0.87	●
16	Sweden	31.09	39.41	0.86	
17	Slovenia (2011)	30.82	39.01	0.85	
18	Ukraine (2013)	30.45	38.45	0.84	●
19	Malawi (2014)	30.16	38.02	0.83	●
20	Burundi (2013)	30.06	37.86	0.82	●
21	Denmark (2011)	29.44	36.92	0.81	
22	Mauritius (2014)	29.15	36.48	0.81	●
23	Senegal (2010)	28.95	36.18	0.80	●
24	Estonia	27.09	33.35	0.79	
25	Austria	26.95	33.14	0.78	
26	France	26.88	33.04	0.77	
27	Ireland	26.29	32.14	0.76	
28	Switzerland	26.05	31.78	0.75	
29	Norway (2011)	25.79	31.37	0.74	
30	Spain (2011)	25.78	31.36	0.73	
31	Côte d'Ivoire (2014)	25.74	31.30	0.72	●
32	Japan (2013)	25.67	31.20	0.71	
33	Czech Republic	25.35	30.72	0.70	
34	New Zealand	24.70	29.73	0.69	
35	Tunisia (2008)	24.36	29.20	0.69	●
36	Mali (2014)	24.26	29.07	0.68	●
37	Netherlands	24.16	28.90	0.67	
38	Poland (2011)	23.51	27.93	0.66	
39	Korea, Rep. (2013)	23.37	27.71	0.65	
40	Germany	23.23	27.50	0.64	
41	Malaysia (2013)	23.20	27.45	0.63	
42	Italy	22.82	26.88	0.62	
43	Jamaica (2014)	22.82	26.87	0.61	
44	United States of America	22.81	26.87	0.60	
45	Ethiopia (2010)	22.69	26.67	0.59	●
46	Brazil	22.66	26.63	0.58	
47	United Kingdom (2013)	22.51	26.41	0.57	○
48	Kuwait (2011)	21.75	25.26	0.56	
49	Kenya (2006)	21.17	24.37	0.56	
50	Argentina (2013)	20.88	23.93	0.55	
51	Kazakhstan (2014)	20.39	23.19	0.54	
52	Bulgaria	20.38	23.18	0.53	
53	Bolivia, Plurinational St.	20.33	23.09	0.52	●
54	Iceland (2011)	20.24	22.96	0.51	
55	Oman (2013)	19.97	22.55	0.50	
56	Cameroon	19.74	22.20	0.49	●
57	Hungary	19.73	22.18	0.48	
58	Thailand	19.69	22.12	0.47	
59	Uganda	19.44	21.75	0.46	
60	Hong Kong (China) (2014)	19.33	21.57	0.45	○
61	South Africa (2014)	19.01	21.10	0.44	
62	Honduras (2013)	18.72	20.66	0.44	
63	Slovakia	18.43	20.22	0.43	
64	Canada (2011)	18.32	20.05	0.42	○
65	United Arab Emirates	18.32	20.05	0.41	
66	Saudi Arabia (2007)	18.11	19.73	0.40	
67	Luxembourg (2011)	18.02	19.60	0.39	
68	Colombia (2014)	17.75	19.18	0.38	
69	Paraguay	17.35	18.58	0.37	
70	Latvia	17.24	18.40	0.36	
71	Singapore (2010)	16.68	17.57	0.35	○
72	Venezuela, Bolivarian Rep. (2009)	16.61	17.45	0.34	
73	Australia	16.54	17.35	0.33	○
74	Iran, Islamic Rep. (2014)	16.16	16.76	0.32	
75	Armenia (2014)	15.93	16.43	0.31	
76	Namibia (2008)	15.93	16.43	0.31	
77	Mexico (2011)	15.91	16.40	0.30	
78	Georgia (2008)	15.49	15.76	0.29	
79	Israel (2011)	15.46	15.72	0.28	○
80	Togo (2011)	15.42	15.65	0.27	
81	Mongolia (2010)	15.37	15.57	0.26	
82	Burkina Faso (2013)	15.24	15.38	0.25	
83	India	15.19	15.29	0.24	
84	Chile (2013)	15.15	15.24	0.23	○
85	Jordan (2011)	15.06	15.11	0.22	○
86	Benin (2014)	14.88	14.83	0.21	
87	Nepal (2014)	14.64	14.47	0.20	
88	Dominican Republic (2014)	14.60	14.40	0.19	
89	Pakistan (2014)	13.22	12.31	0.19	
90	Serbia (2011)	13.06	12.06	0.18	○
91	Peru (2014)	12.94	11.89	0.17	○
92	Romania	12.56	11.31	0.16	○
93	Tanzania, United Rep. (2010)	12.15	10.69	0.15	
94	Bangladesh (2011)	12.13	10.66	0.14	
95	Yemen (2011)	12.13	10.66	0.13	
96	El Salvador (2010)	11.31	9.41	0.12	
97	Uruguay (2006)	10.69	8.47	0.11	○
98	Qatar (2009)	10.27	7.84	0.10	○
99	Guinea	9.89	7.26	0.09	
100	Indonesia (2013)	9.81	7.14	0.08	
101	Panama (2011)	9.66	6.92	0.07	○
102	Philippines (2008)	9.14	6.12	0.06	○
103	Madagascar	8.39	4.98	0.06	
104	Nicaragua (2010)	7.44	3.55	0.05	○
105	Sri Lanka	6.87	2.68	0.04	○
106	Ecuador (2014)	6.33	1.85	0.03	○
107	Albania (2013)	5.81	1.07	0.02	○
108	Guatemala (2013)	5.42	0.48	0.01	○
109	Lebanon (2013)	5.10	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Egypt	n/a	n/a	n/a	
n/a	Greece	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Russian Federation	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Turkey	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.1.3 School life expectancy

School life expectancy, primary to tertiary education (years) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Australia	20.43	100.00	1.00	●
2	Belgium	19.60	94.52	0.99	●
3	Finland	19.27	92.31	0.98	●
4	Denmark	19.18	91.69	0.97	●
5	New Zealand	19.17	91.63	0.97	●
6	Iceland (2012)	18.99	90.48	0.96	
7	Ireland	18.80	89.17	0.95	
8	Netherlands (2012)	18.12	84.68	0.94	
9	Sweden	18.11	84.61	0.93	
10	United Kingdom	17.81	82.64	0.92	
11	Norway	17.67	81.74	0.91	
12	Slovenia	17.64	81.50	0.91	●
13	Spain	17.61	81.31	0.90	●
14	Greece	17.22	78.73	0.89	●
15	Argentina	17.14	78.19	0.88	●
16	Germany	16.97	77.10	0.87	
17	Portugal	16.80	75.95	0.86	
18	Czech Republic	16.67	75.08	0.85	
19	Korea, Rep. (2014)	16.59	74.58	0.84	
20	United States of America	16.54	74.25	0.84	
21	Estonia	16.50	74.00	0.83	
22	Lithuania	16.49	73.92	0.82	
23	Hong Kong (China) (2014)	16.40	73.33	0.81	
24	Turkey	16.39	73.23	0.80	
25	Poland	16.37	73.15	0.79	
26	Italy	16.26	72.39	0.78	
27	Chile	16.21	72.08	0.78	
28	France	16.16	71.74	0.77	
29	Saudi Arabia (2014)	16.12	71.47	0.76	
30	Latvia	15.97	70.51	0.75	
31	Israel	15.96	70.43	0.74	
32	Austria (2014)	15.91	70.10	0.73	
33	Albania (2014)	15.80	69.36	0.72	●
34	Hungary	15.79	69.30	0.72	
35	Switzerland (2012)	15.78	69.25	0.71	
36	Belarus (2014)	15.60	68.04	0.70	
37	Uruguay (2010)	15.51	67.45	0.69	
38	Japan	15.34	66.31	0.68	
39	Romania (2011)	15.33	66.24	0.67	
40	Ukraine (2014)	15.31	66.09	0.66	
41	Ecuador	15.19	65.30	0.66	●
42	Mauritius (2014)	15.17	65.19	0.65	
43	Costa Rica (2014)	15.14	65.00	0.64	
44	Montenegro (2010)	15.13	64.95	0.63	
45	Slovakia	15.06	64.46	0.62	
46	Bulgaria (2014)	15.04	64.33	0.61	
47	Kazakhstan (2014)	14.98	63.93	0.60	
48	Georgia (2014)	14.91	63.49	0.59	
49	Russian Federation	14.87	63.17	0.59	
50	Croatia (2012)	14.86	63.14	0.58	
51	Mongolia (2014)	14.85	63.04	0.57	
52	Iran, Islamic Rep. (2014)	14.82	62.90	0.56	
53	Tunisia	14.69	61.98	0.55	
54	Malta (2014)	14.59	61.38	0.54	
55	Serbia (2014)	14.36	59.82	0.53	
56	Algeria (2011)	14.36	59.81	0.53	●
57	Colombia (2009)	14.30	59.44	0.52	
58	Cyprus (2014)	14.24	59.05	0.51	
59	Venezuela, Bolivarian Rep. (2009)	14.04	57.69	0.50	
60	Sri Lanka	13.96	57.19	0.49	
61	Bolivia, Plurinational St. (2007)	13.96	57.15	0.48	
62	Luxembourg (2012)	13.86	56.55	0.47	
63	China	13.85	56.42	0.47	
64	Oman (2011)	13.74	55.73	0.46	
65	Thailand	13.57	54.64	0.45	
66	Malaysia	13.40	53.46	0.44	
67	Peru (2010)	13.39	53.39	0.43	
68	South Africa	13.23	52.35	0.42	
69	El Salvador	13.17	51.98	0.41	
70	Dominican Republic (2014)	13.17	51.95	0.41	
71	Mexico	13.12	51.64	0.40	
72	Egypt	13.09	51.45	0.39	
73	Qatar (2011)	13.08	51.33	0.38	
74	Botswana	13.07	51.31	0.37	
75	Kuwait	12.96	50.59	0.36	
76	Indonesia	12.90	50.18	0.35	
77	TFYR of Macedonia (2012)	12.89	50.13	0.34	
78	Panama	12.80	49.50	0.34	
79	Kyrgyzstan	12.76	49.27	0.33	
80	Jordan (2012)	12.76	49.27	0.32	
81	Philippines	12.75	49.18	0.31	
82	Azerbaijan (2014)	12.64	48.46	0.30	
83	Bhutan	12.52	47.62	0.29	
84	Armenia (2009)	12.32	46.36	0.28	
85	Paraguay (2010)	12.32	46.32	0.28	
86	Lebanon	12.23	45.76	0.27	
87	Nepal (2014)	12.22	45.66	0.26	
88	Benin	12.14	45.12	0.25	
89	Morocco (2012)	12.05	44.58	0.24	
90	Togo (2011)	11.97	43.99	0.23	
91	Moldova, Rep.	11.81	42.94	0.22	
92	India	11.61	41.62	0.22	
93	Ghana (2014)	11.37	40.04	0.21	
94	Tajikistan	11.26	39.33	0.20	
95	Namibia (2006)	11.26	39.30	0.19	
96	Rwanda	11.25	39.25	0.18	
97	Honduras (2014)	11.24	39.17	0.17	
98	Kenya (2009)	11.07	38.09	0.16	
99	Malawi (2011)	10.72	35.77	0.16	
100	Guatemala	10.72	35.76	0.15	
101	Burundi	10.65	35.27	0.14	
102	Cambodia (2008)	10.52	34.40	0.13	
103	Cameroon (2011)	10.42	33.73	0.12	
104	Madagascar (2012)	10.35	33.28	0.11	
105	Uganda (2011)	10.01	31.07	0.10	
106	Bangladesh (2011)	9.86	30.05	0.09	
107	Mozambique (2014)	9.07	24.83	0.09	
108	Yemen (2011)	8.99	24.30	0.08	
109	Côte d'Ivoire (2014)	8.82	23.17	0.07	○
110	Guinea (2014)	8.69	22.34	0.06	
111	Tanzania, United Rep.	8.36	20.11	0.05	
112	Ethiopia (2012)	8.35	20.08	0.04	
113	Pakistan (2014)	8.11	18.46	0.03	○
114	Senegal (2010)	7.88	16.98	0.03	○
115	Mali (2011)	7.72	15.90	0.02	○
116	Burkina Faso	7.69	15.72	0.01	○
117	Niger (2012)	5.32	0.00	0.00	○
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Brazil	n/a	n/a	n/a	
n/a	Canada	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Singapore	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.1.4 Assessment in reading, mathematics, and science

PISA average scales in reading, mathematics, and science | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	587.46	100.00	1.00	●
2	Singapore	555.73	87.38	0.98	●
3	Hong Kong (China)	553.59	86.53	0.97	●
4	Korea, Rep.	542.45	82.10	0.95	
5	Japan	540.40	81.28	0.93	
6	Finland	529.40	76.91	0.92	
7	Estonia	526.08	75.59	0.90	
8	Canada	522.21	74.05	0.89	
9	Poland	520.50	73.37	0.87	●
10	Netherlands	518.75	72.68	0.85	
11	Switzerland	518.42	72.55	0.84	
12	Ireland	515.56	71.41	0.82	
13	Germany	515.11	71.23	0.80	
14	Australia	512.48	70.18	0.79	
15	Belgium	509.77	69.10	0.77	
16	New Zealand	509.19	68.87	0.75	
17	United Kingdom	502.46	66.20	0.74	
18	Austria	500.31	65.34	0.72	
19	Czech Republic	500.05	65.24	0.70	
20	France	499.81	65.14	0.69	
21	Slovenia	498.86	64.77	0.67	
22	Denmark	498.21	64.51	0.66	
23	Norway	495.94	63.61	0.64	
24	Latvia	493.82	62.76	0.62	
25	United States of America	492.12	62.09	0.61	
26	Luxembourg	489.62	61.09	0.59	
27	Spain	489.57	61.07	0.57	
28	Italy	489.54	61.06	0.56	
29	Portugal	488.03	60.46	0.54	
30	Hungary	486.60	59.89	0.52	
31	Iceland	484.49	59.05	0.51	
32	Lithuania	483.94	58.83	0.49	
33	Croatia	482.35	58.20	0.48	
34	Sweden	482.13	58.11	0.46	○
35	Russian Federation	481.20	57.74	0.44	
36	Israel	474.12	54.93	0.43	
37	Slovakia	471.87	54.03	0.41	
38	United Arab Emirates	468.74	52.79	0.39	
39	Greece	465.63	51.55	0.38	
40	Turkey	462.30	50.23	0.36	
41	Serbia	446.60	43.98	0.34	
42	Bulgaria	440.44	41.54	0.33	
43	Romania	440.31	41.48	0.31	
44	Thailand	437.32	40.29	0.30	
45	Chile	436.32	39.90	0.28	○
46	Costa Rica	425.63	35.64	0.26	
47	Mexico	417.25	32.31	0.25	
48	Kazakhstan	416.41	31.98	0.23	
49	Montenegro	413.95	31.00	0.21	○
50	Venezuela, Bolivarian Rep. (2010)	413.44	30.80	0.20	
51	Malaysia	412.74	30.52	0.18	○
52	Uruguay	412.16	30.29	0.16	○
53	Brazil	402.10	26.29	0.15	○
54	Jordan	398.00	24.66	0.13	○
55	Argentina	396.68	24.13	0.11	
56	Tunisia	396.65	24.12	0.10	○
57	Albania	395.22	23.55	0.08	
58	Colombia	392.86	22.61	0.07	○
59	Indonesia	384.38	19.24	0.05	○
60	Qatar	382.53	18.50	0.03	○
61	Peru	375.12	15.56	0.02	○
62	India (2010)	336.00	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	

Rank	Country/Economy	Value	Score (0–100)	Percent rank
n/a	Azerbaijan	n/a	n/a	n/a
n/a	Bahrain	n/a	n/a	n/a
n/a	Bangladesh	n/a	n/a	n/a
n/a	Belarus	n/a	n/a	n/a
n/a	Benin	n/a	n/a	n/a
n/a	Bhutan	n/a	n/a	n/a
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a
n/a	Bosnia and Herzegovina	n/a	n/a	n/a
n/a	Botswana	n/a	n/a	n/a
n/a	Burkina Faso	n/a	n/a	n/a
n/a	Burundi	n/a	n/a	n/a
n/a	Cambodia	n/a	n/a	n/a
n/a	Cameroon	n/a	n/a	n/a
n/a	Côte d'Ivoire	n/a	n/a	n/a
n/a	Cyprus	n/a	n/a	n/a
n/a	Dominican Republic	n/a	n/a	n/a
n/a	Ecuador	n/a	n/a	n/a
n/a	Egypt	n/a	n/a	n/a
n/a	El Salvador	n/a	n/a	n/a
n/a	Ethiopia	n/a	n/a	n/a
n/a	Georgia	n/a	n/a	n/a
n/a	Ghana	n/a	n/a	n/a
n/a	Guatemala	n/a	n/a	n/a
n/a	Guinea	n/a	n/a	n/a
n/a	Honduras	n/a	n/a	n/a
n/a	Iran, Islamic Rep.	n/a	n/a	n/a
n/a	Jamaica	n/a	n/a	n/a
n/a	Kenya	n/a	n/a	n/a
n/a	Kuwait	n/a	n/a	n/a
n/a	Kyrgyzstan	n/a	n/a	n/a
n/a	Lebanon	n/a	n/a	n/a
n/a	Madagascar	n/a	n/a	n/a
n/a	Malawi	n/a	n/a	n/a
n/a	Mali	n/a	n/a	n/a
n/a	Malta	n/a	n/a	n/a
n/a	Mauritius	n/a	n/a	n/a
n/a	Moldova, Rep.	n/a	n/a	n/a
n/a	Mongolia	n/a	n/a	n/a
n/a	Morocco	n/a	n/a	n/a
n/a	Mozambique	n/a	n/a	n/a
n/a	Namibia	n/a	n/a	n/a
n/a	Nepal	n/a	n/a	n/a
n/a	Nicaragua	n/a	n/a	n/a
n/a	Niger	n/a	n/a	n/a
n/a	Nigeria	n/a	n/a	n/a
n/a	Oman	n/a	n/a	n/a
n/a	Pakistan	n/a	n/a	n/a
n/a	Panama	n/a	n/a	n/a
n/a	Paraguay	n/a	n/a	n/a
n/a	Philippines	n/a	n/a	n/a
n/a	Rwanda	n/a	n/a	n/a
n/a	Saudi Arabia	n/a	n/a	n/a
n/a	Senegal	n/a	n/a	n/a
n/a	South Africa	n/a	n/a	n/a
n/a	Sri Lanka	n/a	n/a	n/a
n/a	Tajikistan	n/a	n/a	n/a
n/a	Tanzania, United Rep.	n/a	n/a	n/a
n/a	TFYR of Macedonia	n/a	n/a	n/a
n/a	Togo	n/a	n/a	n/a
n/a	Uganda	n/a	n/a	n/a
n/a	Ukraine	n/a	n/a	n/a
n/a	Viet Nam	n/a	n/a	n/a
n/a	Yemen	n/a	n/a	n/a
n/a	Zambia	n/a	n/a	n/a

SOURCE: OECD Programme for International Student Assessment (PISA) (2010–2012)
NOTE: ● indicates a strength; ○ a weakness

2.1.5 Pupil-teacher ratio, secondary

Pupil-teacher ratio, secondary | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Georgia	7.25	100.00	1.00	●
2	Croatia (2012)	7.81	98.36	0.99	●
3	Malta	7.82	98.31	0.98	●
4	Luxembourg (2012)	7.88	98.13	0.97	●
5	Greece (2007)	7.88	98.13	0.96	●
6	Venezuela, Bolivarian Rep.	7.89	98.11	0.96	●
7	Belarus	8.06	97.62	0.95	●
8	Lithuania (2013)	8.10	97.49	0.94	●
9	Kuwait (2009)	8.17	97.27	0.93	●
10	Lebanon (2013)	8.21	97.17	0.92	●
11	Latvia (2013)	8.33	96.81	0.91	●
12	Estonia (2012)	8.38	96.67	0.90	
13	Honduras	8.63	95.91	0.89	●
14	Serbia	8.65	95.86	0.88	●
15	Kazakhstan	8.66	95.84	0.88	●
16	Russian Federation (2012)	8.76	95.53	0.87	●
17	Switzerland (2012)	9.33	93.86	0.86	
18	Moldova, Rep.	9.38	93.72	0.85	●
19	Belgium (2013)	9.45	93.51	0.84	
20	Sweden (2012)	9.52	93.29	0.83	
21	Poland (2013)	9.53	93.26	0.82	●
22	Austria (2013)	9.67	92.85	0.81	
23	Cyprus	9.72	92.71	0.80	
24	Israel (2009)	9.76	92.58	0.79	
25	Portugal (2013)	9.77	92.55	0.79	
26	Bahrain	9.86	92.30	0.78	
27	Benin	9.92	92.13	0.77	●
28	Slovenia (2013)	10.07	91.68	0.76	
29	Qatar	10.17	91.38	0.75	
30	Hungary (2013)	10.48	90.46	0.74	
31	TFYR of Macedonia (2012)	10.49	90.43	0.73	●
32	Bosnia and Herzegovina	10.65	89.97	0.72	●
33	Argentina (2008)	10.90	89.23	0.71	●
34	Saudi Arabia	10.96	89.04	0.71	
35	Botswana (2013)	11.15	88.48	0.70	●
36	Slovakia (2013)	11.23	88.25	0.69	
37	Uruguay (2010)	11.32	87.99	0.68	
38	Spain (2012)	11.35	87.90	0.67	
39	Italy (2013)	11.38	87.82	0.66	
40	Czech Republic (2013)	11.55	87.31	0.65	
41	Japan (2012)	11.68	86.94	0.64	
42	Ukraine	11.78	86.61	0.63	
43	Egypt (2009)	12.13	85.58	0.63	●
44	Germany (2013)	12.56	84.34	0.62	
45	Guatemala	12.66	84.02	0.61	
46	Finland (2013)	12.71	83.89	0.60	○
47	Romania (2013)	12.81	83.58	0.59	
48	France (2013)	12.94	83.21	0.58	
49	Kyrgyzstan	12.97	83.11	0.57	
50	Bulgaria	13.23	82.35	0.56	
51	Malaysia (2013)	13.26	82.26	0.55	
52	United Arab Emirates	13.27	82.22	0.54	
53	Hong Kong (China)	13.61	81.24	0.54	
54	Tunisia (2011)	13.62	81.18	0.53	
55	Mongolia	13.66	81.08	0.52	
56	Netherlands (2013)	14.11	79.74	0.51	○
57	Peru	14.20	79.48	0.50	
58	Albania	14.30	79.20	0.49	
59	Bhutan	14.30	79.19	0.48	
60	Costa Rica	14.36	79.02	0.47	
61	New Zealand (2012)	14.36	79.01	0.46	
62	United States of America (2013)	14.70	78.02	0.46	
63	Singapore (2009)	14.91	77.39	0.45	○
64	China (2013)	15.14	76.71	0.44	
65	Mauritius	15.17	76.64	0.43	
66	Indonesia (2013)	15.38	76.02	0.42	
67	Tajikistan (2011)	15.44	75.83	0.41	
68	Panama (2013)	15.52	75.60	0.40	
69	Korea, Rep.	15.61	75.32	0.39	
70	Ghana	15.82	74.72	0.38	
71	United Kingdom (2013)	15.87	74.57	0.38	○
72	Yemen (2011)	16.09	73.92	0.37	●
73	Jamaica	16.50	72.71	0.36	
74	Brazil (2013)	17.26	70.45	0.35	
75	Sri Lanka (2012)	17.28	70.39	0.34	
76	Iran, Islamic Rep.	17.51	69.71	0.33	
77	Mexico (2012)	17.74	69.04	0.32	
78	Bolivia, Plurinational St. (2007)	18.17	67.78	0.31	
79	Paraguay (2012)	18.40	67.08	0.30	
80	Ecuador	18.61	66.47	0.29	
81	Mali	18.89	65.65	0.29	
82	Pakistan	19.20	64.72	0.28	
83	Thailand (2011)	19.91	62.65	0.27	
84	Turkey (2013)	20.13	61.98	0.26	
85	Cameroon	20.43	61.12	0.25	
86	Chile (2013)	21.00	59.42	0.24	○
87	Uganda (2013)	21.32	58.48	0.23	
88	Dominican Republic	21.37	58.33	0.22	
89	Côte d'Ivoire	22.30	55.58	0.21	
90	Rwanda (2013)	22.79	54.13	0.21	
91	Madagascar	23.12	53.17	0.20	
92	Namibia (2007)	24.62	48.72	0.19	
93	Colombia	24.90	47.91	0.18	○
94	South Africa (2009)	25.05	47.47	0.17	○
95	Niger	25.11	47.28	0.16	
96	Togo (2011)	26.25	43.94	0.15	
97	Tanzania, United Rep. (2012)	26.39	43.50	0.14	
98	Philippines (2013)	26.99	41.74	0.13	
99	Burkina Faso	27.09	41.45	0.13	
100	Senegal (2011)	27.35	40.68	0.12	
101	Nepal	28.84	36.28	0.11	
102	Cambodia (2007)	28.92	36.04	0.10	
103	India (2013)	30.78	30.55	0.09	○
104	Nicaragua (2010)	30.83	30.41	0.08	
105	Mozambique (2013)	31.18	29.38	0.07	
106	Nigeria (2010)	33.08	23.77	0.06	
107	Guinea (2011)	33.14	23.61	0.05	
108	Bangladesh (2013)	35.20	17.51	0.04	○
109	Burundi	37.22	11.56	0.04	
110	El Salvador (2013)	37.99	9.27	0.03	○
111	Ethiopia (2012)	38.78	6.96	0.02	○
112	Kenya (2012)	41.13	0.00	0.00	○
112	Malawi	70.40	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Australia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Canada	n/a	n/a	n/a	
n/a	Denmark	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Ireland	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Morocco	n/a	n/a	n/a	
n/a	Norway	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.2.1 Tertiary enrolment

School enrolment, tertiary (% gross) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Greece	110.16	100.00	1.00	●
2	Korea, Rep. (2014)	95.35	86.45	0.99	●
3	Finland	91.07	82.54	0.98	●
4	Belarus (2014)	88.86	80.52	0.98	●
5	United States of America	88.81	80.47	0.97	
6	Spain	87.07	78.88	0.96	●
7	Australia	86.55	78.41	0.95	●
8	Slovenia	85.22	77.19	0.94	●
9	Chile	83.82	75.91	0.93	●
10	Ukraine (2014)	82.31	74.53	0.93	●
11	Iceland (2012)	82.23	74.46	0.92	
12	Denmark	81.24	73.55	0.91	
13	Austria (2014)	80.00	72.42	0.90	
14	Argentina	79.99	72.41	0.89	●
15	New Zealand	79.71	72.16	0.88	
16	Turkey	78.98	71.49	0.88	●
17	Netherlands (2012)	78.50	71.05	0.87	
18	Russian Federation	78.00	70.59	0.86	●
19	Venezuela, Bolivarian Rep. (2009)	76.98	69.66	0.85	●
20	Norway	76.12	68.87	0.84	
21	Ireland	73.17	66.17	0.83	
22	Estonia	72.92	65.95	0.83	
23	Belgium	72.31	65.39	0.82	
24	Lithuania	71.97	65.08	0.81	
25	Poland	71.16	64.34	0.80	
26	Bulgaria (2014)	70.79	63.99	0.79	
27	Hong Kong (China) (2014)	68.78	62.16	0.78	
28	Latvia	66.95	60.49	0.78	
29	Israel	66.28	59.87	0.77	
30	Portugal	66.22	59.82	0.76	
31	Iran, Islamic Rep. (2014)	65.96	59.58	0.75	●
32	Czech Republic	65.38	59.05	0.74	
33	Mongolia (2014)	64.27	58.04	0.73	
34	Italy	63.46	57.29	0.73	
35	Sweden	63.39	57.24	0.72	
36	Uruguay (2010)	63.13	57.00	0.71	●
37	Albania (2014)	62.71	56.61	0.70	●
38	Japan	62.41	56.34	0.69	
39	France	62.15	56.10	0.68	
40	Croatia (2012)	61.67	55.66	0.68	
41	Saudi Arabia (2014)	61.11	55.15	0.67	
42	Germany	61.06	55.10	0.66	
43	Serbia (2014)	58.05	52.35	0.65	
44	Hungary	57.02	51.40	0.64	
45	United Kingdom	56.87	51.27	0.63	○
46	Switzerland	56.27	50.72	0.63	
47	Montenegro (2010)	55.34	49.88	0.62	
48	Slovakia	54.43	49.04	0.61	
49	Cyprus (2014)	53.10	47.83	0.60	
50	Costa Rica (2014)	53.04	47.77	0.59	
51	Romania	52.17	46.97	0.58	
52	Thailand	51.38	46.25	0.58	
53	Colombia (2014)	51.29	46.17	0.57	
54	Kazakhstan (2014)	48.48	43.59	0.56	
55	Jordan (2012)	47.59	42.78	0.55	
56	Dominican Republic (2014)	47.52	42.72	0.54	
57	Kyrgyzstan	47.33	42.55	0.53	
58	Armenia (2014)	46.64	41.92	0.53	
59	Malta (2014)	45.08	40.49	0.52	
60	Lebanon (2014)	42.77	38.38	0.51	
61	Moldova, Rep.	41.28	37.01	0.50	
62	Peru (2010)	40.51	36.31	0.49	
63	Ecuador	40.48	36.29	0.48	
64	TFYR of Macedonia	39.35	35.25	0.48	
65	Georgia (2014)	39.18	35.09	0.47	
66	Panama	38.74	34.69	0.46	
67	Mauritius (2014)	38.67	34.63	0.45	
68	Malaysia	38.53	34.50	0.44	
69	Bolivia, Plurinational St. (2007)	38.39	34.37	0.43	
70	Bahrain (2014)	36.84	32.95	0.43	
71	Philippines (2014)	35.75	31.96	0.42	
72	Paraguay (2010)	35.08	31.35	0.41	
73	Algeria (2014)	34.59	30.90	0.40	
74	Tunisia (2014)	34.58	30.89	0.39	
75	Indonesia	31.29	27.88	0.38	
76	Viet Nam (2014)	30.48	27.14	0.38	
77	Egypt	30.32	26.99	0.37	
78	China	30.16	26.85	0.36	
79	Mexico	29.21	25.98	0.35	
80	El Salvador	29.17	25.94	0.34	
81	Oman (2011)	28.58	25.40	0.33	
82	Botswana (2014)	27.51	24.43	0.33	
83	Jamaica	27.44	24.37	0.32	
84	Kuwait	27.03	23.98	0.31	
85	Morocco (2014)	24.57	21.74	0.30	
86	Tajikistan (2014)	24.47	21.65	0.29	
87	India	23.89	21.11	0.28	
88	Azerbaijan (2014)	23.16	20.45	0.28	
89	United Arab Emirates (2014)	22.04	19.42	0.27	○
90	Honduras (2014)	21.18	18.64	0.26	
91	Sri Lanka (2014)	20.71	18.20	0.25	
92	South Africa	19.66	17.25	0.24	○
93	Luxembourg (2012)	19.41	17.02	0.23	○
94	Guatemala	18.33	16.03	0.23	
95	Cambodia (2011)	15.90	13.81	0.22	
96	Nepal (2014)	15.83	13.75	0.21	
97	Qatar (2014)	15.83	13.75	0.20	
98	Ghana (2014)	15.57	13.50	0.19	
99	Benin	15.36	13.32	0.18	
100	Bangladesh (2012)	13.39	11.51	0.18	
101	Cameroon (2011)	11.93	10.18	0.17	
102	Bhutan	10.93	9.26	0.16	
103	Guinea (2014)	10.85	9.19	0.15	
104	Pakistan (2014)	10.36	8.74	0.14	
105	Togo (2014)	10.12	8.52	0.13	
106	Yemen (2011)	9.97	8.39	0.13	
107	Namibia (2008)	9.33	7.80	0.12	
108	Côte d'Ivoire (2014)	8.68	7.21	0.11	
109	Rwanda	7.53	6.16	0.10	
110	Senegal (2010)	7.39	6.03	0.09	
111	Mali (2012)	6.87	5.56	0.08	
112	Ethiopia (2014)	6.30	5.03	0.08	
113	Mozambique (2014)	5.97	4.73	0.07	
114	Burkina Faso	4.78	3.64	0.06	
115	Uganda (2011)	4.48	3.37	0.05	○
116	Burundi	4.41	3.30	0.04	
117	Madagascar	4.25	3.15	0.03	○
118	Kenya (2009)	4.05	2.97	0.03	○
119	Tanzania, United Rep.	3.65	2.61	0.02	○
120	Niger (2012)	1.71	0.84	0.01	○
121	Malawi (2011)	0.80	0.00	0.00	○
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Brazil	n/a	n/a	n/a	
n/a	Canada	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Singapore	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.2.2 Graduates in science and engineering

Tertiary graduates in science, engineering, manufacturing, and construction (% of total tertiary graduates) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Oman (2014)	48.69	100.00	1.00	●
2	Iran, Islamic Rep. (2014)	46.56	95.35	0.99	●
3	Tunisia (2014)	44.09	89.99	0.98	●
4	Morocco (2010)	34.91	70.06	0.97	●
5	Hong Kong (China) (2006)	34.67	69.54	0.96	
6	Malaysia	33.26	66.49	0.95	●
7	Korea, Rep. (2011)	31.92	63.57	0.94	
8	India	29.11	57.48	0.93	●
9	Greece (2012)	28.66	56.50	0.92	●
10	Belarus (2014)	28.62	56.40	0.91	●
11	Russian Federation (2009)	28.11	55.30	0.90	●
12	Tajikistan (2014)	28.07	55.22	0.89	●
13	Austria	27.87	54.77	0.88	
14	Finland	27.86	54.75	0.87	
15	Algeria (2014)	27.60	54.19	0.86	●
16	Qatar (2014)	27.56	54.11	0.85	
17	Mexico (2012)	26.88	52.64	0.84	●
18	Saudi Arabia (2014)	26.85	52.57	0.83	●
19	Bhutan	26.83	52.51	0.82	●
20	Kuwait	26.74	52.32	0.81	●
21	Serbia (2014)	26.21	51.17	0.80	●
22	Portugal	26.09	50.92	0.79	
23	Moldova, Rep.	25.73	50.13	0.78	
24	Sweden	25.71	50.08	0.77	
25	Kazakhstan (2014)	25.71	50.08	0.76	
26	Philippines (2014)	25.53	49.70	0.75	●
27	Ukraine (2014)	25.52	49.67	0.74	
28	Romania	25.49	49.62	0.73	
29	United Kingdom	25.18	48.94	0.72	
30	Slovenia (2012)	24.74	47.98	0.71	
31	France	24.47	47.41	0.70	
32	Croatia (2012)	23.85	46.05	0.69	
33	Ireland (2012)	23.76	45.87	0.68	
34	Lebanon (2011)	23.35	44.96	0.67	
35	Czech Republic	23.22	44.68	0.66	
36	Mauritius (2014)	22.93	44.06	0.65	
37	Colombia (2014)	22.74	43.65	0.64	
38	Rwanda (2012)	22.45	43.01	0.63	
39	Viet Nam (2014)	22.40	42.90	0.62	
40	El Salvador	22.23	42.53	0.61	
41	Spain (2012)	22.21	42.49	0.60	
42	Lithuania	22.20	42.47	0.59	
43	Estonia (2012)	22.12	42.30	0.58	
44	Switzerland	22.05	42.15	0.57	○
45	Azerbaijan (2014)	22.02	42.08	0.56	
46	Indonesia (2009)	21.68	41.35	0.55	
47	TFYR of Macedonia	21.23	40.35	0.54	
48	Cameroon (2010)	21.02	39.91	0.53	●
49	Turkey (2012)	20.89	39.61	0.52	
50	Slovakia	20.51	38.80	0.51	
51	United Arab Emirates (2014)	20.43	38.61	0.50	
52	Denmark	20.37	38.50	0.50	○
53	Madagascar	20.28	38.29	0.49	
54	Italy (2012)	20.18	38.08	0.48	
55	Bulgaria	20.13	37.97	0.47	
56	Norway	19.97	37.62	0.46	○
57	Sri Lanka (2014)	19.95	37.58	0.45	
58	Japan	19.93	37.55	0.44	○
59	Bahrain (2014)	19.48	36.56	0.43	
60	Mongolia (2014)	19.48	36.56	0.42	
61	Chile (2012)	19.18	35.91	0.41	
62	Malta (2012)	19.12	35.77	0.40	
63	South Africa	19.00	35.52	0.39	
64	Cyprus	18.96	35.44	0.38	
65	New Zealand (2012)	18.79	35.06	0.37	○
66	Kyrgyzstan	18.28	33.96	0.36	
67	Latvia	17.90	33.14	0.35	
68	Ghana (2014)	17.58	32.44	0.34	
69	Burkina Faso	17.55	32.38	0.33	
70	Botswana (2014)	17.49	32.25	0.32	
71	Poland	17.42	32.09	0.31	○
72	Hungary (2012)	16.84	30.82	0.30	○
73	Albania (2014)	16.79	30.73	0.29	
74	Guatemala (2007)	16.76	30.66	0.28	
75	Georgia (2014)	16.69	30.51	0.27	
76	Belgium (2012)	16.44	29.97	0.26	○
77	Luxembourg	16.25	29.55	0.25	○
78	Jordan (2011)	16.12	29.27	0.24	
79	Australia (2011)	15.93	28.85	0.23	○
80	Panama	15.86	28.69	0.22	
81	Iceland (2010)	15.64	28.21	0.21	○
82	Bangladesh (2012)	15.62	28.18	0.20	
83	Uruguay (2010)	15.60	28.14	0.19	
84	Bosnia and Herzegovina (2014)	15.38	27.65	0.18	
85	United States of America	14.88	26.58	0.17	○
86	Ecuador	14.87	26.55	0.16	
87	Dominican Republic (2014)	14.42	25.58	0.15	
88	Netherlands (2012)	14.42	25.57	0.14	○
89	Argentina	14.14	24.97	0.13	
90	Armenia (2014)	14.14	24.96	0.12	○
91	Costa Rica (2014)	13.12	22.75	0.11	○
92	Benin (2011)	12.67	21.78	0.10	
93	Cambodia (2008)	12.49	21.39	0.09	○
94	Honduras (2014)	12.37	21.12	0.08	○
95	Nepal (2014)	12.08	20.48	0.07	
96	Brazil (2012)	11.96	20.23	0.06	○
97	Egypt	11.79	19.87	0.05	○
98	Ethiopia (2008)	11.22	18.62	0.04	
99	Mozambique (2014)	8.13	11.92	0.03	○
100	Burundi	6.37	8.09	0.02	
101	Niger (2008)	4.28	3.55	0.01	○
102	Namibia (2008)	2.64	0.00	0.00	○
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Canada	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Germany	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Israel	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Singapore	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Thailand	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.2.3 Tertiary inbound mobility

Tertiary inbound mobility ratio (%) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Luxembourg (2012)	40.56	100.00	0.97	●	65	Morocco (2010)	1.92	9.91	0.40	
1	Qatar (2014)	39.90	100.00	0.97	●	66	Moldova, Rep.	1.88	9.69	0.39	
1	Singapore	19.17	100.00	0.97	●	67	Tunisia	1.85	9.51	0.38	
1	United Arab Emirates (2014)	44.82	100.00	0.97	●	68	Russian Federation	1.84	9.47	0.37	
5	Australia	17.97	93.75	0.96	●	69	Egypt	1.78	9.13	0.36	
6	United Kingdom	17.46	91.10	0.95		70	Madagascar	1.75	8.98	0.35	
7	Switzerland	16.86	87.95	0.94		71	Côte d'Ivoire (2014)	1.68	8.62	0.34	
8	New Zealand	16.12	84.06	0.93		72	Korea, Rep. (2014)	1.66	8.54	0.33	○
9	Austria (2014)	15.47	80.69	0.92	●	73	Botswana (2014)	1.63	8.38	0.32	
10	Cyprus (2014)	14.35	74.84	0.92	●	74	Poland	1.46	7.48	0.31	○
11	Bahrain (2014)	13.21	68.90	0.91	●	75	Togo (2007)	1.41	7.23	0.30	
12	Uganda (2011)	10.73	55.94	0.90	●	76	Cameroon (2011)	1.39	7.10	0.29	
13	France	10.24	53.34	0.89		77	Israel (2012)	1.19	6.06	0.28	○
14	Namibia (2008)	10.17	52.99	0.88	●	78	Malawi (2010)	1.14	5.79	0.27	
15	Denmark	10.13	52.76	0.87		79	Turkey	1.09	5.57	0.26	
16	Belgium	9.98	52.00	0.86		80	Burundi	1.00	5.07	0.25	
17	Hong Kong (China) (2014)	9.84	51.29	0.85		81	Rwanda	0.96	4.85	0.25	
18	Czech Republic	9.39	48.92	0.84		82	Guinea (2012)	0.92	4.66	0.24	
19	Jordan (2012)	9.11	47.45	0.83	●	83	Thailand (2012)	0.84	4.22	0.23	○
20	Benin (2010)	7.92	41.24	0.82	●	84	Honduras (2014)	0.69	3.48	0.22	
21	Lebanon (2014)	7.64	39.78	0.81	●	85	Mongolia (2014)	0.64	3.23	0.21	
22	Bosnia and Herzegovina (2014)	7.28	37.87	0.80	●	86	Algeria (2014)	0.64	3.19	0.20	
23	Netherlands (2012)	7.25	37.72	0.79		87	Ecuador (2012)	0.59	2.94	0.19	
24	Finland	7.07	36.82	0.78		88	Tajikistan (2014)	0.55	2.75	0.18	
25	Germany	7.07	36.81	0.77		89	Croatia (2012)	0.54	2.65	0.17	○
26	Ireland	6.45	33.55	0.76		90	Mali (2011)	0.53	2.61	0.16	
27	Iceland (2012)	6.21	32.30	0.75		91	El Salvador	0.43	2.10	0.15	
28	Malta (2014)	5.86	30.48	0.75		92	Mozambique (2014)	0.37	1.79	0.14	
29	Sweden	5.83	30.30	0.74		93	China	0.28	1.33	0.13	○
30	Hungary	5.76	29.97	0.73		94	Sri Lanka (2014)	0.28	1.29	0.12	○
31	Niger (2012)	5.43	28.21	0.72	●	95	Chile	0.26	1.19	0.11	○
32	Slovakia	4.86	25.25	0.71		96	Mexico	0.24	1.12	0.10	○
33	Saudi Arabia (2014)	4.80	24.91	0.70		97	Iran, Islamic Rep. (2014)	0.24	1.11	0.09	○
34	Italy	4.40	22.86	0.69		98	Brazil (2012)	0.21	0.95	0.08	○
35	Yemen (2011)	4.26	22.11	0.68	●	99	India	0.12	0.49	0.08	○
36	Greece	4.19	21.73	0.67		100	Indonesia (2012)	0.12	0.46	0.07	○
37	South Africa	4.09	21.22	0.66		101	Philippines (2008)	0.10	0.38	0.06	○
38	Bulgaria (2014)	3.98	20.66	0.65		102	Bangladesh (2009)	0.10	0.38	0.05	
39	Kyrgyzstan	3.96	20.53	0.64		103	Viet Nam (2014)	0.09	0.35	0.04	○
40	Armenia (2014)	3.95	20.49	0.63		104	Venezuela, Bolivarian Rep. (2008)	0.09	0.33	0.03	
41	United States of America	3.93	20.38	0.62		105	Cambodia (2006)	0.07	0.23	0.02	○
42	Portugal	3.92	20.34	0.61		106	Colombia (2014)	0.04	0.07	0.01	○
43	Ghana (2014)	3.90	20.23	0.60	●	107	Nepal (2011)	0.03	0.00	0.00	○
44	Mauritius (2014)	3.82	19.82	0.59		n/a	Argentina	n/a	n/a	n/a	
45	Latvia	3.71	19.24	0.58		n/a	Bhutan	n/a	n/a	n/a	
46	Serbia (2014)	3.67	19.04	0.58		n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
47	Malaysia	3.62	18.79	0.57		n/a	Canada	n/a	n/a	n/a	
48	Norway	3.62	18.75	0.56		n/a	Costa Rica	n/a	n/a	n/a	
49	Japan	3.52	18.23	0.55		n/a	Ethiopia	n/a	n/a	n/a	
50	Romania	3.49	18.08	0.54		n/a	Guatemala	n/a	n/a	n/a	
51	Oman (2014)	3.04	15.72	0.53		n/a	Jamaica	n/a	n/a	n/a	
52	Burkina Faso	2.90	15.01	0.52	●	n/a	Kenya	n/a	n/a	n/a	
53	Estonia	2.89	14.98	0.51		n/a	Kuwait	n/a	n/a	n/a	
54	Belarus (2014)	2.88	14.92	0.50		n/a	Montenegro	n/a	n/a	n/a	
55	Spain	2.86	14.81	0.49	○	n/a	Nicaragua	n/a	n/a	n/a	
56	Georgia (2014)	2.83	14.63	0.48		n/a	Nigeria	n/a	n/a	n/a	
57	Ukraine (2014)	2.80	14.47	0.47		n/a	Pakistan	n/a	n/a	n/a	
58	Kazakhstan (2014)	2.66	13.75	0.46		n/a	Panama	n/a	n/a	n/a	
59	Slovenia	2.62	13.56	0.45		n/a	Paraguay	n/a	n/a	n/a	
60	Lithuania	2.45	12.67	0.44		n/a	Peru	n/a	n/a	n/a	
61	Dominican Republic (2014)	2.34	12.09	0.43		n/a	Senegal	n/a	n/a	n/a	
62	Azerbaijan (2014)	2.25	11.64	0.42		n/a	Tanzania, United Rep.	n/a	n/a	n/a	
63	TFYR of Macedonia	2.16	11.14	0.42		n/a	Uruguay	n/a	n/a	n/a	
64	Albania (2014)	2.11	10.88	0.41		n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.3.1 Researchers

Researchers, full-time equivalence (FTE) (per million population) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Israel (2012)	8,255.40	100.00	1.00	●
2	Denmark	7,198.18	87.17	0.99	●
3	Finland	6,985.94	84.60	0.98	●
4	Korea, Rep.	6,899.00	83.55	0.97	
5	Sweden	6,868.11	83.17	0.96	
6	Singapore (2013)	6,665.19	80.71	0.95	
7	Iceland (2013)	5,993.08	72.55	0.94	
8	Norway	5,703.61	69.04	0.93	
9	Japan	5,386.15	65.19	0.92	
10	Austria	4,814.55	58.26	0.91	●
11	Luxembourg	4,577.30	55.38	0.90	
12	Australia (2010)	4,530.73	54.81	0.89	
13	Canada (2013)	4,518.51	54.67	0.88	
14	Switzerland (2012)	4,481.07	54.21	0.86	
15	Netherlands	4,478.05	54.18	0.85	
16	Germany	4,459.48	53.95	0.84	
17	United Kingdom	4,252.36	51.44	0.83	
18	France	4,201.06	50.82	0.82	
19	Belgium	4,175.88	50.51	0.81	
20	Slovenia	4,149.91	50.19	0.80	
21	United States of America (2012)	4,018.63	48.60	0.79	
22	New Zealand (2013)	4,008.71	48.48	0.78	
23	Ireland	3,732.06	45.13	0.77	
24	Portugal	3,699.87	44.74	0.76	
25	Czech Republic	3,418.46	41.32	0.75	
26	Estonia	3,270.77	39.53	0.74	
27	Hong Kong (China) (2013)	3,135.99	37.89	0.73	
28	Russian Federation	3,101.63	37.48	0.72	
29	Lithuania	2,961.47	35.78	0.71	
30	Slovakia	2,718.53	32.83	0.70	
31	Greece	2,699.26	32.60	0.69	
32	Hungary	2,650.58	32.01	0.68	
33	Spain	2,640.93	31.89	0.67	
34	Malta	2,132.99	25.73	0.66	
35	Poland	2,037.21	24.56	0.65	
36	Italy	2,006.68	24.19	0.64	
37	Latvia	1,884.03	22.71	0.63	
38	Bulgaria	1,817.86	21.90	0.61	
39	Malaysia (2012)	1,793.55	21.61	0.60	
40	Serbia	1,464.82	17.62	0.59	
41	Croatia	1,437.31	17.29	0.58	
42	Tunisia (2012)	1,393.10	16.75	0.57	
43	Argentina (2013)	1,193.85	14.33	0.56	
44	Ukraine (2013)	1,165.18	13.99	0.55	
45	Turkey	1,156.51	13.88	0.54	
46	China	1,113.07	13.35	0.53	
47	Romania	921.50	11.03	0.52	
48	Morocco (2012)	856.92	10.25	0.51	
49	TFYR of Macedonia	838.45	10.02	0.50	
50	Cyprus	749.79	8.95	0.49	
51	Kazakhstan (2013)	734.05	8.76	0.48	
52	Brazil (2010)	698.10	8.32	0.47	
53	Iran, Islamic Rep. (2012)	691.41	8.24	0.46	
54	Egypt	681.61	8.12	0.45	
55	Moldova, Rep.	651.96	7.76	0.44	
56	Montenegro (2013)	646.76	7.70	0.43	
57	Qatar (2012)	597.06	7.09	0.42	
58	Georgia	585.41	6.95	0.41	
59	Thailand (2011)	543.47	6.44	0.40	
60	Uruguay	504.16	5.97	0.39	
61	Chile	427.98	5.04	0.38	
62	South Africa (2012)	404.69	4.76	0.36	
63	Senegal (2010)	361.12	4.23	0.35	
64	Costa Rica (2013)	357.81	4.19	0.34	
65	Mexico (2011)	322.54	3.76	0.33	
66	Venezuela, Bolivarian Rep. (2012)	290.95	3.38	0.32	
67	Bosnia and Herzegovina	266.61	3.09	0.31	
68	Kenya (2010)	230.73	2.65	0.30	
69	Philippines (2013)	221.31	2.54	0.29	
70	Mauritius (2012)	181.11	2.05	0.28	
71	Ecuador (2011)	180.30	2.04	0.27	
72	Paraguay (2012)	169.46	1.91	0.26	
73	Pakistan (2013)	166.92	1.88	0.25	
74	Bolivia, Plurinational St. (2010)	165.95	1.86	0.24	
75	Botswana (2012)	164.90	1.85	0.23	
76	Albania (2008)	157.34	1.76	0.22	
77	India (2010)	156.64	1.75	0.21	
78	Colombia (2013)	151.95	1.69	0.20	
79	Kuwait (2012)	128.38	1.41	0.19	
80	Oman (2013)	127.27	1.39	0.18	
81	Panama (2011)	118.96	1.29	0.17	
82	Sri Lanka (2013)	110.91	1.20	0.16	
83	Indonesia (2009)	89.53	0.94	0.15	
84	Madagascar (2011)	51.02	0.47	0.14	
85	Malawi (2010)	49.57	0.45	0.13	
86	Burkina Faso (2010)	47.50	0.43	0.11	
87	Ethiopia (2013)	45.12	0.40	0.10	
88	Zambia (2008)	40.87	0.35	0.09	
89	Ghana (2010)	38.68	0.32	0.08	
90	Nigeria (2007)	38.58	0.32	0.07	
91	Uganda (2010)	38.09	0.31	0.06	
92	Mozambique (2010)	37.51	0.31	0.05	
93	Togo (2012)	35.93	0.29	0.04	
94	Mali (2010)	29.17	0.20	0.03	○
95	Guatemala (2012)	26.74	0.18	0.02	○
96	Tanzania, United Rep. (2013)	18.49	0.08	0.01	○
97	Rwanda (2009)	12.29	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*
NOTE: ● indicates a strength; ○ a weakness

2.3.2 Gross expenditure on R&D (GERD)

GERD: Gross expenditure on R&D (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Korea, Rep.	4.29	100.00	1.00	●
2	Israel	4.11	95.69	0.99	●
3	Japan	3.58	83.34	0.98	●
4	Finland	3.17	73.68	0.97	
5	Sweden	3.16	73.38	0.96	●
6	Denmark	3.08	71.59	0.95	●
7	Austria (2015)	3.00	69.61	0.94	●
8	Switzerland (2012)	2.97	68.80	0.93	
9	Germany	2.84	65.87	0.93	
10	United States of America (2013)	2.73	63.12	0.92	
11	Belgium	2.46	56.98	0.91	
12	Slovenia	2.39	55.14	0.90	
13	France	2.26	52.07	0.89	
14	Australia (2013)	2.20	50.65	0.88	
15	China	2.05	47.12	0.87	
16	Singapore (2013)	2.00	46.05	0.86	
17	Czech Republic	2.00	45.98	0.85	
18	Netherlands	1.97	45.40	0.84	
19	Iceland	1.89	43.47	0.83	
20	Norway	1.71	39.15	0.82	
21	United Kingdom	1.70	38.99	0.81	
22	Canada	1.61	36.89	0.80	
23	Ireland	1.52	34.71	0.79	
24	Estonia	1.43	32.67	0.79	
25	Hungary	1.37	31.22	0.78	
26	Italy	1.29	29.25	0.77	
27	Portugal	1.29	29.21	0.76	
28	Luxembourg	1.26	28.52	0.75	
29	Brazil (2013)	1.24	28.05	0.74	
30	Spain	1.22	27.73	0.73	
31	Russian Federation	1.19	26.89	0.72	
32	New Zealand (2013)	1.17	26.53	0.71	
33	Malaysia (2012)	1.09	24.68	0.70	
34	Lithuania	1.01	22.84	0.69	
35	Turkey	1.01	22.66	0.68	
36	Poland	0.94	21.09	0.67	
37	Slovakia	0.89	19.81	0.66	
38	Malta	0.85	18.92	0.65	
39	Greece	0.83	18.60	0.64	
40	India (2011)	0.82	18.31	0.64	
41	Croatia	0.79	17.55	0.63	
42	Kenya (2010)	0.79	17.45	0.62	
43	Bulgaria	0.78	17.42	0.61	
44	Serbia	0.78	17.21	0.60	
45	South Africa (2012)	0.73	16.18	0.59	
46	Hong Kong (China) (2013)	0.73	16.14	0.58	
47	Morocco (2010)	0.71	15.77	0.57	
48	United Arab Emirates	0.70	15.43	0.56	
49	Latvia	0.69	15.20	0.55	
50	Tunisia (2012)	0.68	14.98	0.54	
51	Egypt	0.68	14.93	0.53	
52	Belarus (2013)	0.67	14.81	0.52	
53	Mali (2010)	0.67	14.79	0.51	
54	Ukraine	0.66	14.46	0.50	
55	Argentina (2013)	0.61	13.35	0.50	
56	Ethiopia (2013)	0.60	13.19	0.49	●
57	Costa Rica (2013)	0.56	12.17	0.48	
58	Senegal (2010)	0.54	11.68	0.47	
59	Mexico	0.54	11.62	0.46	
60	Tanzania, United Rep. (2013)	0.53	11.41	0.45	●
61	Uganda (2010)	0.48	10.15	0.44	
62	Cyprus	0.47	10.07	0.43	
63	Qatar (2012)	0.47	10.01	0.42	
64	TFYR of Macedonia (2013)	0.44	9.33	0.41	
65	Jordan (2008)	0.43	9.18	0.40	
66	Mozambique (2010)	0.42	8.90	0.39	
67	Romania	0.38	7.97	0.38	
68	Chile	0.38	7.88	0.37	
69	Ghana (2010)	0.38	7.81	0.36	
70	Montenegro (2013)	0.37	7.76	0.36	
71	Moldova, Rep.	0.37	7.70	0.35	
72	Thailand (2011)	0.36	7.46	0.34	
73	Ecuador (2011)	0.34	6.95	0.33	
74	Iran, Islamic Rep. (2012)	0.33	6.60	0.32	
75	Uruguay (2013)	0.32	6.51	0.31	
76	Nepal (2010)	0.30	6.06	0.30	
77	Kuwait (2013)	0.30	6.05	0.29	
78	Pakistan (2013)	0.29	5.84	0.28	
79	Zambia (2008)	0.28	5.50	0.27	
80	Bosnia and Herzegovina	0.26	5.09	0.26	
81	Botswana (2012)	0.25	4.89	0.25	
82	Armenia	0.24	4.62	0.24	
83	Mongolia	0.23	4.30	0.23	
84	Togo (2012)	0.22	4.15	0.22	
85	Nigeria (2007)	0.22	4.10	0.21	
86	Azerbaijan	0.21	3.89	0.21	
87	Burkina Faso (2009)	0.20	3.66	0.20	
88	Colombia	0.20	3.55	0.19	○
89	Viet Nam (2011)	0.19	3.43	0.18	
90	Mauritius (2012)	0.18	3.21	0.17	○
91	Panama (2011)	0.18	3.20	0.16	
92	Kazakhstan (2013)	0.17	3.06	0.15	
93	Oman (2013)	0.17	2.97	0.14	
94	Bolivia, Plurinational St. (2009)	0.16	2.64	0.13	
95	Albania (2008)	0.15	2.58	0.12	
96	Namibia (2010)	0.14	2.28	0.11	○
97	Philippines (2013)	0.14	2.19	0.10	○
98	Kyrgyzstan	0.13	1.92	0.09	
99	Burundi (2011)	0.12	1.80	0.08	
100	Tajikistan (2013)	0.12	1.72	0.07	
101	Madagascar (2011)	0.11	1.44	0.07	
102	Sri Lanka (2013)	0.10	1.32	0.06	○
103	Georgia	0.10	1.26	0.05	○
104	Paraguay (2012)	0.09	1.02	0.04	○
105	Indonesia (2013)	0.08	0.95	0.03	○
106	Saudi Arabia (2009)	0.07	0.68	0.02	○
107	El Salvador (2013)	0.06	0.30	0.01	○
108	Guatemala (2012)	0.04	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

2.3.3 Global R&D companies, average expenditure top 3

Average expenditure of the top 3 global companies by R&D, mn $US | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Germany	7,304.67	100.00	1.00	●
2	United States of America	7,293.40	99.98	0.99	●
3	Switzerland	5,207.03	96.20	0.98	●
4	Japan	4,694.61	95.03	0.98	●
5	Korea, Rep.	4,465.68	94.47	0.97	
6	France	3,032.33	90.12	0.96	●
7	United Kingdom	2,813.40	89.28	0.95	
8	Netherlands	2,257.49	86.80	0.94	
9	China	2,094.47	85.96	0.94	
10	Italy	2,029.00	85.61	0.93	●
11	Sweden	1,996.26	85.42	0.92	
12	Finland	1,278.47	80.42	0.91	
13	Canada	929.83	76.84	0.91	
14	Spain	926.81	76.80	0.90	●
15	Denmark	696.48	73.60	0.89	
16	Ireland	624.83	72.38	0.88	
17	Brazil	557.79	71.10	0.87	●
18	Australia	511.46	70.13	0.87	
19	Israel	440.50	68.46	0.86	
20	India	433.91	68.29	0.85	●
21	Belgium	402.07	67.43	0.84	
22	Russian Federation	300.24	64.16	0.83	
23	Hong Kong (China)	267.10	62.85	0.83	
24	Norway	212.64	60.30	0.82	
25	Saudi Arabia	173.42	58.02	0.81	●
26	Hungary	141.05	55.71	0.80	
27	Singapore	120.96	54.00	0.80	
28	Austria	107.95	52.73	0.79	
29	Venezuela, Bolivarian Rep.	100.79	51.96	0.78	●
30	Luxembourg	98.32	51.69	0.77	
31	Slovenia	97.24	51.56	0.76	
32	New Zealand	84.88	50.05	0.76	
33	Portugal	73.09	48.39	0.75	
34	Mexico	58.56	45.94	0.74	
35	Iceland	53.71	44.98	0.73	
36	Turkey	50.84	44.38	0.72	
37	South Africa	45.98	43.27	0.72	
38	Thailand	41.39	42.12	0.71	
39	Czech Republic	38.53	41.33	0.70	
40	Malta	34.53	40.13	0.69	
41	United Arab Emirates	32.46	39.46	0.69	
42	Malaysia	32.17	39.36	0.68	
43	Greece	30.26	38.69	0.67	
44	Poland	18.61	33.45	0.66	
45	Albania	0.00	0.00	0.00	○
45	Algeria	0.00	0.00	0.00	○
45	Argentina	0.00	0.00	0.00	○
45	Armenia	0.00	0.00	0.00	○
45	Azerbaijan	0.00	0.00	0.00	○
45	Bahrain	0.00	0.00	0.00	○
45	Bangladesh	0.00	0.00	0.00	○
45	Belarus	0.00	0.00	0.00	○
45	Benin	0.00	0.00	0.00	○
45	Bhutan	0.00	0.00	0.00	○
45	Bolivia, Plurinational St.	0.00	0.00	0.00	○
45	Bosnia and Herzegovina	0.00	0.00	0.00	○
45	Botswana	0.00	0.00	0.00	○
45	Bulgaria	0.00	0.00	0.00	○
45	Burkina Faso	0.00	0.00	0.00	○
45	Burundi	0.00	0.00	0.00	○
45	Cambodia	0.00	0.00	0.00	○
45	Cameroon	0.00	0.00	0.00	○
45	Chile	0.00	0.00	0.00	○
45	Colombia	0.00	0.00	0.00	○
45	Costa Rica	0.00	0.00	0.00	○
45	Côte d'Ivoire	0.00	0.00	0.00	○
45	Croatia	0.00	0.00	0.00	○
45	Cyprus	0.00	0.00	0.00	○
45	Dominican Republic	0.00	0.00	0.00	○
45	Ecuador	0.00	0.00	0.00	○
45	Egypt	0.00	0.00	0.00	○
45	El Salvador	0.00	0.00	0.00	○
45	Estonia	0.00	0.00	0.00	○
45	Ethiopia	0.00	0.00	0.00	○
45	Georgia	0.00	0.00	0.00	○
45	Ghana	0.00	0.00	0.00	○
45	Guatemala	0.00	0.00	0.00	○
45	Guinea	0.00	0.00	0.00	○
45	Honduras	0.00	0.00	0.00	○
45	Indonesia	0.00	0.00	0.00	○
45	Iran, Islamic Rep.	0.00	0.00	0.00	○
45	Jamaica	0.00	0.00	0.00	○
45	Jordan	0.00	0.00	0.00	○
45	Kazakhstan	0.00	0.00	0.00	○
45	Kenya	0.00	0.00	0.00	○
45	Kuwait	0.00	0.00	0.00	○
45	Kyrgyzstan	0.00	0.00	0.00	○
45	Latvia	0.00	0.00	0.00	○
45	Lebanon	0.00	0.00	0.00	○
45	Lithuania	0.00	0.00	0.00	○
45	Madagascar	0.00	0.00	0.00	○
45	Malawi	0.00	0.00	0.00	○
45	Mali	0.00	0.00	0.00	○
45	Mauritius	0.00	0.00	0.00	○
45	Moldova, Rep.	0.00	0.00	0.00	○
45	Mongolia	0.00	0.00	0.00	○
45	Montenegro	0.00	0.00	0.00	○
45	Morocco	0.00	0.00	0.00	○
45	Mozambique	0.00	0.00	0.00	○
45	Namibia	0.00	0.00	0.00	○
45	Nepal	0.00	0.00	0.00	○
45	Nicaragua	0.00	0.00	0.00	○
45	Niger	0.00	0.00	0.00	○
45	Nigeria	0.00	0.00	0.00	○
45	Oman	0.00	0.00	0.00	○
45	Pakistan	0.00	0.00	0.00	○
45	Panama	0.00	0.00	0.00	○
45	Paraguay	0.00	0.00	0.00	○
45	Peru	0.00	0.00	0.00	○
45	Philippines	0.00	0.00	0.00	○
45	Qatar	0.00	0.00	0.00	○
45	Romania	0.00	0.00	0.00	○
45	Rwanda	0.00	0.00	0.00	○
45	Senegal	0.00	0.00	0.00	○
45	Serbia	0.00	0.00	0.00	○
45	Slovakia	0.00	0.00	0.00	○
45	Sri Lanka	0.00	0.00	0.00	○
45	Tajikistan	0.00	0.00	0.00	○
45	Tanzania, United Rep.	0.00	0.00	0.00	○
45	TFYR of Macedonia	0.00	0.00	0.00	○
45	Togo	0.00	0.00	0.00	○
45	Tunisia	0.00	0.00	0.00	○
45	Uganda	0.00	0.00	0.00	○
45	Ukraine	0.00	0.00	0.00	○
45	Uruguay	0.00	0.00	0.00	○
45	Viet Nam	0.00	0.00	0.00	○
45	Yemen	0.00	0.00	0.00	○
45	Zambia	0.00	0.00	0.00	○

SOURCE: EU JRC Industrial R&D Investment Scoreboard 2014

NOTE: ● indicates a strength; ○ a weakness

2.3.4 QS university ranking average score top 3 universities

Average score of the top 3 universities at the QS world university ranking | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United States of America	99.10	99.10	1.00	●
2	United Kingdom	97.83	97.83	0.99	●
3	Switzerland	87.17	87.17	0.98	●
4	Canada	85.63	85.63	0.97	●
4	Hong Kong (China)	85.63	85.63	0.97	
6	Australia	85.33	85.33	0.96	●
7	China	84.43	84.43	0.95	
8	Japan	83.03	83.03	0.94	
9	Korea, Rep.	79.97	79.97	0.94	
10	France	78.73	78.73	0.93	●
11	Germany	76.03	76.03	0.92	
12	Netherlands	75.80	75.80	0.91	
13	Sweden	71.57	71.57	0.91	
14	Denmark	69.97	69.97	0.90	
15	Belgium	66.17	66.17	0.89	
16	Singapore	62.70	62.70	0.88	
17	Ireland	61.30	61.30	0.87	
18	Finland	60.77	60.77	0.87	
19	New Zealand	60.20	60.20	0.86	
20	India	57.07	57.07	0.85	●
21	Spain	56.30	56.30	0.84	
22	Israel	56.10	56.10	0.83	
23	Norway	55.30	55.30	0.83	
24	Italy	52.90	52.90	0.82	
25	Austria	52.43	52.43	0.81	
26	Brazil	52.27	52.27	0.80	●
27	Russian Federation	51.53	51.53	0.80	
28	Malaysia	49.13	49.13	0.79	
29	Argentina	48.13	48.13	0.78	●
30	Saudi Arabia	48.03	48.03	0.77	
31	Chile	47.20	47.20	0.76	
32	South Africa	46.60	46.60	0.76	
33	Mexico	44.43	44.43	0.75	●
34	Colombia	40.60	40.60	0.74	
35	Portugal	38.97	38.97	0.73	
36	Thailand	38.17	38.17	0.72	
37	Kazakhstan	36.07	36.07	0.72	
38	Czech Republic	33.97	33.97	0.71	
39	Turkey	33.53	33.53	0.70	
40	United Arab Emirates	32.47	32.47	0.69	
41	Indonesia	32.33	32.33	0.69	●
42	Poland	31.73	31.73	0.68	
43	Greece	31.47	31.47	0.67	
44	Lebanon	30.80	30.80	0.66	
45	Ukraine	29.17	29.17	0.65	
46	Egypt	28.50	28.50	0.65	●
47	Philippines	27.57	27.57	0.64	
48	Hungary	24.77	24.77	0.63	
49	Pakistan	22.70	22.70	0.62	●
50	Venezuela, Bolivarian Rep.	22.10	22.10	0.61	●
51	Lithuania	22.07	22.07	0.61	
52	Peru	21.07	21.07	0.60	
53	Estonia	19.70	19.70	0.59	
54	Iran, Islamic Rep.	19.10	19.10	0.58	
55	Azerbaijan	18.63	18.63	0.57	
56	Belarus	17.27	17.27	0.57	
57	Romania	16.40	16.40	0.56	
58	Jordan	15.87	15.87	0.55	
59	Bahrain	15.40	15.40	0.54	
60	Uruguay	15.00	15.00	0.54	
61	Qatar	9.90	9.90	0.53	
62	Oman	9.13	9.13	0.52	
63	Slovenia	8.50	8.50	0.51	
64	Croatia	6.80	6.80	0.50	
65	Bulgaria	6.67	6.67	0.50	
66	Bangladesh	6.00	6.00	0.49	●
67	Sri Lanka	5.73	5.73	0.48	
68	Kuwait	5.23	5.23	0.47	
69	Kenya	4.60	4.60	0.46	
70	Serbia	4.27	4.27	0.46	
71	Tanzania, United Rep.	2.53	2.53	0.45	●
72	Ghana	2.33	2.33	0.44	
73	Albania	0.00	0.00	0.00	○
73	Algeria	0.00	0.00	0.00	○
73	Armenia	0.00	0.00	0.00	○
73	Benin	0.00	0.00	0.00	○
73	Bhutan	0.00	0.00	0.00	○
73	Bolivia, Plurinational St.	0.00	0.00	0.00	○
73	Bosnia and Herzegovina	0.00	0.00	0.00	○
73	Botswana	0.00	0.00	0.00	○
73	Burkina Faso	0.00	0.00	0.00	○
73	Burundi	0.00	0.00	0.00	○
73	Cambodia	0.00	0.00	0.00	○
73	Cameroon	0.00	0.00	0.00	○
73	Costa Rica	0.00	0.00	0.00	○
73	Côte d'Ivoire	0.00	0.00	0.00	○
73	Cyprus	0.00	0.00	0.00	○
73	Dominican Republic	0.00	0.00	0.00	○
73	Ecuador	0.00	0.00	0.00	○
73	El Salvador	0.00	0.00	0.00	○
73	Ethiopia	0.00	0.00	0.00	○
73	Georgia	0.00	0.00	0.00	○
73	Guatemala	0.00	0.00	0.00	○
73	Guinea	0.00	0.00	0.00	○
73	Honduras	0.00	0.00	0.00	○
73	Iceland	0.00	0.00	0.00	○
73	Jamaica	0.00	0.00	0.00	○
73	Kyrgyzstan	0.00	0.00	0.00	○
73	Latvia	0.00	0.00	0.00	○
73	Luxembourg	0.00	0.00	0.00	○
73	Madagascar	0.00	0.00	0.00	○
73	Malawi	0.00	0.00	0.00	○
73	Mali	0.00	0.00	0.00	○
73	Malta	0.00	0.00	0.00	○
73	Mauritius	0.00	0.00	0.00	○
73	Moldova, Rep.	0.00	0.00	0.00	○
73	Mongolia	0.00	0.00	0.00	○
73	Montenegro	0.00	0.00	0.00	○
73	Morocco	0.00	0.00	0.00	○
73	Mozambique	0.00	0.00	0.00	○
73	Namibia	0.00	0.00	0.00	○
73	Nepal	0.00	0.00	0.00	○
73	Nicaragua	0.00	0.00	0.00	○
73	Niger	0.00	0.00	0.00	○
73	Nigeria	0.00	0.00	0.00	○
73	Panama	0.00	0.00	0.00	○
73	Paraguay	0.00	0.00	0.00	○
73	Rwanda	0.00	0.00	0.00	○
73	Senegal	0.00	0.00	0.00	○
73	Slovakia	0.00	0.00	0.00	○
73	Tajikistan	0.00	0.00	0.00	○
73	TFYR of Macedonia	0.00	0.00	0.00	○
73	Togo	0.00	0.00	0.00	○
73	Tunisia	0.00	0.00	0.00	○
73	Uganda	0.00	0.00	0.00	○
73	Viet Nam	0.00	0.00	0.00	○
73	Yemen	0.00	0.00	0.00	○
73	Zambia	0.00	0.00	0.00	○

SOURCE: QS Quacquarelli Symonds Ltd, QS World University Ranking 2015/2016, Top Universities

NOTE: ● indicates a strength; ○ a weakness

3.1.1 ICT access

ICT access index | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Luxembourg	9.49	94.91	1.00	●
2	Iceland	9.37	93.70	0.99	●
3	Hong Kong (China)	9.32	93.22	0.98	●
4	United Kingdom	9.24	92.43	0.98	●
5	Germany	9.22	92.24	0.97	●
6	Switzerland	9.20	92.05	0.96	
7	Malta	9.04	90.44	0.95	●
8	Netherlands	9.04	90.42	0.94	
9	Korea, Rep.	9.00	89.95	0.93	
10	Sweden	8.90	88.95	0.93	
11	Japan	8.85	88.52	0.92	
12	France	8.77	87.75	0.91	
13	Denmark	8.72	87.23	0.90	
14	Singapore	8.64	86.39	0.89	
15	Belgium	8.45	84.53	0.89	
16	Australia	8.37	83.75	0.88	
17	Norway	8.24	82.43	0.87	
18	Ireland	8.24	82.43	0.86	
19	Austria	8.21	82.10	0.85	
20	Qatar	8.13	81.32	0.84	
21	Canada	8.13	81.30	0.84	
22	New Zealand	8.08	80.79	0.83	
23	Israel	7.98	79.83	0.82	
24	Slovenia	7.94	79.35	0.81	
25	Estonia	7.86	78.56	0.80	
26	United Arab Emirates	7.86	78.56	0.80	
27	United States of America	7.82	78.20	0.79	
28	Finland	7.81	78.10	0.78	
29	Spain	7.80	78.04	0.77	
30	Bahrain	7.79	77.85	0.76	
31	Portugal	7.77	77.75	0.75	
32	Italy	7.71	77.15	0.75	
33	Greece	7.71	77.14	0.74	
34	Belarus	7.68	76.79	0.73	
35	Hungary	7.54	75.41	0.72	
36	Saudi Arabia	7.42	74.24	0.71	
37	Czech Republic	7.41	74.09	0.70	
38	Croatia	7.33	73.27	0.70	
39	Kuwait	7.31	73.08	0.69	●
40	Serbia	7.28	72.80	0.68	
41	Oman	7.24	72.36	0.67	
42	Russian Federation	7.24	72.36	0.66	
43	Latvia	7.23	72.32	0.66	
44	Uruguay	7.15	71.52	0.65	
45	Poland	7.15	71.45	0.64	
46	Slovakia	7.04	70.45	0.63	
47	Lithuania	7.04	70.37	0.62	
48	Cyprus	7.04	70.35	0.61	
49	Kazakhstan	6.92	69.16	0.61	
50	Bulgaria	6.85	68.54	0.60	
51	TFYR of Macedonia	6.75	67.53	0.59	
52	Montenegro	6.74	67.43	0.58	
53	Moldova, Rep.	6.70	67.03	0.57	
54	Romania	6.69	66.94	0.57	
55	Malaysia	6.61	66.09	0.56	
56	Argentina	6.60	66.00	0.55	
57	Lebanon	6.57	65.73	0.54	
58	Chile	6.55	65.50	0.53	
59	Mauritius	6.48	64.80	0.52	
60	Costa Rica	6.30	62.99	0.52	
61	Brazil	6.28	62.76	0.51	
62	Ukraine	6.27	62.70	0.50	
63	Georgia	6.20	62.04	0.49	
64	Azerbaijan	6.11	61.11	0.48	
65	Armenia	6.08	60.79	0.48	
66	Turkey	6.00	60.04	0.47	
67	Iran, Islamic Rep.	5.97	59.71	0.46	
68	Panama	5.72	57.21	0.45	
69	Bosnia and Herzegovina	5.71	57.10	0.44	
70	Jordan	5.69	56.91	0.43	
71	Morocco	5.65	56.53	0.43	
72	Colombia	5.54	55.42	0.42	
73	Venezuela, Bolivarian Rep.	5.44	54.40	0.41	
74	South Africa	5.31	53.07	0.40	
75	China	5.25	52.54	0.39	
76	Ecuador	5.21	52.07	0.39	
77	Thailand	5.20	51.98	0.38	
78	Egypt	5.12	51.21	0.37	
79	El Salvador	5.04	50.37	0.36	
80	Tunisia	5.00	49.98	0.35	
81	Mongolia	4.97	49.66	0.34	
82	Mexico	4.84	48.42	0.34	
83	Peru	4.68	46.84	0.33	
84	Indonesia	4.60	45.96	0.32	
85	Jamaica	4.57	45.71	0.31	
86	Ghana	4.51	45.13	0.30	
87	Albania	4.50	44.95	0.30	
88	Paraguay	4.44	44.40	0.29	
89	Viet Nam	4.43	44.26	0.28	
90	Philippines	4.39	43.89	0.27	
91	Bolivia, Plurinational St.	4.31	43.13	0.26	
92	Algeria	4.27	42.65	0.25	
93	Botswana	4.22	42.22	0.25	
94	Sri Lanka	4.17	41.68	0.24	
95	Guatemala	4.16	41.63	0.23	
96	Kyrgyzstan	4.16	41.62	0.22	
97	Namibia	4.14	41.39	0.21	
98	Dominican Republic	4.12	41.19	0.20	
99	Honduras	4.05	40.46	0.20	
100	Nicaragua	4.01	40.06	0.19	
101	Cambodia	3.77	37.74	0.18	
102	Bhutan	3.57	35.73	0.17	
103	Senegal	3.51	35.14	0.16	
104	Côte d'Ivoire	3.44	34.39	0.16	
105	Mali	3.43	34.26	0.15	
106	Kenya	3.30	32.99	0.14	
107	Pakistan	3.15	31.47	0.13	
108	India	3.13	31.33	0.12	
109	Benin	3.08	30.77	0.11	
110	Nepal	2.92	29.18	0.11	
111	Cameroon	2.83	28.25	0.10	
112	Nigeria	2.82	28.22	0.09	
113	Bangladesh	2.82	28.17	0.08	
114	Mozambique	2.74	27.41	0.07	
115	Burkina Faso	2.63	26.33	0.07	
116	Zambia	2.63	26.30	0.06	○
117	Togo	2.59	25.85	0.05	
118	Rwanda	2.54	25.38	0.04	○
119	Tanzania, United Rep.	2.48	24.79	0.03	○
120	Uganda	2.35	23.46	0.02	○
121	Malawi	1.96	19.62	0.02	○
122	Ethiopia	1.90	19.04	0.01	○
123	Madagascar	1.67	16.67	0.00	○
n/a	Burundi	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: International Telecommunication Union, *Measuring the Information Society 2015*, ICT Development Index 2015

NOTE: ● indicates a strength; ○ a weakness

3.1.2 ICT use

ICT use index | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Denmark	8.83	88.32	1.00	●
2	Norway	8.43	84.30	0.99	●
3	United Kingdom	8.42	84.19	0.98	●
4	Korea, Rep.	8.42	84.17	0.98	●
5	Luxembourg	8.34	83.38	0.97	
6	Sweden	8.32	83.17	0.96	●
7	Finland	8.21	82.07	0.95	
8	Iceland	8.11	81.11	0.94	
9	Switzerland	8.01	80.08	0.93	
10	Japan	7.98	79.81	0.93	
11	United States of America	7.86	78.62	0.92	
12	Netherlands	7.69	76.88	0.91	
13	Estonia	7.66	76.62	0.90	
14	New Zealand	7.63	76.32	0.89	
15	Singapore	7.61	76.10	0.89	
16	Australia	7.58	75.83	0.88	
17	Bahrain	7.56	75.55	0.87	●
18	Hong Kong (China)	7.55	75.55	0.86	
19	France	7.23	72.31	0.85	
20	United Arab Emirates	6.99	69.86	0.84	
21	Germany	6.98	69.81	0.84	
22	Qatar	6.93	69.33	0.83	
23	Ireland	6.85	68.51	0.82	
24	Canada	6.84	68.41	0.81	
25	Belgium	6.76	67.59	0.80	
26	Spain	6.62	66.23	0.80	
27	Austria	6.47	64.70	0.79	
28	Latvia	6.29	62.93	0.78	
29	Czech Republic	6.29	62.87	0.77	
30	Lithuania	6.10	61.04	0.76	
31	Malta	6.05	60.54	0.75	
32	Kuwait	6.03	60.33	0.75	●
33	Saudi Arabia	6.00	60.00	0.74	
34	Slovakia	5.86	58.63	0.73	
35	Croatia	5.85	58.50	0.72	
36	Italy	5.74	57.36	0.71	
37	Poland	5.62	56.20	0.70	
38	Israel	5.57	55.75	0.70	
39	Lebanon	5.54	55.40	0.69	
40	Russian Federation	5.52	55.17	0.68	
41	Slovenia	5.42	54.17	0.67	
42	Uruguay	5.41	54.09	0.66	
43	Belarus	5.40	54.02	0.66	
44	Bulgaria	5.22	52.15	0.65	
45	Hungary	5.19	51.91	0.64	
46	Brazil	5.16	51.62	0.63	
47	Portugal	5.14	51.45	0.62	
48	Costa Rica	5.12	51.24	0.61	
49	Greece	5.05	50.48	0.61	
50	Oman	5.05	50.48	0.60	
51	Cyprus	4.89	48.89	0.59	
52	Chile	4.88	48.76	0.58	
53	Argentina	4.76	47.61	0.57	
54	Malaysia	4.76	47.58	0.57	
55	TFYR of Macedonia	4.76	47.58	0.56	
56	Azerbaijan	4.70	46.96	0.55	
57	Serbia	4.69	46.86	0.54	
58	Kazakhstan	4.54	45.41	0.53	
59	Romania	4.48	44.79	0.52	
60	Thailand	4.28	42.81	0.52	
61	Moldova, Rep.	4.02	40.16	0.51	
62	Montenegro	3.91	39.10	0.50	
63	China	3.84	38.36	0.49	
64	Colombia	3.83	38.25	0.48	
65	Venezuela, Bolivarian Rep.	3.80	37.96	0.48	
66	Turkey	3.77	37.73	0.47	
67	Bosnia and Herzegovina	3.74	37.38	0.46	
68	Philippines	3.55	35.45	0.45	
69	Kyrgyzstan	3.46	34.58	0.44	
70	Albania	3.40	33.98	0.43	
71	Mexico	3.37	33.72	0.43	
72	Tunisia	3.37	33.70	0.42	
73	South Africa	3.37	33.68	0.41	
74	Mauritius	3.25	32.50	0.40	
75	Mongolia	3.20	32.01	0.39	
76	Armenia	3.19	31.91	0.39	
77	Georgia	3.03	30.31	0.38	
78	Viet Nam	3.01	30.05	0.37	
79	Dominican Republic	2.97	29.72	0.36	
80	Morocco	2.95	29.52	0.35	
81	Panama	2.92	29.19	0.34	
82	Ecuador	2.90	28.97	0.34	
83	Jamaica	2.76	27.55	0.33	
84	Egypt	2.71	27.11	0.32	
85	Ghana	2.64	26.37	0.31	
86	El Salvador	2.41	24.14	0.30	
87	Botswana	2.37	23.65	0.30	
88	Jordan	2.36	23.61	0.29	
89	Bolivia, Plurinational St.	2.33	23.27	0.28	
90	Bhutan	2.27	22.66	0.27	
91	Iran, Islamic Rep.	2.19	21.94	0.26	
92	Ukraine	2.17	21.66	0.25	
93	Peru	2.11	21.14	0.25	
94	Nigeria	1.81	18.13	0.24	
95	Indonesia	1.79	17.95	0.23	
96	Namibia	1.77	17.74	0.22	
97	Kenya	1.76	17.60	0.21	
98	Paraguay	1.71	17.09	0.20	
99	Algeria	1.52	15.19	0.20	
100	Sri Lanka	1.44	14.41	0.19	
101	Senegal	1.42	14.21	0.18	
102	Côte d'Ivoire	1.32	13.21	0.17	
103	Honduras	1.26	12.58	0.16	
104	Guatemala	1.23	12.28	0.16	
105	Nepal	1.14	11.41	0.15	
106	Uganda	1.10	10.95	0.14	
107	India	0.85	8.53	0.13	
108	Cambodia	0.78	7.77	0.12	
109	Nicaragua	0.77	7.70	0.11	
110	Rwanda	0.73	7.30	0.11	
111	Pakistan	0.69	6.89	0.10	
112	Burkina Faso	0.63	6.34	0.09	
113	Zambia	0.62	6.19	0.08	
114	Mali	0.61	6.11	0.07	
115	Bangladesh	0.60	6.00	0.07	
116	Ethiopia	0.38	3.75	0.06	
117	Cameroon	0.37	3.71	0.05	○
118	Togo	0.33	3.34	0.04	
119	Malawi	0.33	3.34	0.03	○
120	Madagascar	0.33	3.32	0.02	○
121	Mozambique	0.30	3.00	0.02	○
122	Benin	0.29	2.93	0.01	○
123	Tanzania, United Rep.	0.27	2.73	0.00	○
n/a	Burundi	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: International Telecommunication Union, *Measuring the Information Society 2015*, ICT Development Index 2015

NOTE: ● indicates a strength; ○ a weakness

3.1.3 Government's online service

Government's online service index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	France	1.00	100.00	1.00	●
2	Singapore	0.99	99.21	0.99	●
3	Korea, Rep.	0.98	97.64	0.98	●
4	Japan	0.94	94.49	0.96	
4	Spain	0.94	94.49	0.96	●
4	United States of America	0.94	94.49	0.96	
7	Bahrain	0.94	93.70	0.95	●
8	Australia	0.93	92.91	0.94	
8	Netherlands	0.93	92.91	0.94	
10	Canada	0.91	91.34	0.93	
11	United Kingdom	0.90	89.76	0.92	
12	United Arab Emirates	0.88	88.19	0.91	●
13	Israel	0.87	87.40	0.90	
14	Uruguay	0.85	85.04	0.90	●
15	New Zealand	0.84	84.25	0.89	
16	Chile	0.82	81.89	0.88	●
17	Colombia	0.79	78.74	0.87	●
18	Estonia	0.77	77.17	0.85	
18	Finland	0.77	77.17	0.85	
18	Saudi Arabia	0.77	77.17	0.85	●
21	Lithuania	0.76	75.59	0.83	
21	Norway	0.76	75.59	0.83	
23	Austria	0.75	74.80	0.81	
23	Italy	0.75	74.80	0.81	
23	Kazakhstan	0.75	74.80	0.81	●
26	Oman	0.73	73.23	0.80	●
27	Russian Federation	0.71	70.87	0.79	
28	Latvia	0.70	70.08	0.78	
28	Sweden	0.70	70.08	0.78	
30	Morocco	0.69	69.29	0.77	●
31	Belgium	0.68	67.72	0.75	
31	Ireland	0.68	67.72	0.75	
31	Malaysia	0.68	67.72	0.75	
34	Germany	0.67	66.93	0.74	
35	Denmark	0.66	66.14	0.72	
35	Mexico	0.66	66.14	0.72	
37	Qatar	0.65	65.35	0.71	
37	Sri Lanka	0.65	65.35	0.71	●
39	Portugal	0.64	63.78	0.69	
39	Tunisia	0.64	63.78	0.69	●
41	Peru	0.63	62.99	0.68	●
42	Luxembourg	0.62	62.20	0.67	
43	Armenia	0.61	61.42	0.64	
43	Costa Rica	0.61	61.42	0.64	
43	Iceland	0.61	61.42	0.64	
43	Mongolia	0.61	61.42	0.64	
47	China	0.61	60.63	0.63	
47	Greece	0.61	60.63	0.63	
49	Brazil	0.60	59.84	0.61	
49	Georgia	0.60	59.84	0.61	
51	Egypt	0.59	59.06	0.60	
52	Kuwait	0.57	57.48	0.60	
53	Hungary	0.56	55.91	0.58	
53	Turkey	0.56	55.91	0.58	
55	Argentina	0.55	55.12	0.56	
55	Venezuela, Bolivarian Rep.	0.55	55.12	0.56	
57	India	0.54	54.33	0.55	
57	Poland	0.54	54.33	0.55	
59	El Salvador	0.54	53.54	0.54	
60	Moldova, Rep.	0.53	52.76	0.52	
60	Montenegro	0.53	52.76	0.52	
62	Jordan	0.52	51.97	0.52	
63	Rwanda	0.51	51.18	0.51	
64	Switzerland	0.50	50.39	0.50	○
65	Slovakia	0.49	48.82	0.49	
66	Ecuador	0.48	48.03	0.48	
66	Philippines	0.48	48.03	0.48	
68	Cyprus	0.47	47.24	0.46	
68	Mauritius	0.47	47.24	0.46	
70	Croatia	0.46	46.46	0.45	
71	Ethiopia	0.46	45.67	0.44	●
72	Albania	0.45	44.88	0.44	
73	Romania	0.44	44.09	0.42	
73	Thailand	0.44	44.09	0.42	
75	Azerbaijan	0.43	43.31	0.41	
76	Kenya	0.43	42.52	0.40	
76	Slovenia	0.43	42.52	0.40	
78	Viet Nam	0.42	41.73	0.39	
79	Honduras	0.40	40.16	0.37	
79	Malta	0.40	40.16	0.37	
81	Bolivia, Plurinational St.	0.39	39.37	0.36	
81	Serbia	0.39	39.37	0.36	
83	Dominican Republic	0.39	38.58	0.34	
83	South Africa	0.39	38.58	0.34	
85	Czech Republic	0.37	37.01	0.32	○
85	Iran, Islamic Rep.	0.37	37.01	0.32	
85	Panama	0.37	37.01	0.32	
88	Indonesia	0.36	36.22	0.31	
89	Lebanon	0.35	35.43	0.30	
90	Bangladesh	0.35	34.65	0.29	
91	Belarus	0.32	32.28	0.27	
91	Namibia	0.32	32.28	0.27	
91	Pakistan	0.32	32.28	0.27	
94	Ghana	0.31	31.50	0.25	
94	Jamaica	0.31	31.50	0.25	
94	Mozambique	0.31	31.50	0.25	
97	Botswana	0.31	30.71	0.21	
97	Nigeria	0.31	30.71	0.21	
97	Senegal	0.31	30.71	0.21	
97	Yemen	0.31	30.71	0.21	
101	Burkina Faso	0.30	29.92	0.20	
101	Tanzania, United Rep.	0.30	29.92	0.20	
103	Bosnia and Herzegovina	0.28	28.35	0.19	
104	Kyrgyzstan	0.28	27.56	0.18	
105	Ukraine	0.27	26.77	0.17	
106	Bhutan	0.24	24.41	0.15	
106	Madagascar	0.24	24.41	0.15	
106	TFYR of Macedonia	0.24	24.41	0.15	○
109	Bulgaria	0.24	23.62	0.14	○
110	Paraguay	0.23	22.83	0.13	
111	Cameroon	0.20	19.69	0.13	
112	Cambodia	0.17	17.32	0.10	
112	Côte d'Ivoire	0.17	17.32	0.10	
112	Malawi	0.17	17.32	0.10	
115	Nepal	0.16	15.75	0.10	
116	Guatemala	0.15	14.96	0.08	
116	Uganda	0.15	14.96	0.08	
118	Zambia	0.14	14.17	0.07	
119	Mali	0.13	13.39	0.06	
120	Niger	0.13	12.60	0.06	
121	Benin	0.11	11.02	0.04	○
121	Togo	0.11	11.02	0.04	○
123	Nicaragua	0.09	9.45	0.03	○
124	Algeria	0.08	7.87	0.02	
125	Tajikistan	0.06	6.30	0.02	○
126	Burundi	0.02	1.57	0.01	○
127	Guinea	0.00	0.00	0.00	○
n/a	Hong Kong (China)	n/a	n/a	n/a	

SOURCE: United Nations Public Administration Network, *e-Government Survey 2014*
NOTE: ● indicates a strength; ○ a weakness

3.1.4 Online e-participation

E-Participation index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Korea, Rep.	1.00	100.00	0.99	●	64	Iceland	0.49	49.02	0.46	
1	Netherlands	1.00	100.00	0.99	●	64	Panama	0.49	49.02	0.46	
3	Uruguay	0.98	98.04	0.98	●	64	Poland	0.49	49.02	0.46	
4	France	0.96	96.08	0.96	●	64	Turkey	0.49	49.02	0.46	
4	Japan	0.96	96.08	0.96		64	Viet Nam	0.49	49.02	0.46	
4	United Kingdom	0.96	96.08	0.96		70	Jordan	0.47	47.06	0.44	
7	Australia	0.94	94.12	0.94	●	70	Malta	0.47	47.06	0.44	
7	Chile	0.94	94.12	0.94	●	70	Romania	0.47	47.06	0.44	
9	United States of America	0.92	92.16	0.94		73	Hungary	0.45	45.10	0.43	
10	Singapore	0.90	90.20	0.93		74	Azerbaijan	0.43	43.14	0.40	
11	Colombia	0.88	88.24	0.92	●	74	Kuwait	0.43	43.14	0.40	
12	Israel	0.86	86.27	0.91		74	Ukraine	0.43	43.14	0.40	
13	United Arab Emirates	0.84	84.31	0.90	●	77	Bolivia, Plurinational St.	0.41	41.18	0.38	
14	Bahrain	0.82	82.35	0.88	●	77	Kyrgyzstan	0.41	41.18	0.38	
14	Canada	0.82	82.35	0.88		77	Serbia	0.41	41.18	0.38	
14	Costa Rica	0.82	82.35	0.88	●	80	Bangladesh	0.39	39.22	0.35	
17	Greece	0.80	80.39	0.87	●	80	Ghana	0.39	39.22	0.35	
17	Morocco	0.80	80.39	0.87	●	80	Slovenia	0.39	39.22	0.35	○
19	Italy	0.78	78.43	0.84		80	Tanzania, United Rep.	0.39	39.22	0.35	
19	New Zealand	0.78	78.43	0.84		84	Switzerland	0.37	37.25	0.34	○
19	Spain	0.78	78.43	0.84		85	Belarus	0.35	35.29	0.31	
22	Estonia	0.76	76.47	0.83		85	Bhutan	0.35	35.29	0.31	
22	Kazakhstan	0.76	76.47	0.83	●	85	Madagascar	0.35	35.29	0.31	
24	Brazil	0.71	70.59	0.78	●	85	Senegal	0.35	35.29	0.31	
24	Finland	0.71	70.59	0.78		89	Croatia	0.33	33.33	0.25	○
24	Germany	0.71	70.59	0.78		89	Dominican Republic	0.33	33.33	0.25	
24	Latvia	0.71	70.59	0.78		89	Honduras	0.33	33.33	0.25	
24	Oman	0.71	70.59	0.78	●	89	Mozambique	0.33	33.33	0.25	
24	Peru	0.71	70.59	0.78	●	89	Namibia	0.33	33.33	0.25	
30	Mongolia	0.69	68.63	0.75		89	Nigeria	0.33	33.33	0.25	
30	Norway	0.69	68.63	0.75		89	Pakistan	0.33	33.33	0.25	
30	Russian Federation	0.69	68.63	0.75		89	South Africa	0.33	33.33	0.25	○
33	China	0.65	64.71	0.70		97	Botswana	0.31	31.37	0.23	
33	Ireland	0.65	64.71	0.70		97	Cyprus	0.31	31.37	0.23	○
33	Kenya	0.65	64.71	0.70		99	Indonesia	0.29	29.41	0.20	
33	Lithuania	0.65	64.71	0.70		99	Iran, Islamic Rep.	0.29	29.41	0.20	
33	Portugal	0.65	64.71	0.70		99	Lebanon	0.29	29.41	0.20	
33	Sri Lanka	0.65	64.71	0.70	●	99	Nepal	0.29	29.41	0.20	
33	Tunisia	0.65	64.71	0.70	●	103	Yemen	0.27	27.45	0.19	
40	Austria	0.63	62.75	0.66		104	Bulgaria	0.25	25.49	0.16	○
40	Belgium	0.63	62.75	0.66		104	Czech Republic	0.25	25.49	0.16	○
40	India	0.63	62.75	0.66		104	Ethiopia	0.25	25.49	0.16	
40	Moldova, Rep.	0.63	62.75	0.66		104	Paraguay	0.25	25.49	0.16	
40	Slovakia	0.63	62.75	0.66		108	Bosnia and Herzegovina	0.24	23.53	0.13	
45	El Salvador	0.61	60.78	0.63	●	108	Malawi	0.24	23.53	0.13	
45	Mexico	0.61	60.78	0.63		108	Niger	0.24	23.53	0.13	
45	Qatar	0.61	60.78	0.63		111	TFYR of Macedonia	0.22	21.57	0.13	○
45	Sweden	0.61	60.78	0.63	○	112	Cambodia	0.20	19.61	0.10	
49	Georgia	0.59	58.82	0.61		112	Guatemala	0.20	19.61	0.10	
49	Montenegro	0.59	58.82	0.61		112	Jamaica	0.20	19.61	0.10	○
51	Philippines	0.57	56.86	0.59		115	Benin	0.18	17.65	0.08	
51	Saudi Arabia	0.57	56.86	0.59		115	Côte d'Ivoire	0.18	17.65	0.08	○
51	Venezuela, Bolivarian Rep.	0.57	56.86	0.59		115	Zambia	0.18	17.65	0.08	
54	Argentina	0.55	54.90	0.55		118	Cameroon	0.16	15.69	0.06	○
54	Denmark	0.55	54.90	0.55	○	118	Mali	0.16	15.69	0.06	
54	Egypt	0.55	54.90	0.55		120	Burkina Faso	0.14	13.73	0.05	○
54	Luxembourg	0.55	54.90	0.55		120	Uganda	0.14	13.73	0.05	○
54	Thailand	0.55	54.90	0.55		122	Tajikistan	0.12	11.76	0.04	
59	Albania	0.53	52.94	0.52		123	Nicaragua	0.10	9.80	0.02	○
59	Armenia	0.53	52.94	0.52		123	Togo	0.10	9.80	0.02	○
59	Malaysia	0.53	52.94	0.52		125	Algeria	0.08	7.84	0.02	○
59	Mauritius	0.53	52.94	0.52		126	Burundi	0.06	5.88	0.01	○
63	Rwanda	0.51	50.98	0.51		127	Guinea	0.02	1.96	0.00	○
64	Ecuador	0.49	49.02	0.46		n/a	Hong Kong (China)	n/a	n/a	n/a	

SOURCE: United Nations Public Administration Network, *e-Government Survey 2014*

NOTE: ● indicates a strength; ○ a weakness

3.2.1 Electricity output

Electricity output (kWh per capita) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bahrain	19,485.71	100.00	0.98	●
1	Iceland (2014)	54,915.15	100.00	0.98	●
1	Norway (2014)	27,550.00	100.00	0.98	●
4	Kuwait	18,095.55	92.86	0.97	●
5	Canada (2014)	17,991.53	92.33	0.97	●
6	Qatar	15,976.04	81.97	0.96	●
7	Sweden (2014)	15,889.18	81.53	0.95	
8	United States of America (2014)	13,515.13	69.33	0.94	
9	Finland (2014)	12,460.07	63.91	0.93	
10	United Arab Emirates	11,360.64	58.27	0.92	●
11	Korea, Rep. (2014)	10,724.93	55.00	0.92	
12	Australia (2014)	10,534.08	54.02	0.91	
13	Saudi Arabia	9,851.44	50.52	0.90	●
14	New Zealand (2014)	9,654.32	49.50	0.89	
15	Estonia (2014)	9,427.27	48.34	0.88	
16	Singapore	8,882.22	45.54	0.87	
17	Paraguay	8,879.56	45.52	0.86	●
18	Switzerland (2014)	8,546.39	43.81	0.86	
19	France (2014)	8,418.36	43.16	0.85	
20	Slovenia (2014)	8,330.10	42.70	0.84	
21	Czech Republic (2014)	8,066.35	41.35	0.83	
22	Japan (2014)	8,020.07	41.11	0.82	
23	Russian Federation	7,395.73	37.90	0.81	
24	Germany (2014)	7,389.61	37.87	0.81	
25	Oman	7,228.65	37.04	0.80	●
26	Austria (2014)	7,207.85	36.94	0.79	
27	Israel (2014)	7,003.31	35.89	0.78	
28	Belgium (2014)	6,387.19	32.72	0.77	
29	Montenegro	6,362.90	32.60	0.76	●
30	Netherlands (2014)	6,079.89	31.14	0.75	
31	Bulgaria	5,924.21	30.34	0.75	
32	Spain (2014)	5,895.89	30.20	0.74	
33	Denmark (2014)	5,656.91	28.97	0.73	
34	Ireland (2014)	5,621.43	28.79	0.72	
35	Kazakhstan	5,596.71	28.66	0.71	
36	Serbia	5,478.63	28.06	0.70	
37	Hong Kong (China)	5,445.76	27.89	0.69	
38	Malta	5,366.67	27.48	0.69	
39	United Kingdom (2014)	5,149.26	26.36	0.68	
40	Portugal (2014)	5,008.95	25.64	0.67	
41	Cyprus	4,931.03	25.24	0.66	
42	Slovakia (2014)	4,892.07	25.04	0.65	
43	South Africa	4,762.83	24.38	0.64	
44	Malaysia	4,655.05	23.83	0.64	
45	Bosnia and Herzegovina	4,556.40	23.32	0.63	
46	Italy (2014)	4,542.88	23.25	0.62	
47	Greece (2014)	4,329.48	22.15	0.61	
48	Chile (2014)	4,296.80	21.99	0.60	
49	Ukraine	4,258.21	21.79	0.59	
50	Poland (2014)	4,117.91	21.07	0.58	
51	Lebanon	4,061.07	20.78	0.58	
52	Venezuela, Bolivarian Rep.	4,049.98	20.72	0.57	
53	China	3,997.46	20.45	0.56	
54	Iran, Islamic Rep.	3,490.91	17.85	0.55	
55	Uruguay	3,419.94	17.48	0.54	
56	Luxembourg (2014)	3,403.64	17.40	0.53	
57	Argentina	3,357.56	17.16	0.53	
58	Belarus	3,327.03	17.00	0.52	
59	Turkey (2014)	3,265.55	16.69	0.51	
60	Croatia	3,128.17	15.98	0.50	
61	Latvia	3,089.05	15.78	0.49	
62	Hungary (2014)	2,970.39	15.17	0.48	
63	Romania	2,929.73	14.96	0.47	
64	TFYR of Macedonia	2,888.15	14.75	0.47	
65	Brazil	2,851.65	14.56	0.46	
66	Jordan	2,672.29	13.64	0.45	
67	Armenia	2,587.25	13.21	0.44	
68	Mexico (2014)	2,507.70	12.80	0.43	
69	Azerbaijan	2,479.19	12.65	0.42	
70	Thailand	2,472.87	12.62	0.42	
71	Kyrgyzstan	2,449.48	12.50	0.41	
72	Albania	2,399.66	12.24	0.40	
73	Panama	2,320.73	11.84	0.39	
74	Mauritius	2,292.06	11.69	0.38	
75	Georgia	2,240.31	11.42	0.37	
76	Costa Rica	2,101.64	10.71	0.36	
77	Tajikistan	2,084.65	10.62	0.36	
78	Egypt	2,045.05	10.42	0.35	
79	Mongolia	1,767.61	9.00	0.34	
80	Dominican Republic	1,700.00	8.65	0.33	
81	Tunisia	1,687.88	8.59	0.32	
82	Jamaica	1,527.57	7.76	0.31	
83	Algeria	1,527.42	7.76	0.31	
84	Ecuador	1,477.70	7.51	0.30	
85	Peru	1,427.62	7.25	0.29	
86	Lithuania	1,423.65	7.23	0.28	○
87	Viet Nam	1,415.98	7.19	0.27	
88	Colombia	1,338.70	6.79	0.26	
89	Moldova, Rep.	1,261.52	6.40	0.25	
90	Honduras	996.79	5.04	0.25	
91	India	954.78	4.82	0.24	
92	El Salvador	920.35	4.64	0.23	
93	Zambia	915.96	4.62	0.22	
94	Indonesia	862.36	4.35	0.21	
95	Morocco	846.08	4.26	0.20	
96	Philippines	764.98	3.85	0.19	
97	Bolivia, Plurinational St.	755.67	3.80	0.19	
98	Nicaragua	684.70	3.43	0.18	
99	Guatemala	641.24	3.21	0.17	
100	Sri Lanka	587.06	2.93	0.16	
101	Namibia	578.70	2.89	0.15	
102	Mozambique	576.66	2.88	0.14	
103	Pakistan	537.34	2.68	0.14	
104	Ghana	496.76	2.47	0.13	
105	Botswana	431.19	2.13	0.12	○
106	Côte d'Ivoire	372.39	1.83	0.11	
107	Yemen	348.26	1.71	0.10	
108	Bangladesh	337.85	1.65	0.09	
109	Cameroon	307.82	1.50	0.08	
110	Senegal	262.63	1.27	0.08	
111	Kenya	200.14	0.94	0.07	○
112	Nigeria	166.44	0.77	0.06	
113	Nepal	131.15	0.59	0.05	○
114	Cambodia	117.44	0.52	0.04	○
115	Tanzania, United Rep.	113.18	0.50	0.03	○
116	Ethiopia	92.66	0.39	0.03	
117	Niger	24.85	0.04	0.02	
118	Benin	16.76	0.00	0.01	○
119	Togo	16.28	0.00	0.00	○
n/a	Bhutan	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	

SOURCE: International Energy Agency (IEA) *World Energy Balances on-line data service, 2015 edition*

NOTE: ● indicates a strength; ○ a weakness

3.2.2 Logistics performance

Logistics Performance Index | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Germany	4.12	100.00	1.00	●
2	Netherlands	4.05	96.17	0.99	●
3	Belgium	4.04	96.01	0.98	●
4	United Kingdom	4.01	94.46	0.98	●
5	Singapore	4.00	93.94	0.97	
6	Sweden	3.96	91.71	0.96	●
7	Norway	3.96	91.55	0.95	●
8	Luxembourg	3.95	90.96	0.94	
9	United States of America	3.92	89.47	0.93	
10	Japan	3.91	89.30	0.93	
11	Ireland	3.87	86.90	0.92	
12	Canada	3.86	86.25	0.91	
13	France	3.85	85.83	0.90	
14	Switzerland	3.84	85.65	0.89	
15	Hong Kong (China)	3.83	84.77	0.89	
16	Australia	3.81	83.94	0.88	
17	Denmark	3.78	82.48	0.87	
18	Spain	3.72	79.19	0.86	
19	Italy	3.69	77.77	0.85	
20	Korea, Rep.	3.67	76.48	0.84	
21	Austria	3.65	75.57	0.84	
22	New Zealand	3.64	75.33	0.83	
23	Finland	3.62	74.25	0.82	
24	Malaysia	3.59	72.57	0.81	
25	Portugal	3.56	71.02	0.80	
26	United Arab Emirates	3.54	69.92	0.80	
27	China	3.53	69.53	0.79	
28	Qatar	3.52	68.77	0.78	
29	Turkey	3.50	67.92	0.77	
30	Poland	3.49	67.59	0.76	
31	Czech Republic	3.49	67.52	0.75	
32	Hungary	3.46	66.07	0.75	
33	South Africa	3.43	64.36	0.74	
34	Thailand	3.43	64.27	0.73	
35	Latvia	3.40	62.89	0.72	
36	Iceland	3.39	62.33	0.71	
37	Slovenia	3.38	61.88	0.70	
38	Estonia	3.35	59.96	0.70	
39	Israel	3.26	55.55	0.69	
40	Chile	3.26	55.31	0.68	
41	Slovakia	3.25	55.24	0.67	
42	Greece	3.20	52.51	0.66	
43	Panama	3.19	52.10	0.66	
44	Lithuania	3.18	51.31	0.65	
45	Bulgaria	3.16	50.22	0.64	
46	Viet Nam	3.15	50.09	0.63	
47	Saudi Arabia	3.15	49.77	0.62	
48	Mexico	3.13	48.73	0.61	
49	Malta	3.11	47.59	0.61	
50	Bahrain	3.08	46.40	0.60	
51	Indonesia	3.08	46.33	0.59	
52	India	3.08	46.24	0.58	
53	Croatia	3.05	44.84	0.57	
54	Kuwait	3.01	42.69	0.57	
55	Philippines	3.00	42.31	0.56	
56	Cyprus	3.00	42.14	0.55	
57	Oman	3.00	41.85	0.54	
58	Argentina	2.99	41.41	0.53	
59	Ukraine	2.98	40.89	0.52	
60	Egypt	2.97	40.35	0.52	
61	Serbia	2.96	40.18	0.51	
62	El Salvador	2.96	40.07	0.50	
63	Brazil	2.94	39.22	0.49	
64	Montenegro	2.88	35.68	0.48	
65	Jordan	2.87	35.60	0.48	
66	Dominican Republic	2.86	34.91	0.47	
67	Jamaica	2.84	33.98	0.46	
68	Peru	2.84	33.89	0.45	
69	Pakistan	2.83	33.10	0.44	
70	Malawi	2.81	32.46	0.43	
71	Kenya	2.81	32.41	0.43	
72	Nigeria	2.81	32.24	0.42	
73	Venezuela, Bolivarian Rep.	2.81	32.21	0.41	
74	Guatemala	2.80	31.66	0.40	
75	Paraguay	2.78	30.74	0.39	
76	Côte d'Ivoire	2.76	29.83	0.39	
77	Rwanda	2.76	29.68	0.38	
78	Bosnia and Herzegovina	2.75	29.08	0.37	
79	Cambodia	2.74	28.76	0.36	
80	Lebanon	2.73	27.96	0.35	
81	Ecuador	2.71	27.19	0.34	
82	Costa Rica	2.70	26.66	0.34	
83	Kazakhstan	2.70	26.60	0.33	
84	Sri Lanka	2.70	26.38	0.32	
85	Russian Federation	2.69	26.34	0.31	
86	Uruguay	2.68	25.53	0.30	
87	Armenia	2.67	25.22	0.30	
88	Namibia	2.66	24.45	0.29	
89	Moldova, Rep.	2.65	24.22	0.28	
90	Nicaragua	2.65	24.22	0.27	
91	Algeria	2.65	24.02	0.26	
92	Colombia	2.64	23.51	0.25	
93	Burkina Faso	2.64	23.44	0.25	
94	Belarus	2.64	23.44	0.24	
95	Ghana	2.63	22.86	0.23	
96	Senegal	2.62	22.61	0.22	
97	Honduras	2.61	21.85	0.21	
98	Ethiopia	2.59	21.14	0.20	
99	Nepal	2.59	20.84	0.20	
100	Burundi	2.57	19.70	0.19	
101	Bangladesh	2.56	19.58	0.18	
102	Benin	2.56	19.45	0.17	
103	Tunisia	2.55	18.94	0.16	○
104	Tajikistan	2.53	17.72	0.16	
105	Mauritius	2.51	17.08	0.15	○
106	Georgia	2.51	16.69	0.14	
107	TFYR of Macedonia	2.50	16.26	0.13	○
108	Mali	2.50	16.06	0.12	
109	Botswana	2.49	15.93	0.11	○
110	Bolivia, Plurinational St.	2.48	15.31	0.11	
111	Guinea	2.46	14.46	0.10	
112	Zambia	2.46	14.38	0.09	
113	Azerbaijan	2.45	13.64	0.08	○
114	Niger	2.39	10.81	0.07	
115	Madagascar	2.38	10.24	0.07	
116	Mongolia	2.36	8.86	0.06	○
117	Tanzania, United Rep.	2.33	7.58	0.05	
118	Togo	2.32	6.94	0.04	
119	Cameroon	2.30	5.81	0.03	○
120	Bhutan	2.29	5.48	0.02	○
121	Mozambique	2.23	2.32	0.02	○
122	Kyrgyzstan	2.21	1.31	0.01	○
123	Yemen	2.18	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Morocco	n/a	n/a	n/a	
n/a	Romania	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	

SOURCE: World Bank and Turku School of Economics, *Logistics Performance Index 2014*; Arvis et al., 2014, *Connecting to Compete 2014: Trade Logistics in the Global Economy*
NOTE: ● indicates a strength; ○ a weakness

3.2.3 Gross capital formation

Gross capital formation (% of GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bhutan	55.91	100.00	1.00	●
2	Algeria	49.05	87.19	0.99	●
3	Mozambique	48.64	86.43	0.98	●
4	China	44.31	78.35	0.98	●
5	Niger	43.83	77.45	0.97	●
6	Ethiopia	39.50	69.37	0.96	●
7	Indonesia	33.95	59.02	0.95	●
8	Belarus	33.92	58.96	0.94	●
9	Morocco	33.44	58.06	0.94	●
10	Uganda	33.36	57.91	0.93	●
11	Botswana	32.80	56.87	0.92	●
12	Georgia	32.28	55.90	0.91	●
13	Mongolia	31.60	54.63	0.90	●
14	Zambia	30.94	53.40	0.90	●
15	Tanzania, United Rep.	30.87	53.26	0.89	●
16	Kazakhstan	30.83	53.18	0.88	●
17	Iran, Islamic Rep.	30.79	53.11	0.87	●
18	India	30.71	52.97	0.86	●
19	Mali	30.47	52.52	0.85	●
20	Albania	29.91	51.47	0.85	●
21	Sri Lanka	29.79	51.24	0.84	●
22	Saudi Arabia	29.67	51.03	0.83	●
23	Namibia	29.57	50.84	0.82	●
24	Oman	29.50	50.71	0.81	●
25	Bangladesh	29.46	50.64	0.81	●
26	Nepal	28.94	49.67	0.80	●
27	Korea, Rep.	28.63	49.09	0.79	
28	Panama	28.50	48.84	0.78	●
29	Kyrgyzstan	28.22	48.32	0.77	●
30	Norway	28.21	48.30	0.77	
31	Nicaragua	27.49	46.95	0.76	●
32	Senegal	26.89	45.83	0.75	●
33	Singapore	26.60	45.30	0.74	
34	Malaysia	26.54	45.19	0.73	
35	Czech Republic	26.33	44.79	0.73	
36	Australia	26.32	44.78	0.72	
37	Montenegro	26.28	44.69	0.71	
38	Estonia	25.56	43.35	0.70	
39	Mauritius	25.41	43.07	0.69	
40	Peru	25.36	42.98	0.69	●
41	Rwanda	25.27	42.81	0.68	●
42	Thailand	24.68	41.72	0.67	
43	Ecuador	24.67	41.70	0.66	●
44	Togo	24.58	41.52	0.65	●
45	Sweden	24.47	41.31	0.65	
46	United Arab Emirates	24.24	40.90	0.64	
47	Romania	24.18	40.77	0.63	
48	Colombia	24.01	40.47	0.62	
49	Viet Nam	23.93	40.31	0.61	
50	Kenya	23.84	40.15	0.60	
51	Switzerland	23.80	40.07	0.60	
52	Ghana	23.77	40.01	0.59	●
53	New Zealand	23.66	39.81	0.58	
54	Canada	23.63	39.76	0.57	○
55	Latvia	23.48	39.47	0.56	
56	Hong Kong (China)	23.21	38.97	0.56	
57	Cameroon	22.65	37.93	0.55	●
58	Benin	22.50	37.65	0.54	●
59	Cambodia	22.50	37.65	0.53	●
60	Chile	22.34	37.36	0.52	
61	Austria	22.34	37.34	0.52	○
62	Azerbaijan	22.30	37.28	0.51	
63	Mexico	22.10	36.90	0.50	
64	Belgium	22.03	36.77	0.49	○
65	Moldova, Rep.	21.94	36.61	0.48	
66	Japan	21.80	36.34	0.48	
67	Honduras	21.76	36.26	0.47	
68	Bulgaria	21.70	36.16	0.46	
69	France	21.68	36.12	0.45	○
70	Tunisia	21.47	35.73	0.44	
71	Hungary	21.47	35.73	0.44	
72	Slovakia	21.28	35.38	0.43	
73	Lithuania	21.13	35.10	0.42	
74	Kuwait	20.81	34.49	0.41	
75	Ireland	20.79	34.46	0.40	○
76	Philippines	20.73	34.34	0.40	
77	Israel	20.66	34.21	0.39	○
78	Turkey	20.56	34.02	0.38	
79	Jordan	20.32	33.58	0.37	
80	United States of America	20.31	33.55	0.36	○
81	Bolivia, Plurinational St.	20.30	33.53	0.35	
82	Finland	20.26	33.46	0.35	○
83	Dominican Republic	20.25	33.45	0.34	
84	Poland	20.08	33.12	0.33	○
85	South Africa	19.95	32.89	0.32	
86	Denmark	19.90	32.79	0.31	○
87	Slovenia	19.81	32.62	0.31	○
88	Spain	19.76	32.54	0.30	○
89	Costa Rica	19.67	32.37	0.29	
90	Armenia	19.59	32.21	0.28	
91	Uruguay	19.38	31.83	0.27	
92	Malta	19.09	31.28	0.27	○
93	Germany	18.77	30.68	0.26	○
94	Iceland	18.76	30.67	0.25	○
95	Russian Federation	18.74	30.62	0.24	○
96	Côte d'Ivoire	18.51	30.20	0.23	
97	Luxembourg	18.20	29.63	0.23	○
98	Brazil	18.03	29.31	0.22	○
99	Netherlands	17.88	29.03	0.21	○
100	Venezuela, Bolivarian Rep.	17.85	28.97	0.20	
101	Croatia	17.68	28.65	0.19	○
102	Bahrain	17.62	28.53	0.19	
103	Bosnia and Herzegovina	17.57	28.44	0.18	
104	United Kingdom	17.54	28.39	0.17	○
105	Argentina	17.38	28.09	0.16	
106	Nigeria	17.36	28.05	0.15	
107	Serbia	17.27	27.89	0.15	○
108	Paraguay	16.80	27.01	0.14	
109	Italy	16.28	26.03	0.13	○
110	Madagascar	16.26	26.00	0.12	
111	Jamaica	16.00	25.52	0.11	○
112	Pakistan	15.12	23.87	0.10	
113	Egypt	14.78	23.24	0.10	
114	Portugal	14.69	23.08	0.09	○
115	Burundi	14.67	23.03	0.08	
116	Burkina Faso	13.80	21.41	0.07	
117	El Salvador	13.60	21.03	0.06	
118	Malawi	13.43	20.72	0.06	
119	Tajikistan	12.96	19.85	0.05	
120	Guatemala	12.72	19.40	0.04	○
121	Guinea	12.46	18.90	0.03	
122	Cyprus	11.90	17.87	0.02	○
123	Ukraine	11.61	17.33	0.02	○
124	Greece	8.98	12.41	0.01	○
125	Yemen	2.33	0.00	0.00	○
n/a	Lebanon	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	

SOURCE: International Monetary Fund, *World Economic Outlook Database,* 2015

NOTE: ● indicates a strength; ○ a weakness

3.3.1 GDP per unit of energy use

GDP per unit of energy use (2005 PPP$ per kg of oil equivalent) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	23.81	100.00	1.00	●	65	Senegal	7.35	23.99	0.46	
2	Sri Lanka	17.24	69.66	0.99	●	66	Tajikistan	7.25	23.49	0.44	
3	Colombia	16.39	65.75	0.98	●	66	TFYR of Macedonia	7.25	23.49	0.44	
4	Panama	16.13	64.52	0.97	●	68	Australia (2014)	7.14	23.02	0.43	○
5	Dominican Republic	14.49	56.97	0.97	●	69	Georgia	7.09	22.78	0.42	
6	Peru	14.29	56.01	0.96	●	70	Belgium (2014)	7.04	22.55	0.42	○
7	Ireland (2014)	14.29	56.01	0.95	●	71	Saudi Arabia	6.94	22.10	0.39	
8	Singapore	14.08	55.08	0.94		71	United Arab Emirates	6.94	22.10	0.39	
9	Mauritius	13.89	54.18	0.92	●	71	Venezuela, Bolivarian Rep.	6.94	22.10	0.39	
9	Switzerland (2014)	13.89	54.18	0.92		74	Armenia	6.90	21.88	0.38	
11	Malta	13.70	53.30	0.92		75	Bolivia, Plurinational St.	6.90	21.88	0.36	
12	United Kingdom (2014)	12.82	49.24	0.91		75	Nicaragua	6.90	21.88	0.36	
13	Uruguay	12.50	47.76	0.90	●	77	Kuwait	6.85	21.66	0.35	
14	Philippines	12.50	47.76	0.89	●	77	Viet Nam	6.85	21.66	0.35	
15	Costa Rica	12.05	45.67	0.88	●	79	Malaysia	6.71	21.02	0.33	
16	Bangladesh	11.76	44.36	0.87	●	79	United States of America (2014)	6.71	21.02	0.33	○
17	Botswana	11.49	43.12	0.86	●	81	Cambodia	6.62	20.61	0.32	
18	Denmark (2014)	11.36	42.51	0.86		82	Montenegro	6.49	20.02	0.31	
19	Albania	11.24	41.92	0.85	●	83	Qatar	6.45	19.82	0.31	
20	Italy (2014)	11.11	41.35	0.84		84	Jamaica	6.37	19.44	0.30	
21	Morocco	10.99	40.78	0.82	●	85	Czech Republic (2014)	6.33	19.26	0.29	○
21	Spain (2014)	10.99	40.78	0.82		86	Nigeria	6.29	19.07	0.28	
23	Namibia	10.87	40.23	0.81	●	87	Thailand	6.21	18.71	0.27	
24	Portugal (2014)	10.64	39.16	0.81		88	Honduras	6.17	18.54	0.25	
25	Israel (2014)	10.42	38.14	0.80		88	New Zealand (2014)	6.17	18.54	0.25	○
26	Egypt	10.10	36.68	0.77	●	90	Korea, Rep. (2014)	6.06	18.02	0.25	○
26	Greece (2014)	10.10	36.68	0.77		91	Bulgaria	5.43	15.13	0.23	○
26	Yemen	10.10	36.68	0.77	●	91	Oman	5.43	15.13	0.23	
29	Azerbaijan	10.00	36.21	0.75	●	93	Belarus	5.26	14.33	0.22	○
29	Tunisia	10.00	36.21	0.75	●	94	Canada (2014)	5.26	14.33	0.21	○
31	Cyprus	10.00	36.21	0.74		95	Nepal	5.24	14.21	0.20	
31	El Salvador	10.00	36.21	0.74	●	96	Finland (2014)	5.10	13.59	0.19	○
33	Austria (2014)	9.90	35.76	0.71		96	Zambia	5.10	13.59	0.19	
33	Ghana	9.90	35.76	0.71	●	98	Niger	5.03	13.23	0.18	
33	Luxembourg (2014)	9.90	35.76	0.71		99	Kenya	4.98	13.00	0.17	
36	Germany (2014)	9.80	35.31	0.70		100	Serbia	4.78	12.12	0.16	○
37	Paraguay	9.62	34.44	0.69	●	101	Moldova, Rep.	4.67	11.61	0.15	○
38	Ecuador	9.62	34.44	0.68	●	102	China	4.63	11.41	0.14	○
38	Indonesia	9.62	34.44	0.68	●	103	Iran, Islamic Rep.	4.57	11.12	0.14	
40	Algeria	9.43	33.60	0.67	●	104	Bosnia and Herzegovina	4.42	10.46	0.12	○
41	Lebanon	9.35	33.19	0.66		104	Mongolia	4.42	10.46	0.12	
42	Japan (2014)	9.26	32.79	0.65		106	Côte d'Ivoire	4.29	9.85	0.10	
43	Turkey (2014)	9.09	32.01	0.64		106	Estonia (2014)	4.29	9.85	0.10	○
44	Netherlands (2014)	9.01	31.64	0.64	○	108	Tanzania, United Rep.	4.27	9.76	0.09	
45	Brazil	8.85	30.90	0.62		109	Kazakhstan	4.18	9.35	0.08	○
45	Croatia	8.85	30.90	0.62		110	South Africa	4.17	9.27	0.08	○
47	Mexico (2014)	8.62	29.84	0.61		111	Kyrgyzstan	4.02	8.57	0.07	
48	France (2014)	8.47	29.17	0.59		112	Benin	3.92	8.14	0.06	
48	Jordan	8.47	29.17	0.59		113	Bahrain	3.68	7.01	0.05	○
50	Pakistan	8.40	28.84	0.58	●	114	Russian Federation	3.02	3.98	0.04	○
51	Lithuania	8.33	28.52	0.57		115	Ukraine	2.97	3.73	0.03	○
51	Norway (2014)	8.33	28.52	0.57		116	Togo	2.55	1.81	0.03	○
53	Argentina	8.26	28.20	0.56		117	Ethiopia	2.34	0.82	0.02	○
54	Guatemala	8.06	27.27	0.54		118	Mozambique	2.28	0.57	0.01	○
54	Hungary (2014)	8.06	27.27	0.54		119	Iceland (2014)	2.16	0.00	0.00	○
56	Slovakia (2014)	7.87	26.39	0.53		n/a	Bhutan	n/a	n/a	n/a	
57	Poland (2014)	7.81	26.11	0.52		n/a	Burkina Faso	n/a	n/a	n/a	
57	Romania	7.81	26.11	0.52		n/a	Burundi	n/a	n/a	n/a	
59	Latvia	7.69	25.55	0.50		n/a	Guinea	n/a	n/a	n/a	
59	Slovenia (2014)	7.69	25.55	0.50		n/a	Madagascar	n/a	n/a	n/a	
61	Sweden (2014)	7.63	25.28	0.49	○	n/a	Malawi	n/a	n/a	n/a	
62	Chile (2014)	7.58	25.02	0.48		n/a	Mali	n/a	n/a	n/a	
63	India	7.52	24.75	0.47		n/a	Rwanda	n/a	n/a	n/a	
64	Cameroon	7.41	24.24	0.47	●	n/a	Uganda	n/a	n/a	n/a	

SOURCE: International Energy Agency (IEA) *World Energy Balances on-line data service, 2015 edition*

NOTE: ● indicates a strength; ○ a weakness

3.3.2 Environmental performance

Environmental Performance Index | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	90.68	90.68	1.00	●
2	Iceland	90.51	90.51	0.99	●
3	Sweden	90.43	90.43	0.98	●
4	Denmark	89.21	89.21	0.98	●
5	Slovenia	88.98	88.98	0.97	●
6	Spain	88.91	88.91	0.96	●
7	Portugal	88.63	88.63	0.95	●
8	Estonia	88.59	88.59	0.94	●
9	Malta	88.48	88.48	0.94	
10	France	88.20	88.20	0.93	●
11	New Zealand	88.00	88.00	0.92	
12	United Kingdom	87.38	87.38	0.91	
13	Australia	87.22	87.22	0.90	
14	Singapore	87.04	87.04	0.90	
15	Croatia	86.98	86.98	0.89	●
16	Switzerland	86.93	86.93	0.88	
17	Norway	86.90	86.90	0.87	
18	Austria	86.64	86.64	0.86	
19	Ireland	86.60	86.60	0.85	
20	Luxembourg	86.58	86.58	0.85	
21	Greece	85.81	85.81	0.84	●
22	Latvia	85.71	85.71	0.83	
23	Lithuania	85.49	85.49	0.82	
24	Slovakia	85.42	85.42	0.81	●
25	Canada	85.06	85.06	0.81	
26	United States of America	84.72	84.72	0.80	
27	Czech Republic	84.67	84.67	0.79	
28	Hungary	84.60	84.60	0.78	
29	Italy	84.48	84.48	0.77	
30	Germany	84.26	84.26	0.77	
31	Azerbaijan	83.78	83.78	0.76	●
32	Russian Federation	83.52	83.52	0.75	
33	Bulgaria	83.40	83.40	0.74	
34	Romania	83.24	83.24	0.73	
35	Belarus	82.30	82.30	0.73	
36	Netherlands	82.03	82.03	0.72	
37	Armenia	81.60	81.60	0.71	
38	Poland	81.26	81.26	0.70	
39	Japan	80.59	80.59	0.69	
40	Cyprus	80.24	80.24	0.69	
41	Belgium	80.15	80.15	0.68	
42	Costa Rica	80.03	80.03	0.67	
43	Argentina	79.84	79.84	0.66	
44	Ukraine	79.69	79.69	0.65	
45	Brazil	78.90	78.90	0.65	
46	Montenegro	78.89	78.89	0.64	
47	Serbia	78.67	78.67	0.63	
48	Israel	78.14	78.14	0.62	
49	TFYR of Macedonia	78.02	78.02	0.61	
50	Panama	78.00	78.00	0.60	
51	Chile	77.67	77.67	0.60	
52	Tunisia	77.28	77.28	0.59	
53	Jamaica	77.02	77.02	0.58	
54	Moldova, Rep.	76.69	76.69	0.57	
55	Venezuela, Bolivarian Rep.	76.23	76.23	0.56	
56	Colombia	75.93	75.93	0.56	
57	Dominican Republic	75.32	75.32	0.55	
58	Albania	74.38	74.38	0.54	
59	Malaysia	74.23	74.23	0.53	
60	Morocco	74.18	74.18	0.52	
61	Uruguay	73.98	73.98	0.52	
62	Philippines	73.70	73.70	0.51	
63	Mexico	73.59	73.59	0.50	
64	Kazakhstan	73.29	73.29	0.49	
65	Kyrgyzstan	73.13	73.13	0.48	
66	Tajikistan	73.05	73.05	0.48	
67	Peru	72.95	72.95	0.47	
68	Jordan	72.24	72.24	0.46	
69	Bolivia, Plurinational St.	71.09	71.09	0.45	
70	Mauritius	70.85	70.85	0.44	
71	Namibia	70.84	70.84	0.44	
72	Botswana	70.72	70.72	0.43	
73	Korea, Rep.	70.61	70.61	0.42	
74	South Africa	70.52	70.52	0.41	
75	Paraguay	70.36	70.36	0.40	
76	Algeria	70.28	70.28	0.40	
77	Bahrain	70.07	70.07	0.39	
78	Qatar	69.94	69.94	0.38	
79	Guatemala	69.64	69.64	0.36	
79	Honduras	69.64	69.64	0.36	
81	Thailand	69.54	69.54	0.35	
82	United Arab Emirates	69.35	69.35	0.35	
83	Lebanon	69.14	69.14	0.34	
84	Saudi Arabia	68.63	68.63	0.33	
85	El Salvador	68.07	68.07	0.32	
86	Turkey	67.68	67.68	0.31	
87	Ecuador	66.58	66.58	0.31	
88	Egypt	66.45	66.45	0.30	
89	Iran, Islamic Rep.	66.32	66.32	0.29	
90	Indonesia	65.85	65.85	0.28	
91	Sri Lanka	65.55	65.55	0.27	
92	China	65.10	65.10	0.27	
93	Bhutan	64.99	64.99	0.26	
94	Georgia	64.96	64.96	0.25	
95	Kuwait	64.41	64.41	0.24	
96	Mongolia	64.39	64.39	0.23	
97	Nicaragua	64.19	64.19	0.23	
98	Senegal	63.73	63.73	0.22	
99	Bosnia and Herzegovina	63.28	63.28	0.21	
100	Kenya	62.49	62.49	0.20	
101	Oman	60.13	60.13	0.19	
102	Côte d'Ivoire	59.89	59.89	0.19	
103	Ghana	58.89	58.89	0.18	
104	Viet Nam	58.50	58.50	0.17	
105	Tanzania, United Rep.	58.34	58.34	0.16	
106	Nigeria	58.27	58.27	0.15	
107	Uganda	57.56	57.56	0.15	
108	Cameroon	57.13	57.13	0.14	
109	Guinea	55.40	55.40	0.13	
110	India	53.58	53.58	0.12	○
111	Pakistan	51.42	51.42	0.11	
112	Cambodia	51.24	51.24	0.10	
113	Rwanda	50.34	50.34	0.10	
114	Nepal	50.21	50.21	0.09	
115	Malawi	49.69	49.69	0.08	
116	Togo	46.10	46.10	0.07	
117	Ethiopia	45.83	45.83	0.06	
118	Burkina Faso	43.71	43.71	0.06	○
119	Benin	43.66	43.66	0.05	
120	Burundi	43.37	43.37	0.04	
121	Mozambique	41.82	41.82	0.03	○
122	Bangladesh	41.77	41.77	0.02	○
123	Mali	41.48	41.48	0.02	○
124	Niger	37.48	37.48	0.01	○
125	Madagascar	37.10	37.10	0.00	○
n/a	Hong Kong (China)	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: Yale University and Columbia University *Environmental Performance Index 2016*
NOTE: ● indicates a strength; ○ a weakness

3.3.3 ISO 14001 environmental certificates

ISO 14001 Environmental management systems—Requirements with guidance for use: Number of certificates issued (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bulgaria	13.64	100.00	0.98	●	65	Honduras	0.89	6.47	0.49	
1	Czech Republic	18.46	100.00	0.98	●	66	India	0.87	6.31	0.48	
1	Romania	23.62	100.00	0.98	●	67	Egypt	0.86	6.26	0.48	
4	Estonia	13.38	98.06	0.98	●	68	Bhutan	0.85	6.18	0.47	
5	Italy	12.73	93.30	0.97	●	69	Mauritius	0.85	6.16	0.46	
6	Slovakia	11.79	86.42	0.96	●	70	Sri Lanka	0.81	5.84	0.45	
7	Croatia	10.72	78.56	0.95	●	71	Bolivia, Plurinational St.	0.74	5.36	0.44	
8	Serbia	9.40	68.90	0.94	●	72	Jordan	0.73	5.25	0.44	
9	Hungary	9.03	66.16	0.94	●	73	Qatar	0.70	5.05	0.43	
10	Sweden	8.86	64.90	0.93		74	Mexico	0.68	4.89	0.42	
11	Lithuania	8.84	64.82	0.92	●	75	Philippines	0.64	4.65	0.41	
12	Spain	8.82	64.65	0.91	●	76	Indonesia	0.62	4.50	0.40	
13	Latvia	6.91	50.60	0.90	●	77	Namibia	0.60	4.30	0.40	
14	Slovenia	6.90	50.58	0.90		78	Iran, Islamic Rep.	0.56	4.06	0.39	
15	Finland	6.82	49.97	0.89		79	Uganda	0.52	3.74	0.38	
16	China	6.51	47.69	0.88		80	Morocco	0.51	3.69	0.37	
17	United Kingdom	6.49	47.57	0.87		81	Ukraine	0.51	3.68	0.37	
18	Switzerland	6.24	45.68	0.87		82	Jamaica	0.50	3.58	0.36	
19	Colombia	5.37	39.36	0.86	●	83	Oman	0.46	3.30	0.35	
20	Australia	5.18	37.93	0.85		84	Lebanon	0.39	2.81	0.34	
21	Japan	4.98	36.48	0.84		85	Zambia	0.39	2.80	0.33	
22	TFYR of Macedonia	4.94	36.18	0.83	●	86	Senegal	0.38	2.72	0.33	
23	Portugal	4.70	34.37	0.83		87	Azerbaijan	0.38	2.71	0.32	
24	Bosnia and Herzegovina	3.92	28.67	0.82	●	88	United States of America	0.38	2.71	0.31	○
25	Denmark	3.57	26.12	0.81		89	Kazakhstan	0.36	2.60	0.30	
26	Norway	3.55	25.96	0.80		90	Pakistan	0.36	2.53	0.29	
27	Singapore	3.40	24.89	0.79		91	Russian Federation	0.35	2.52	0.29	
28	France	3.21	23.45	0.79		92	Mozambique	0.35	2.51	0.28	
29	Greece	3.19	23.30	0.78		93	Kenya	0.34	2.41	0.27	
30	Thailand	3.07	22.47	0.77		94	El Salvador	0.31	2.22	0.26	
31	Israel	3.00	21.96	0.76		95	Botswana	0.28	1.97	0.25	
32	Iceland	3.00	21.93	0.75		96	Panama	0.27	1.94	0.25	
33	Netherlands	2.98	21.80	0.75		97	Nicaragua	0.27	1.91	0.24	
34	Malaysia	2.97	21.71	0.74		98	Kuwait	0.26	1.85	0.23	
35	Austria	2.95	21.60	0.73		99	Côte d'Ivoire	0.25	1.77	0.22	
36	Korea, Rep.	2.83	20.66	0.72		100	Cameroon	0.24	1.66	0.21	
37	Ireland	2.82	20.60	0.71		101	Dominican Republic	0.23	1.62	0.21	
38	Montenegro	2.76	20.16	0.71		102	Nepal	0.22	1.57	0.20	
39	Belgium	2.52	18.39	0.70		103	Mongolia	0.20	1.40	0.19	
40	Chile	2.35	17.20	0.69		104	Guinea	0.20	1.38	0.18	
41	Poland	2.31	16.84	0.68		105	Togo	0.20	1.37	0.17	
42	United Arab Emirates	2.27	16.55	0.67		106	Algeria	0.19	1.32	0.17	
43	Malta	2.12	15.51	0.67		107	Paraguay	0.19	1.31	0.16	
44	Belarus	2.06	15.05	0.66		108	Ghana	0.18	1.28	0.15	
45	Germany	2.06	15.02	0.65		109	Guatemala	0.18	1.28	0.14	
46	Uruguay	2.05	14.98	0.64		110	Tanzania, United Rep.	0.18	1.25	0.13	
47	Cyprus	2.00	14.59	0.63		111	Saudi Arabia	0.17	1.20	0.13	○
48	New Zealand	1.83	13.34	0.63		112	Cambodia	0.16	1.10	0.12	
49	Georgia	1.66	12.10	0.62		113	Venezuela, Bolivarian Rep.	0.14	0.96	0.11	
50	Viet Nam	1.62	11.81	0.61		114	Armenia	0.12	0.83	0.10	○
51	Hong Kong (China)	1.57	11.47	0.60		115	Madagascar	0.12	0.79	0.10	
52	Turkey	1.52	11.07	0.60		116	Bangladesh	0.11	0.75	0.09	
53	Argentina	1.41	10.27	0.59		117	Niger	0.11	0.74	0.08	
54	Canada	1.32	9.59	0.58	○	118	Mali	0.11	0.73	0.07	
55	South Africa	1.31	9.57	0.57		119	Burkina Faso	0.07	0.43	0.06	
56	Luxembourg	1.30	9.50	0.56		120	Nigeria	0.06	0.35	0.06	
57	Costa Rica	1.28	9.30	0.56		121	Rwanda	0.05	0.32	0.05	○
58	Bahrain	1.24	9.02	0.55		122	Kyrgyzstan	0.05	0.31	0.04	○
59	Albania	1.17	8.52	0.54		123	Malawi	0.05	0.30	0.03	○
60	Tunisia	1.15	8.34	0.53		124	Benin	0.05	0.30	0.02	○
61	Moldova, Rep.	1.07	7.77	0.52		125	Tajikistan	0.04	0.26	0.02	○
62	Ecuador	1.04	7.58	0.52		126	Ethiopia	0.03	0.13	0.01	○
63	Brazil	0.98	7.14	0.51		127	Yemen (2013)	0.01	0.00	0.00	○
64	Peru	0.95	6.88	0.50		n/a	Burundi	n/a	n/a	n/a	

SOURCE: International Organization for Standardization, *The ISO Survey of Management System Standard Certifications, 2014*; International Monetary Fund, World Economic Outlook 2015 (PPP$ GDP)

NOTE: ● indicates a strength; ○ a weakness

4.1.1 Ease of getting credit

Ease of getting credit (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank		
1	New Zealand	100.00	100.00	1.00	●	
2	Colombia	95.00	95.00	0.98	●	
2	Rwanda	95.00	95.00	0.98	●	
2	United States of America	95.00	95.00	0.98	●	
5	Australia	90.00	90.00	0.96	●	
5	Mexico	90.00	90.00	0.96	●	
7	Canada	85.00	85.00	0.91		
7	Costa Rica	85.00	85.00	0.91	●	
7	Georgia	85.00	85.00	0.91	●	
7	Honduras	85.00	85.00	0.91	●	
7	Jamaica	85.00	85.00	0.91	●	
7	Montenegro	85.00	85.00	0.91	●	
7	Romania	85.00	85.00	0.91	●	
14	Cambodia	80.00	80.00	0.87	●	
14	El Salvador	80.00	80.00	0.87	●	
14	Guatemala	80.00	80.00	0.87	●	
14	Peru	80.00	80.00	0.87	●	
18	Hong Kong (China)	75.00	75.00	0.80		
18	Hungary	75.00	75.00	0.80		
18	Latvia	75.00	75.00	0.80		
18	Panama	75.00	75.00	0.80	●	
18	Poland	75.00	75.00	0.80	●	
18	Singapore	75.00	75.00	0.80		
18	Ukraine	75.00	75.00	0.80	●	
18	United Kingdom	75.00	75.00	0.80		
18	Zambia	75.00	75.00	0.80	●	
27	Bulgaria	70.00	70.00	0.71		
27	Czech Republic	70.00	70.00	0.71		
27	Denmark	70.00	70.00	0.71		
27	Estonia	70.00	70.00	0.71		
27	Germany	70.00	70.00	0.71		
27	Ireland	70.00	70.00	0.71		
27	Kenya	70.00	70.00	0.71		
27	Kyrgyzstan	70.00	70.00	0.71	●	
27	Lithuania	70.00	70.00	0.71		
27	Malaysia	70.00	70.00	0.71		
27	Moldova, Rep.	70.00	70.00	0.71		
27	Viet Nam	70.00	70.00	0.71	●	
39	Albania	65.00	65.00	0.60		
39	Armenia	65.00	65.00	0.60		
39	Bosnia and Herzegovina	65.00	65.00	0.60		
39	Cyprus	65.00	65.00	0.60		
39	Finland	65.00	65.00	0.60	○	
39	Ghana	65.00	65.00	0.60	●	
39	India	65.00	65.00	0.60		
39	Israel	65.00	65.00	0.60		
39	Korea, Rep.	65.00	65.00	0.60		
39	Mauritius	65.00	65.00	0.60		
39	Russian Federation	65.00	65.00	0.60		
39	Slovakia	65.00	65.00	0.60		
39	TFYR of Macedonia	65.00	65.00	0.60		
39	Uganda	65.00	65.00	0.60	●	
53	Austria	60.00	60.00	0.52	○	
53	Iceland	60.00	60.00	0.52		
53	Mongolia	60.00	60.00	0.52		
53	Namibia	60.00	60.00	0.52		
53	Nigeria	60.00	60.00	0.52	●	
53	Serbia	60.00	60.00	0.52		
53	South Africa	60.00	60.00	0.52		
53	Spain	60.00	60.00	0.52		
53	Switzerland	60.00	60.00	0.52	○	
53	Uruguay	60.00	60.00	0.52		
63	Botswana	55.00	55.00	0.47		
63	Croatia	55.00	55.00	0.47		
63	Indonesia	55.00	55.00	0.47		
63	Kazakhstan	55.00	55.00	0.47		
63	Norway	55.00	55.00	0.47		○
63	Sweden	55.00	55.00	0.47		○
69	Argentina	50.00	50.00	0.38		
69	Bhutan	50.00	50.00	0.38		
69	Chile	50.00	50.00	0.38		
69	China	50.00	50.00	0.38		
69	Egypt	50.00	50.00	0.38		
69	France	50.00	50.00	0.38		○
69	Greece	50.00	50.00	0.38		
69	Japan	50.00	50.00	0.38		○
69	Netherlands	50.00	50.00	0.38		○
69	Paraguay	50.00	50.00	0.38		
69	Saudi Arabia	50.00	50.00	0.38		
69	Turkey	50.00	50.00	0.38		
81	Belgium	45.00	45.00	0.29		○
81	Brazil	45.00	45.00	0.29		
81	Dominican Republic	45.00	45.00	0.29		
81	Ecuador	45.00	45.00	0.29		
81	Iran, Islamic Rep.	45.00	45.00	0.29		
81	Italy	45.00	45.00	0.29		○
81	Nicaragua	45.00	45.00	0.29		
81	Portugal	45.00	45.00	0.29		○
81	Sri Lanka	45.00	45.00	0.29		
81	Thailand	45.00	45.00	0.29		
81	United Arab Emirates	45.00	45.00	0.29		○
92	Azerbaijan	40.00	40.00	0.22		
92	Bahrain	40.00	40.00	0.22		
92	Belarus	40.00	40.00	0.22		○
92	Kuwait	40.00	40.00	0.22		
92	Lebanon	40.00	40.00	0.22		
92	Morocco	40.00	40.00	0.22		
92	Philippines	40.00	40.00	0.22		
92	Tajikistan	40.00	40.00	0.22		
92	Venezuela, Bolivarian Rep.	40.00	40.00	0.22		
101	Bolivia, Plurinational St.	35.00	35.00	.0.18		
101	Cameroon	35.00	35.00	.0.18		
101	Oman	35.00	35.00	.0.18		
101	Slovenia	35.00	35.00	.0.18		○
101	Tunisia	35.00	35.00	.0.18		
106	Bangladesh	30.00	30.00	0.09		
106	Benin	30.00	30.00	0.09		
106	Burkina Faso	30.00	30.00	0.09		
106	Côte d'Ivoire	30.00	30.00	0.09		○
106	Guinea	30.00	30.00	0.09		
106	Mali	30.00	30.00	0.09		
106	Nepal	30.00	30.00	0.09		
106	Niger	30.00	30.00	0.09		
106	Pakistan	30.00	30.00	0.09		
106	Qatar	30.00	30.00	0.09		○
106	Senegal	30.00	30.00	0.09		
106	Togo	30.00	30.00	0.09		
118	Malawi	25.00	25.00	0.06		
118	Mozambique	25.00	25.00	0.06		
118	Tanzania, United Rep.	25.00	25.00	0.06		
121	Ethiopia	15.00	15.00	0.04		
121	Luxembourg	15.00	15.00	0.04		○
121	Madagascar	15.00	15.00	0.04		
124	Algeria	10.00	10.00	0.02		○
124	Burundi	10.00	10.00	0.02		
124	Malta	10.00	10.00	0.02		○
127	Jordan	.0.00	0.00	0.00		○
127	Yemen	.0.00	0.00	0.00		○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*
NOTE: ● indicates a strength; ○ a weakness

4.1.2 Domestic credit to private sector

Domestic credit to private sector (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Cyprus	251.49	100.00	1.00	●	65	Slovakia	50.16	18.55	0.49	
2	Hong Kong (China)	233.66	92.79	0.99	●	66	Paraguay	49.87	18.43	0.48	
3	United States of America	197.12	78.00	0.98	●	67	TFYR of Macedonia	49.58	18.31	0.47	
4	Japan	187.57	74.14	0.98	●	68	Namibia	49.12	18.13	0.46	
5	Denmark	178.71	70.55	0.97	●	69	Armenia	48.86	18.02	0.46	
6	Switzerland	171.13	67.49	0.96		70	Oman	46.46	17.05	0.45	
7	South Africa	151.48	59.54	0.95	●	71	Qatar	45.24	16.56	0.44	
8	Thailand	146.82	57.65	0.94	●	72	Georgia	45.19	16.53	0.43	
9	New Zealand (2010)	143.60	56.35	0.94		73	Saudi Arabia	44.44	16.23	0.42	
10	China	141.87	55.65	0.93		74	El Salvador	43.90	16.01	0.42	
11	United Kingdom	138.95	54.47	0.92		75	Bhutan	43.82	15.98	0.41	
12	Korea, Rep.	138.45	54.27	0.91		76	Serbia	43.77	15.96	0.40	
13	Sweden	131.84	51.59	0.90		77	Hungary	43.47	15.84	0.39	○
14	Singapore	131.45	51.44	0.90		78	Bangladesh	42.35	15.39	0.38	
15	Australia	129.64	50.70	0.89		79	Philippines	39.15	14.09	0.38	
16	Portugal	129.51	50.65	0.88	●	80	Albania	37.58	13.46	0.37	
17	Spain	129.08	50.48	0.87		81	Moldova, Rep.	37.08	13.26	0.36	
18	Canada (2008)	124.93	48.80	0.86		82	Indonesia	36.52	13.03	0.35	
19	Malaysia	120.56	47.03	0.86		83	Kenya	34.42	12.18	0.34	
20	Greece	116.91	45.55	0.85	●	84	Togo	34.14	12.06	0.34	
21	Netherlands	116.53	45.40	0.84		85	Nicaragua	34.08	12.04	0.33	
22	Malta (2013)	111.80	43.48	0.83		86	Kazakhstan	34.07	12.04	0.32	
23	Chile	109.45	42.53	0.82		87	Peru	34.03	12.02	0.31	
24	Lebanon	103.30	40.05	0.82	●	88	Senegal	33.17	11.67	0.30	
25	Viet Nam	100.30	38.83	0.81	●	89	Guatemala	32.94	11.58	0.30	
26	Mauritius	100.12	38.76	0.80	●	90	Botswana	31.88	11.15	0.29	
27	Iceland	98.83	38.24	0.79		91	Mozambique	31.77	11.11	0.28	
28	France	94.85	36.63	0.78		92	Romania	31.19	10.87	0.27	
29	Finland	93.68	36.15	0.78		93	Mexico	30.99	10.79	0.26	
30	Luxembourg	91.62	35.32	0.77		94	Azerbaijan	30.72	10.68	0.26	
31	Italy	89.39	34.42	0.76		95	Venezuela, Bolivarian Rep. (2013)	29.90	10.35	0.25	
32	Austria	88.58	34.09	0.75		96	Jamaica	29.26	10.09	0.24	
33	Panama	88.34	33.99	0.74	●	97	Burkina Faso	28.04	9.60	0.23	
34	Norway (2006)	84.85	32.58	0.74		98	Ecuador	27.38	9.33	0.22	
35	Ireland	83.24	31.93	0.73		99	Uruguay	26.93	9.15	0.22	
36	Germany	79.63	30.47	0.72		100	Sri Lanka	26.79	9.09	0.21	
37	Tunisia	76.47	29.19	0.71	●	101	Dominican Republic	26.47	8.96	0.20	
38	Ukraine	76.20	29.08	0.70		102	Egypt	25.95	8.75	0.19	
39	Turkey	74.64	28.45	0.70		103	Mali	24.50	8.17	0.18	
40	Latvia	73.19	27.86	0.69		104	Belarus	24.46	8.15	0.18	○
41	Jordan	70.22	26.66	0.68	●	105	Benin	22.90	7.52	0.17	
42	Croatia	69.47	26.36	0.67		106	Tajikistan	21.48	6.94	0.16	
43	Morocco	68.65	26.03	0.66		107	Kyrgyzstan	21.16	6.81	0.15	
44	Kuwait	67.24	25.45	0.66		108	Côte d'Ivoire	20.33	6.48	0.14	
45	Brazil	67.09	25.40	0.65		109	Ghana	19.91	6.31	0.14	
46	Israel	66.93	25.33	0.64		110	Algeria	18.38	5.69	0.13	
47	United Arab Emirates	65.44	24.73	0.63		111	Ethiopia (2008)	17.71	5.42	0.12	
48	Bahrain	63.00	23.74	0.62		112	Zambia	17.14	5.19	0.11	
49	Nepal	62.63	23.59	0.62	●	113	Malawi	16.20	4.81	0.10	
50	Mongolia	60.72	22.82	0.61		114	Pakistan	15.64	4.58	0.10	
51	Bulgaria	59.61	22.37	0.60		115	Cameroon	15.56	4.55	0.09	
52	Russian Federation	59.31	22.25	0.59		116	Burundi	15.36	4.47	0.08	
53	Belgium	58.23	21.81	0.58		117	Nigeria	14.54	4.14	0.07	
54	Honduras	55.26	20.61	0.58		118	Uganda	14.37	4.06	0.06	
55	Costa Rica	55.11	20.55	0.57		119	Argentina	14.30	4.04	0.06	○
56	Slovenia	55.00	20.50	0.56		120	Niger	14.20	4.00	0.05	
57	Bosnia and Herzegovina	54.77	20.41	0.55		121	Tanzania, United Rep.	13.83	3.85	0.04	
58	Iran, Islamic Rep.	54.41	20.26	0.54		122	Madagascar	12.97	3.50	0.03	○
59	Cambodia	54.09	20.14	0.54	●	123	Lithuania	11.87	3.05	0.02	○
60	Colombia	52.73	19.59	0.53		124	Guinea (2011)	9.13	1.95	0.02	
61	Poland	52.20	19.37	0.52		125	Yemen (2013)	6.34	0.82	0.01	○
62	India	51.58	19.12	0.51		126	Estonia	4.32	0.00	0.00	○
63	Czech Republic	50.44	18.66	0.50		n/a	Montenegro	n/a	n/a	n/a	
64	Bolivia, Plurinational St.	50.32	18.61	0.50		n/a	Rwanda	n/a	n/a	n/a	

SOURCE: International Monetary Fund (with World Bank and OECD GDP estimates), extracted from World Bank *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

4.1.3 Microfinance institutions' gross loan portfolio

Microfinance institutions: Gross loan portfolio (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bhutan	8.15	100.00	0.96	●
1	Bolivia, Plurinational St.	16.39	100.00	0.96	●
1	Cambodia	23.74	100.00	0.96	●
1	Mongolia	19.68	100.00	0.96	●
5	Tajikistan	6.12	75.07	0.95	●
6	Rwanda	5.84	71.56	0.94	●
7	Kyrgyzstan	5.42	66.48	0.93	●
8	Paraguay	5.27	64.67	0.91	●
9	Peru	4.96	60.84	0.90	●
10	Ecuador	4.68	57.44	0.89	●
11	Azerbaijan	4.53	55.56	0.88	●
12	Armenia	3.37	41.30	0.87	●
13	Togo	3.22	39.47	0.85	●
14	Nicaragua	3.13	38.44	0.84	●
15	Burundi	2.92	35.75	0.83	●
16	Tanzania, United Rep.	2.74	33.61	0.82	●
17	Georgia	1.88	23.09	0.80	
18	Senegal	1.86	22.79	0.79	●
19	Bangladesh	1.83	22.49	0.78	●
20	Honduras	1.75	21.50	0.77	●
21	Colombia	1.72	21.09	0.76	
22	Malawi	1.71	21.00	0.74	●
23	Uganda	1.62	19.81	0.73	●
24	El Salvador	1.61	19.69	0.72	●
25	Ghana	1.54	18.91	0.71	●
26	Kenya	1.50	18.42	0.70	
27	Bosnia and Herzegovina	1.43	17.55	0.68	●
28	Burkina Faso	1.40	17.14	0.67	●
29	Dominican Republic	1.25	15.37	0.66	●
30	Nepal	1.24	15.25	0.65	●
31	Madagascar	1.21	14.88	0.63	●
32	Cameroon	1.03	12.64	0.62	●
33	Benin	0.76	9.36	0.61	●
34	Chile	0.74	9.02	0.60	
35	Montenegro	0.70	8.64	0.59	
36	Morocco	0.52	6.37	0.57	
37	Viet Nam	0.45	5.51	0.56	
38	Panama	0.42	5.10	0.55	
39	Niger	0.41	5.01	0.54	
40	Albania	0.40	4.94	0.52	
41	Jordan	0.38	4.69	0.51	
42	Moldova, Rep.	0.35	4.30	0.50	
43	India	0.34	4.19	0.49	
44	Guatemala	0.34	4.16	0.48	
45	Mexico	0.34	4.12	0.46	
46	TFYR of Macedonia	0.31	3.77	0.45	
47	Côte d'Ivoire	0.28	3.37	0.44	
48	Tunisia	0.25	3.07	0.43	
49	Guinea (2012)	0.25	3.04	0.41	●
50	Philippines	0.25	3.02	0.40	
51	Mozambique	0.22	2.75	0.39	
52	Mali	0.21	2.61	0.38	
53	Serbia	0.21	2.59	0.37	
54	Pakistan	0.19	2.30	0.35	
55	Venezuela, Bolivarian Rep.	0.17	2.14	0.34	
56	Costa Rica	0.15	1.83	0.33	
57	Malaysia (2011)	0.13	1.58	0.32	○
58	Poland	0.12	1.53	0.30	○
59	Brazil	0.12	1.47	0.29	
60	Kazakhstan	0.11	1.34	0.28	
61	Lebanon	0.10	1.17	0.27	
62	Jamaica	0.08	1.01	0.26	
63	Nigeria	0.08	0.96	0.24	
64	Egypt	0.05	0.64	0.23	
65	Romania	0.05	0.64	0.22	○
66	Zambia	0.04	0.45	0.21	
67	Sri Lanka	0.03	0.39	0.20	
68	Namibia (2012)	0.03	0.36	0.18	
69	Yemen	0.03	0.33	0.17	
70	Ethiopia	0.02	0.27	0.16	
71	Uruguay	0.02	0.21	0.15	○
72	Russian Federation	0.01	0.17	0.13	○
73	Croatia (2007)	0.01	0.14	0.12	○
74	Bulgaria	0.01	0.12	0.11	○
75	China	0.01	0.12	0.10	○
76	Indonesia	0.01	0.11	0.09	
77	South Africa (2013)	0.01	0.09	0.07	○
78	Argentina	0.01	0.07	0.06	○
79	Turkey (2013)	0.00	0.03	0.05	○
80	Hungary (2007)	0.00	0.01	0.04	○
81	Ukraine	0.00	0.01	0.02	○
82	Thailand (2011)	0.00	0.00	0.01	○
83	Belarus	0.00	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Australia	n/a	n/a	n/a	
n/a	Austria	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Belgium	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Canada	n/a	n/a	n/a	
n/a	Cyprus	n/a	n/a	n/a	
n/a	Czech Republic	n/a	n/a	n/a	
n/a	Denmark	n/a	n/a	n/a	
n/a	Estonia	n/a	n/a	n/a	
n/a	Finland	n/a	n/a	n/a	
n/a	France	n/a	n/a	n/a	
n/a	Germany	n/a	n/a	n/a	
n/a	Greece	n/a	n/a	n/a	
n/a	Hong Kong (China)	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Ireland	n/a	n/a	n/a	
n/a	Israel	n/a	n/a	n/a	
n/a	Italy	n/a	n/a	n/a	
n/a	Japan	n/a	n/a	n/a	
n/a	Korea, Rep.	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Latvia	n/a	n/a	n/a	
n/a	Lithuania	n/a	n/a	n/a	
n/a	Luxembourg	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Netherlands	n/a	n/a	n/a	
n/a	New Zealand	n/a	n/a	n/a	
n/a	Norway	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Portugal	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Singapore	n/a	n/a	n/a	
n/a	Slovakia	n/a	n/a	n/a	
n/a	Slovenia	n/a	n/a	n/a	
n/a	Spain	n/a	n/a	n/a	
n/a	Sweden	n/a	n/a	n/a	
n/a	Switzerland	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	United Kingdom	n/a	n/a	n/a	
n/a	United States of America	n/a	n/a	n/a	

SOURCE: Microfinance Information Exchange, *Mix Market database*; International Monetary Fund, *World Economic Outlook Database,* 2015

NOTE: ● indicates a strength; ○ a weakness

4.2.1 Ease of protecting minority investors

Ease of protecting minority investors (distance to frontier) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	83.33	83.33	0.98	●
1	New Zealand	83.33	83.33	0.98	●
1	Singapore	83.33	83.33	0.98	●
4	Malaysia	78.33	78.33	0.97	●
4	United Kingdom	78.33	78.33	0.97	
6	Canada	76.67	76.67	0.96	●
7	Slovenia	75.00	75.00	0.95	●
8	Albania	73.33	73.33	0.91	●
8	India	73.33	73.33	0.91	●
8	Ireland	73.33	73.33	0.91	
8	Israel	73.33	73.33	0.91	
8	Korea, Rep.	73.33	73.33	0.91	
8	Mongolia	73.33	73.33	0.91	●
14	Bulgaria	71.67	71.67	0.86	●
14	Colombia	71.67	71.67	0.86	●
14	Norway	71.67	71.67	0.86	
14	South Africa	71.67	71.67	0.86	●
14	Sweden	71.67	71.67	0.86	
14	TFYR of Macedonia	71.67	71.67	0.86	●
20	Denmark	68.33	68.33	0.82	
20	Georgia	68.33	68.33	0.82	●
20	Iceland	68.33	68.33	0.82	
20	Nigeria	68.33	68.33	0.82	●
20	Turkey	68.33	68.33	0.82	●
25	Cyprus	66.67	66.67	0.80	
25	Kazakhstan	66.67	66.67	0.80	●
25	Pakistan	66.67	66.67	0.80	●
28	Brazil	65.00	65.00	0.75	●
28	Croatia	65.00	65.00	0.75	
28	France	65.00	65.00	0.75	
28	Mauritius	65.00	65.00	0.75	
28	Spain	65.00	65.00	0.75	
28	Tajikistan	65.00	65.00	0.75	●
34	United States of America	64.67	64.67	0.74	
35	Austria	63.33	63.33	0.66	
35	Azerbaijan	63.33	63.33	0.66	●
35	Chile	63.33	63.33	0.66	
35	Italy	63.33	63.33	0.66	
35	Japan	63.33	63.33	0.66	
35	Kyrgyzstan	63.33	63.33	0.66	●
35	Malta	63.33	63.33	0.66	
35	Moldova, Rep.	63.33	63.33	0.66	
35	Montenegro	63.33	63.33	0.66	
35	Thailand	63.33	63.33	0.66	
45	Greece	61.67	61.67	0.65	
45	Lithuania	61.67	61.67	0.65	
47	Argentina	60.00	60.00	0.58	
47	Armenia	60.00	60.00	0.58	
47	Germany	60.00	60.00	0.58	
47	Latvia	60.00	60.00	0.58	
47	Peru	60.00	60.00	0.58	
47	Poland	60.00	60.00	0.58	
47	Sri Lanka	60.00	60.00	0.58	
47	United Arab Emirates	60.00	60.00	0.58	
55	Belarus	58.33	58.33	0.53	
55	Belgium	58.33	58.33	0.53	
55	Czech Republic	58.33	58.33	0.53	
55	Jamaica	58.33	58.33	0.53	
55	Mexico	58.33	58.33	0.53	
55	Nepal	58.33	58.33	0.53	●
55	Romania	58.33	58.33	0.53	
62	Australia	56.67	56.67	0.45	○
62	Bosnia and Herzegovina	56.67	56.67	0.45	
62	Finland	56.67	56.67	0.45	○
62	Ghana	56.67	56.67	0.45	
62	Kuwait	56.67	56.67	0.45	
62	Namibia	56.67	56.67	0.45	
62	Netherlands	56.67	56.67	0.45	○
62	Panama	56.67	56.67	0.45	
62	Portugal	56.67	56.67	0.45	
62	Russian Federation	56.67	56.67	0.45	
72	Botswana	55.00	55.00	0.41	
72	Dominican Republic	55.00	55.00	0.41	
72	Estonia	55.00	55.00	0.41	○
72	Hungary	55.00	55.00	0.41	
72	Serbia	55.00	55.00	0.41	
77	Bangladesh	53.33	53.33	0.36	
77	Indonesia	53.33	53.33	0.36	
77	Rwanda	53.33	53.33	0.36	
77	Slovakia	53.33	53.33	0.36	
77	Ukraine	53.33	53.33	0.36	
77	Zambia	53.33	53.33	0.36	
83	Mozambique	51.67	51.67	0.34	
83	Saudi Arabia	51.67	51.67	0.34	
83	Uganda	51.67	51.67	0.34	
86	Madagascar	50.00	50.00	0.31	
86	Morocco	50.00	50.00	0.31	
86	Switzerland	50.00	50.00	0.31	○
86	Tunisia	50.00	50.00	0.31	
90	Bahrain	48.33	48.33	0.29	
90	Cambodia	48.33	48.33	0.29	
92	Bhutan	46.67	46.67	0.25	
92	Burundi	46.67	46.67	0.25	
92	Ecuador	46.67	46.67	0.25	
92	Kenya	46.67	46.67	0.25	
92	Malawi	46.67	46.67	0.25	
97	Egypt	45.00	45.00	0.20	
97	Luxembourg	45.00	45.00	0.20	○
97	Qatar	45.00	45.00	0.20	
97	Tanzania, United Rep.	45.00	45.00	0.20	
97	Uruguay	45.00	45.00	0.20	
97	Viet Nam	45.00	45.00	0.20	
97	Yemen	45.00	45.00	0.20	
104	Cameroon	43.33	43.33	0.16	
104	China	43.33	43.33	0.16	○
104	Honduras	43.33	43.33	0.16	
104	Lebanon	43.33	43.33	0.16	○
104	Oman	43.33	43.33	0.16	
109	Bolivia, Plurinational St.	41.67	41.67	0.13	
109	Burkina Faso	41.67	41.67	0.13	
109	Paraguay	41.67	41.67	0.13	
112	Benin	40.00	40.00	0.11	
112	Iran, Islamic Rep.	40.00	40.00	0.11	
112	Nicaragua	40.00	40.00	0.11	
115	Côte d'Ivoire	38.33	38.33	0.07	○
115	El Salvador	38.33	38.33	0.07	
115	Philippines	38.33	38.33	0.07	○
115	Senegal	38.33	38.33	0.07	○
115	Togo	38.33	38.33	0.07	
120	Jordan	36.67	36.67	0.06	○
121	Costa Rica	35.00	35.00	0.02	○
121	Ethiopia	35.00	35.00	0.02	○
121	Guinea	35.00	35.00	0.02	
121	Mali	35.00	35.00	0.02	○
121	Niger	35.00	35.00	0.02	
126	Algeria	33.33	33.33	0.01	○
126	Guatemala	33.33	33.33	0.01	○
128	Venezuela, Bolivarian Rep.	31.67	31.67	0.00	○

SOURCE: World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*

NOTE: ● indicates a strength; ○ a weakness

4.2.2 Market capitalization

Market capitalization of listed companies (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	1,111.41	100.00	0.97	●
1	Singapore	244.54	100.00	0.97	●
1	South Africa	266.77	100.00	0.97	●
1	Switzerland	213.30	100.00	0.97	●
5	United States of America	151.16	70.70	0.96	
6	Malaysia	135.76	63.43	0.95	●
7	Canada	117.27	54.71	0.93	
8	United Kingdom	106.48	49.63	0.92	
9	Thailand	106.32	49.55	0.91	●
10	Kuwait (2006)	105.43	49.13	0.90	●
11	Nigeria	99.98	46.56	0.89	●
12	Luxembourg	97.37	45.33	0.88	
13	Japan	95.14	44.28	0.87	
14	Montenegro (2012)	92.65	43.10	0.86	●
15	Philippines	91.95	42.77	0.85	●
16	Chile	90.38	42.04	0.84	●
17	Netherlands	89.45	41.60	0.83	
18	Australia	88.59	41.19	0.82	
19	Qatar	88.46	41.13	0.80	
20	Korea, Rep.	85.99	39.96	0.79	
21	India	76.07	35.29	0.78	
22	France	73.73	34.18	0.77	
23	Spain	71.88	33.31	0.76	
24	Jordan	71.33	33.05	0.75	●
25	Belgium	71.21	32.99	0.74	
26	Mauritius	69.29	32.09	0.73	
27	Bahrain	65.64	30.37	0.72	
28	Israel	65.60	30.35	0.71	
29	Saudi Arabia	64.74	29.94	0.70	
30	China	57.99	26.76	0.68	
31	Ireland	57.20	26.39	0.67	
32	United Arab Emirates	50.47	23.21	0.66	
33	Morocco	47.95	22.02	0.65	
34	Indonesia	47.51	21.82	0.64	
35	Oman	46.25	21.22	0.63	
36	El Salvador (2012)	45.11	20.69	0.62	
37	Germany	44.94	20.61	0.61	
38	Malta (2013)	44.07	20.19	0.60	
39	Norway	43.89	20.11	0.59	
40	Kenya (2013)	40.52	18.52	0.58	
41	Peru	38.91	17.76	0.57	
42	Colombia	38.85	17.73	0.55	
43	Croatia (2013)	38.64	17.63	0.54	
44	Mexico	37.09	16.91	0.53	
45	Czech Republic (2007)	36.50	16.62	0.52	
46	Brazil	35.97	16.38	0.51	
47	Côte d'Ivoire	34.11	15.50	0.50	●
48	Uganda (2012)	31.39	14.22	0.49	
49	Poland	30.99	14.03	0.48	
50	Sri Lanka	30.02	13.57	0.47	
51	Panama	29.77	13.45	0.46	
52	New Zealand (2009)	29.47	13.31	0.45	○
53	Turkey	27.52	12.39	0.43	
54	Iran, Islamic Rep.	27.42	12.35	0.42	
55	Portugal	25.11	11.25	0.41	○
56	Viet Nam	24.74	11.08	0.40	
57	Egypt	24.46	10.95	0.39	
58	Lebanon	24.42	10.93	0.38	
59	Greece	23.41	10.45	0.37	
60	Austria	22.15	9.86	0.36	○
61	Nepal (2012)	22.07	9.82	0.35	
62	Italy (2008)	21.83	9.71	0.34	○
63	Jamaica	21.09	9.36	0.33	
64	Russian Federation	20.74	9.19	0.32	
65	Bangladesh	20.13	8.91	0.30	
66	Iceland (2012)	19.90	8.80	0.29	○
67	Tunisia	19.16	8.45	0.28	
68	Malawi (2012)	17.77	7.79	0.27	
69	Cyprus	17.36	7.60	0.26	○
70	Bolivia, Plurinational St. (2012)	16.41	7.15	0.25	
71	Pakistan (2011)	15.24	6.60	0.24	
72	Slovenia	15.19	6.58	0.23	○
73	Namibia	14.81	6.40	0.22	
74	Zambia (2011)	13.42	5.74	0.21	
75	Bosnia and Herzegovina (2011)	12.36	5.24	0.20	
76	Ukraine (2012)	11.78	4.97	0.18	
77	Romania	11.20	4.70	0.17	○
78	Argentina	11.19	4.69	0.16	
79	Kazakhstan	10.54	4.39	0.15	
80	Mongolia (2012)	10.52	4.37	0.14	
81	Hungary	10.49	4.36	0.13	○
82	Ghana (2013)	10.34	4.29	0.12	
83	Estonia (2012)	10.08	4.17	0.11	○
84	Bulgaria	9.68	3.98	0.10	○
85	Lithuania (2012)	9.25	3.78	0.09	○
86	Georgia (2012)	5.95	2.22	0.08	○
87	TFYR of Macedonia (2012)	5.74	2.12	0.07	○
88	Slovakia	4.88	1.71	0.05	○
89	Latvia (2012)	3.98	1.29	0.04	○
90	Serbia (2011)	3.86	1.23	0.03	○
91	Costa Rica (2011)	3.63	1.13	0.02	○
92	Kyrgyzstan (2012)	2.50	0.59	0.01	○
93	Armenia (2012)	1.24	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Denmark	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Finland	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Sweden	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Federation of Exchanges database; extracted from the World Bank's *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

4.2.3 Total value of stocks traded

Stocks traded, total value (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	115.50	100.00	0.98	●
1	Hong Kong (China)	522.91	100.00	0.98	●
1	United States of America	236.91	100.00	0.98	●
4	Japan	105.30	91.17	0.96	
5	Switzerland	105.26	91.13	0.95	
6	South Africa	92.72	80.28	0.94	●
7	Korea, Rep.	91.78	79.46	0.93	
8	Thailand	76.73	66.44	0.92	●
9	Saudi Arabia	76.03	65.83	0.90	●
10	Canada	75.57	65.43	0.89	
11	Spain	73.10	63.29	0.88	
12	Singapore	65.16	56.42	0.87	
13	Italy (2008)	59.95	51.91	0.86	●
14	Netherlands	54.25	46.97	0.84	
15	Australia	50.58	43.79	0.83	
16	Turkey	46.33	40.11	0.82	●
17	Malaysia	42.40	36.71	0.81	
18	United Kingdom	41.58	36.00	0.80	
19	France	41.48	35.91	0.78	
20	United Arab Emirates	35.90	31.08	0.77	
21	India	35.67	30.88	0.76	
22	Germany	34.84	30.16	0.75	
23	Brazil	27.64	23.93	0.73	
24	Qatar	26.05	22.55	0.72	
25	Norway	25.22	21.84	0.71	
26	Portugal	20.48	17.73	0.70	
27	Belgium	20.20	17.49	0.69	
28	Israel	15.47	13.40	0.67	
29	Philippines	14.84	12.84	0.66	
30	Greece	14.27	12.35	0.65	
31	Viet Nam	11.71	10.14	0.64	
32	Mexico	10.95	9.48	0.63	
33	Poland	10.69	9.25	0.61	
34	Chile	10.52	9.11	0.60	
35	Indonesia	10.21	8.84	0.59	
36	Egypt	9.28	8.03	0.58	
37	Jordan	8.63	7.47	0.57	
38	Russian Federation	8.60	7.45	0.55	
39	Oman	7.10	6.14	0.54	
40	Ireland	6.64	5.74	0.53	○
41	Austria	6.62	5.73	0.52	○
42	Iran, Islamic Rep.	5.49	4.75	0.51	
43	Colombia	5.46	4.73	0.49	
44	Hungary	5.14	4.45	0.48	
45	Iceland (2012)	4.83	4.18	0.47	
46	Mauritius	3.67	3.17	0.46	
47	Sri Lanka	3.30	2.85	0.45	
48	New Zealand (2009)	2.95	2.55	0.43	○
49	Tunisia (2012)	2.77	2.40	0.42	
50	Morocco	2.77	2.39	0.41	
51	Peru	1.81	1.56	0.40	
52	Slovenia	1.49	1.28	0.39	
53	Romania (2012)	1.24	1.07	0.37	
54	Montenegro (2012)	1.05	0.91	0.36	
55	Bahrain (2012)	1.00	0.87	0.35	
56	Lebanon (2012)	0.94	0.82	0.34	
57	Argentina	0.87	0.76	0.33	
58	Zambia (2012)	0.78	0.68	0.31	
59	Estonia (2012)	0.78	0.67	0.30	○
60	Botswana (2012)	0.77	0.66	0.29	
61	Serbia (2012)	0.71	0.61	0.28	
62	Malta (2013)	0.70	0.60	0.27	○
63	Ukraine (2012)	0.69	0.59	0.25	
64	Lithuania (2012)	0.40	0.34	0.24	○
65	Kazakhstan	0.40	0.34	0.23	
66	Malawi (2012)	0.38	0.33	0.22	
67	Mongolia (2012)	0.33	0.29	0.20	
68	TFYR of Macedonia (2012)	0.32	0.27	0.19	
69	Nepal (2012)	0.26	0.22	0.18	
70	Cyprus	0.24	0.21	0.17	○
71	Moldova, Rep. (2009)	0.24	0.20	0.16	○
72	El Salvador (2012)	0.22	0.19	0.14	
73	Paraguay (2012)	0.21	0.18	0.13	
74	Luxembourg	0.20	0.17	0.12	○
75	Slovakia (2012)	0.18	0.15	0.11	○
76	Ecuador (2012)	0.16	0.13	0.10	
77	Latvia (2012)	0.11	0.10	0.08	○
78	Kyrgyzstan (2012)	0.08	0.07	0.07	
79	Bolivia, Plurinational St. (2012)	0.07	0.06	0.06	○
80	Tanzania, United Rep. (2012)	0.07	0.06	0.05	
81	Uganda (2012)	0.05	0.04	0.04	○
82	Georgia (2012)	0.01	0.01	0.02	○
83	Armenia (2012)	0.01	0.01	0.01	○
84	Uruguay (2012)	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Bulgaria	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Czech Republic	n/a	n/a	n/a	
n/a	Denmark	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Finland	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Sweden	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Federation of Exchanges database; extracted from the World Bank's *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

4.2.4 Venture capital deals

Venture capital per investment location: Number of deals (per billion PPP$ GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Canada	0.65	100.00	0.95	●
1	Finland	0.49	100.00	0.95	●
1	France	0.27	100.00	0.95	●
1	Israel	0.46	100.00	0.95	●
1	United States of America	0.42	100.00	0.95	●
6	Estonia	0.26	99.54	0.94	●
7	United Kingdom	0.23	86.80	0.93	
8	Denmark	0.23	86.40	0.92	
9	Ireland	0.21	79.68	0.91	
10	Iceland	0.20	74.34	0.89	
11	Sweden	0.19	73.19	0.88	
12	Luxembourg	0.19	73.09	0.87	
13	Switzerland	0.16	60.61	0.86	
14	Singapore	0.15	57.55	0.85	
15	Latvia	0.12	44.90	0.84	
16	Australia	0.12	44.32	0.82	
17	Germany	0.12	43.31	0.81	
18	Netherlands	0.11	41.70	0.80	
19	Lithuania	0.11	40.83	0.79	
20	Lebanon	0.11	39.98	0.78	●
21	New Zealand	0.10	38.12	0.76	
22	Belgium	0.09	33.77	0.75	
23	Kenya	0.09	33.73	0.74	●
24	Jordan	0.08	31.25	0.73	●
25	Spain	0.08	30.55	0.72	
26	Mauritius	0.08	30.20	0.71	
27	Hong Kong (China)	0.08	29.45	0.69	
28	Norway	0.07	25.04	0.68	
29	Guinea	0.07	24.07	0.67	●
30	Austria	0.06	23.66	0.66	
31	Portugal	0.06	22.90	0.65	
32	India	0.06	20.16	0.64	
33	China	0.05	19.76	0.62	
34	United Arab Emirates	0.05	18.73	0.61	
35	Rwanda	0.05	17.89	0.60	
36	Italy	0.04	15.80	0.59	
37	Poland	0.04	13.20	0.58	
38	Cyprus	0.04	12.80	0.56	
39	Mali	0.03	12.22	0.55	●
40	Burkina Faso	0.03	11.37	0.54	●
41	Tunisia	0.03	11.14	0.53	
42	Ukraine	0.03	10.31	0.52	
43	Senegal	0.03	9.66	0.51	
44	Japan	0.03	9.15	0.49	
45	Panama	0.02	8.43	0.48	
46	Morocco	0.02	7.49	0.47	
47	Brazil	0.02	7.36	0.46	
48	Malaysia	0.02	7.13	0.45	
49	South Africa	0.02	6.53	0.44	
50	Slovakia	0.02	6.33	0.42	
51	Cambodia	0.02	6.20	0.41	
52	Peru	0.02	6.09	0.40	
53	Czech Republic	0.02	6.06	0.39	
54	Korea, Rep.	0.02	5.76	0.38	○
55	Slovenia	0.02	5.16	0.36	○
56	Zambia	0.02	5.06	0.35	
57	Bahrain	0.02	5.04	0.34	
58	Tanzania, United Rep.	0.01	4.68	0.33	
59	Greece	0.01	4.58	0.32	
60	Costa Rica	0.01	4.31	0.31	
61	Côte d'Ivoire	0.01	4.04	0.29	
62	Uganda	0.01	3.95	0.28	
63	Indonesia	0.01	3.87	0.27	
64	Turkey	0.01	3.77	0.26	
65	Croatia	0.01	3.39	0.25	○
66	Viet Nam	0.01	3.32	0.24	
67	Russian Federation	0.01	3.23	0.22	○
68	Saudi Arabia	0.01	3.03	0.21	○
69	Mexico	0.01	2.95	0.20	○
70	Ghana	0.01	2.54	0.19	
71	Egypt	0.01	2.24	0.18	
72	Hungary	0.01	2.14	0.16	○
73	Bulgaria	0.01	2.05	0.15	○
74	Colombia	0.01	2.04	0.14	○
75	Philippines	0.01	1.74	0.13	○
76	Nigeria	0.01	1.59	0.12	
77	Thailand	0.01	1.59	0.11	○
78	Ethiopia	0.01	1.57	0.09	
79	Belarus	0.01	1.44	0.08	○
80	Ecuador	0.01	1.27	0.07	○
81	Romania	0.00	1.03	0.06	○
82	Kuwait	0.00	0.50	0.05	○
83	Argentina	0.00	0.37	0.04	○
84	Chile	0.00	0.08	0.02	○
85	Kazakhstan	0.00	0.07	0.01	○
86	Pakistan	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Serbia	n/a	n/a	n/a	
n/a	Sri Lanka	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: Thomson Reuters, *Thomson One Banker Private Equity* database; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

4.3.1 Applied tariff rate, weighted mean

Tariff rate, applied, weighted mean, all products (%) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	0.00	100.00	0.98	●
1	Singapore	0.00	100.00	0.98	●
1	Switzerland	0.00	100.00	0.98	●
4	Botswana	0.50	96.86	0.98	●
5	Georgia (2012)	0.68	95.73	0.97	●
6	Mauritius	0.72	95.48	0.96	●
7	Namibia	0.75	95.29	0.95	●
8	Israel (2012)	0.94	94.10	0.94	
9	Austria	1.04	93.47	0.73	
9	Belgium	1.04	93.47	0.73	
9	Bulgaria	1.04	93.47	0.73	
9	Cyprus	1.04	93.47	0.73	
9	Czech Republic	1.04	93.47	0.73	
9	Denmark	1.04	93.47	0.73	
9	Estonia	1.04	93.47	0.73	
9	Finland	1.04	93.47	0.73	
9	France	1.04	93.47	0.73	
9	Germany	1.04	93.47	0.73	
9	Greece	1.04	93.47	0.73	
9	Hungary	1.04	93.47	0.73	
9	Ireland	1.04	93.47	0.73	
9	Italy	1.04	93.47	0.73	
9	Latvia	1.04	93.47	0.73	
9	Lithuania	1.04	93.47	0.73	
9	Luxembourg	1.04	93.47	0.73	
9	Malta	1.04	93.47	0.73	
9	Netherlands	1.04	93.47	0.73	
9	Poland	1.04	93.47	0.73	
9	Portugal	1.04	93.47	0.73	
9	Romania	1.04	93.47	0.73	
9	Slovakia	1.04	93.47	0.73	
9	Slovenia	1.04	93.47	0.73	
9	Spain	1.04	93.47	0.73	
9	Sweden	1.04	93.47	0.73	
9	United Kingdom	1.04	93.47	0.73	
36	Iceland	1.06	93.35	0.72	
37	Norway	1.09	93.16	0.71	
38	Albania	1.17	92.66	0.71	●
39	Japan (2012)	1.22	92.34	0.70	
40	Croatia	1.30	91.84	0.69	
41	New Zealand	1.38	91.34	0.68	
42	United States of America	1.46	90.83	0.67	
43	Canada	1.50	90.58	0.67	
44	Peru	1.52	90.46	0.66	
45	Bosnia and Herzegovina	1.54	90.33	0.65	
46	Guatemala	1.75	89.01	0.64	
47	Chile (2012)	1.78	88.83	0.63	
48	TFYR of Macedonia (2012)	1.81	88.64	0.63	
49	Australia	1.83	88.51	0.62	
50	Nicaragua	1.87	88.26	0.61	●
51	Ukraine (2012)	2.06	87.07	0.60	
52	El Salvador	2.12	86.69	0.60	
53	Armenia	2.21	86.13	0.59	
54	Indonesia	2.27	85.75	0.58	
55	Oman	2.45	84.62	0.57	
56	Kyrgyzstan	2.46	84.56	0.56	
57	Montenegro (2012)	2.63	83.49	0.56	
58	Turkey	2.78	82.55	0.55	
59	Costa Rica (2010)	2.79	82.49	0.54	
60	Malaysia (2009)	2.81	82.36	0.53	
61	Belarus	3.00	81.17	0.52	
62	Zambia	3.35	78.97	0.52	●
63	Viet Nam	3.54	77.78	0.51	
64	China (2011)	3.57	77.59	0.49	
64	Saudi Arabia	3.57	77.59	0.49	
66	United Arab Emirates	3.60	77.40	0.48	
67	Bahrain	3.69	76.84	0.48	
68	Kazakhstan	3.80	76.15	0.46	
68	Malawi	3.80	76.15	0.46	
70	Kuwait	3.92	75.39	0.45	
71	South Africa	4.01	74.83	0.44	
72	Yemen	4.09	74.33	0.44	●
73	Qatar	4.10	74.26	0.43	
74	Morocco (2012)	4.11	74.20	0.42	
75	Mozambique (2010)	4.17	73.82	0.41	●
76	Bolivia, Plurinational St.	4.23	73.45	0.40	
77	Lebanon (2007)	4.29	73.07	0.40	
78	Ecuador (2012)	4.34	72.76	0.39	
79	Philippines (2010)	4.37	72.57	0.38	
80	Paraguay	4.42	72.25	0.37	
81	Colombia	4.51	71.69	0.37	
82	Azerbaijan	4.60	71.12	0.36	
83	Uruguay	4.69	70.56	0.35	
84	Thailand (2009)	4.78	69.99	0.34	
85	Mongolia	5.03	68.42	0.33	
86	Jordan (2009)	5.13	67.80	0.33	
87	Mexico (2010)	5.37	66.29	0.32	
88	Burundi	5.40	66.10	0.31	
89	Moldova, Rep.	5.67	64.41	0.30	
90	Tajikistan	5.69	64.28	0.29	
91	Dominican Republic (2010)	6.08	61.83	0.28	
91	Panama	6.08	61.83	0.28	
93	Russian Federation	6.25	60.77	0.26	
93	Sri Lanka (2012)	6.25	60.77	0.26	
95	Argentina	6.27	60.64	0.25	
96	Madagascar	6.39	59.89	0.25	
97	Côte d'Ivoire	6.59	58.63	0.24	
98	Honduras (2009)	6.71	57.88	0.23	
99	India (2009)	6.81	57.25	0.22	
100	Korea, Rep. (2010)	7.17	54.99	0.21	○
101	Jamaica (2011)	7.34	53.92	0.21	
102	Mali	7.43	53.36	0.20	
103	Brazil (2012)	7.76	51.29	0.19	○
104	Senegal	8.08	49.28	0.18	
105	Egypt (2009)	8.20	48.52	0.17	
106	Tanzania, United Rep.	8.37	47.46	0.17	
107	Bangladesh (2008)	8.42	47.14	0.14	
107	Burkina Faso	8.42	47.14	0.14	
107	Venezuela, Bolivarian Rep.	8.42	47.14	0.14	
110	Uganda	8.64	45.76	0.13	
111	Rwanda	8.70	45.39	0.13	
112	Algeria (2009)	9.36	41.24	0.11	
112	Togo	9.36	41.24	0.11	
114	Pakistan (2009)	9.55	40.05	0.10	
115	Kenya	9.65	39.42	0.10	○
116	Cambodia (2008)	9.91	37.79	0.09	○
117	Ethiopia (2012)	9.96	37.48	0.07	
117	Ghana	9.96	37.48	0.07	
119	Bhutan (2007)	9.97	37.41	0.06	
120	Nigeria	10.07	36.79	0.06	
121	Niger	10.21	35.91	0.05	
122	Cameroon (2012)	11.70	26.55	0.04	○
123	Guinea (2012)	11.91	25.24	0.03	
124	Nepal	14.69	7.78	0.02	○
125	Iran, Islamic Rep. (2011)	15.23	4.39	0.02	○
126	Benin	15.60	2.07	0.01	○
127	Tunisia (2008)	15.93	0.00	0.00	○
n/a	Serbia	n/a	n/a	n/a	

SOURCE: World Bank, based on UNCTAD TRAINS, WTO, IDB, and UN COMTRADE databases; extracted from World Bank *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

4.3.2 Intensity of local competition

Average answer to the question: In your country, how intense is competition in the local markets? (1 = not intense at all; 7 = extremely intense) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Japan	6.33	88.86	1.00	●
2	Hong Kong (China)	6.16	86.02	0.99	●
3	United Kingdom	6.02	83.69	0.98	●
4	United States of America	6.01	83.58	0.98	
5	Belgium	5.97	82.92	0.97	●
6	Germany	5.97	82.83	0.96	
7	United Arab Emirates	5.96	82.60	0.95	●
8	Australia	5.93	82.21	0.94	●
9	Turkey	5.87	81.17	0.93	●
10	Netherlands	5.86	80.99	0.93	
11	Malta	5.84	80.74	0.92	
12	Korea, Rep.	5.82	80.40	0.91	
13	Czech Republic	5.75	79.12	0.90	●
14	Austria	5.73	78.88	0.89	
15	New Zealand	5.68	77.94	0.89	
16	Sri Lanka	5.67	77.76	0.88	●
17	Lithuania	5.64	77.41	0.87	●
18	Spain	5.61	76.86	0.86	
19	Estonia	5.61	76.79	0.85	
20	Singapore	5.58	76.29	0.84	
21	Chile	5.57	76.18	0.84	●
22	Kenya	5.56	75.96	0.83	●
23	Canada	5.55	75.89	0.82	
24	Qatar	5.55	75.82	0.81	
25	Zambia	5.54	75.71	0.80	●
26	Slovakia	5.54	75.62	0.80	
27	Guatemala	5.53	75.54	0.79	●
28	France	5.52	75.35	0.78	
29	Switzerland	5.52	75.34	0.77	
30	TFYR of Macedonia	5.47	74.53	0.76	●
31	Mauritius	5.46	74.34	0.75	
32	Sweden	5.46	74.27	0.75	
33	Lebanon	5.44	74.08	0.74	
34	Colombia	5.44	73.92	0.73	
35	China	5.41	73.46	0.72	
36	Malaysia	5.41	73.44	0.71	
37	Latvia	5.40	73.41	0.70	
38	Jamaica	5.40	73.29	0.70	●
39	Saudi Arabia	5.39	73.13	0.69	
40	Brazil	5.37	72.85	0.68	
41	Thailand	5.36	72.72	0.67	
42	South Africa	5.35	72.53	0.66	
43	Dominican Republic	5.34	72.35	0.66	●
44	Denmark	5.30	71.69	0.65	
45	Cyprus	5.29	71.50	0.64	
46	Bahrain	5.29	71.47	0.63	
47	Poland	5.29	71.45	0.62	
48	Norway	5.28	71.41	0.61	
49	Uganda	5.28	71.39	0.61	●
50	Panama	5.28	71.33	0.60	
51	Italy	5.26	70.98	0.59	
52	Portugal	5.26	70.98	0.58	
53	Costa Rica	5.25	70.79	0.57	
54	Philippines	5.23	70.45	0.57	
55	Jordan	5.21	70.22	0.56	
56	Peru	5.17	69.45	0.55	
57	Mexico	5.16	69.36	0.54	
58	Nigeria	5.15	69.18	0.53	●
59	Luxembourg	5.15	69.13	0.52	
60	El Salvador	5.13	68.77	0.52	
61	Hungary	5.12	68.73	0.51	
62	Slovenia	5.12	68.69	0.50	
63	Indonesia	5.11	68.54	0.49	
64	Malawi	5.09	68.24	0.48	
65	Ireland	5.08	68.06	0.48	○
66	Greece	5.07	67.81	0.47	
67	Kuwait	5.05	67.49	0.46	
68	Rwanda	5.04	67.35	0.45	
69	Viet Nam	5.04	67.29	0.44	
70	Botswana	5.03	67.18	0.43	
71	Morocco	5.03	67.10	0.43	
72	Honduras	4.99	66.47	0.42	
73	Bangladesh	4.98	66.31	0.41	
74	Ecuador	4.97	66.23	0.40	
75	Russian Federation	4.97	66.23	0.39	
76	Mongolia	4.96	65.99	0.39	
77	Paraguay	4.95	65.85	0.38	
78	Senegal	4.95	65.80	0.37	
79	Benin	4.94	65.67	0.36	
80	Nepal	4.93	65.46	0.35	
81	Croatia	4.90	64.95	0.34	
82	Iceland	4.83	63.77	0.34	
83	Armenia	4.81	63.51	0.33	
84	Ghana	4.79	63.13	0.32	
85	Finland	4.76	62.65	0.31	○
86	Tunisia	4.75	62.50	0.30	
87	Georgia	4.74	62.32	0.30	
88	Uruguay	4.74	62.26	0.29	
89	Kazakhstan	4.72	62.06	0.28	
90	Oman	4.71	61.82	0.27	
91	Nicaragua	4.70	61.59	0.26	
92	Cambodia	4.69	61.51	0.25	
93	Pakistan	4.69	61.48	0.25	
94	Ukraine	4.66	60.94	0.24	
95	Namibia	4.64	60.61	0.23	
96	India	4.63	60.57	0.22	
97	Bhutan	4.63	60.44	0.21	
98	Moldova, Rep.	4.62	60.38	0.20	
99	Bulgaria	4.61	60.19	0.20	○
100	Côte d'Ivoire	4.60	60.06	0.19	
101	Cameroon	4.59	59.80	0.18	
102	Tajikistan	4.59	59.79	0.17	
103	Mozambique	4.56	59.39	0.16	
104	Madagascar	4.56	59.38	0.16	
105	Tanzania, United Rep.	4.53	58.82	0.15	
106	Romania	4.51	58.58	0.14	○
107	Mali	4.46	57.74	0.13	
108	Kyrgyzstan	4.44	57.34	0.12	
109	Israel	4.43	57.19	0.11	○
110	Bosnia and Herzegovina	4.40	56.60	0.11	○
111	Azerbaijan	4.35	55.81	0.10	○
112	Iran, Islamic Rep.	4.34	55.71	0.09	○
113	Argentina	4.30	54.93	0.08	
114	Serbia	4.27	54.58	0.07	○
115	Ethiopia	4.27	54.58	0.07	
116	Bolivia, Plurinational St.	4.27	54.44	0.06	○
117	Egypt	4.24	53.95	0.05	○
118	Guinea	4.20	53.28	0.04	
119	Montenegro	4.18	52.99	0.03	○
120	Albania	4.04	50.62	0.02	○
121	Burundi	3.91	48.56	0.02	
122	Algeria	3.74	45.70	0.01	○
123	Venezuela, Bolivarian Rep.	2.75	29.13	0.00	○
n/a	Belarus	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Economic Forum, *Executive Opinion Survey 2014–2015*
NOTE: ● indicates a strength; ○ a weakness

4.3.3 Domestic market scale

Domestic market scale as measured by GDP, bn PPP$ | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	18,088.05	100.00	1.00	●	65	Slovakia	153.20	51.00	0.50	
2	United States of America	17,348.08	99.57	0.99	●	66	Ethiopia	145.10	50.43	0.49	●
3	India	7,411.09	90.89	0.98	●	67	Dominican Republic	138.51	49.94	0.48	
4	Japan	4,767.16	86.39	0.98	●	68	Kenya	133.02	49.51	0.47	
5	Germany	3,748.09	83.93	0.97	●	69	Bulgaria	129.10	49.19	0.46	
6	Russian Federation	3,576.84	83.46	0.96	●	70	Tanzania, United Rep.	128.16	49.12	0.46	●
7	Brazil	3,275.80	82.56	0.95	●	71	Tunisia	124.73	48.83	0.45	
8	Indonesia	2,685.89	80.53	0.94	●	72	Guatemala	119.81	48.40	0.44	
9	France	2,591.17	80.16	0.94	●	73	Ghana	108.46	47.34	0.43	
10	United Kingdom	2,569.22	80.07	0.93		74	Yemen	104.01	46.89	0.43	●
11	Mexico	2,148.88	78.25	0.92	●	75	Serbia	95.84	46.01	0.42	
12	Italy	2,135.36	78.18	0.91	●	76	Croatia	88.73	45.18	0.41	
13	Korea, Rep.	1,783.95	76.35	0.91		77	Lebanon	81.42	44.25	0.40	
14	Saudi Arabia	1,609.63	75.29	0.90	●	78	Lithuania	79.93	44.05	0.39	
15	Canada	1,595.98	75.21	0.89		79	Jordan	79.91	44.05	0.39	
16	Spain	1,572.11	75.05	0.88		80	Panama	76.77	43.61	0.38	
17	Turkey	1,514.86	74.67	0.87	●	81	Uganda	75.08	43.37	0.37	
18	Iran, Islamic Rep.	1,357.03	73.55	0.87	●	82	Uruguay	71.68	42.86	0.36	
19	Australia	1,099.77	71.39	0.86		83	Côte d'Ivoire	71.67	42.86	0.35	
20	Thailand	1,069.57	71.11	0.85	●	84	Costa Rica	71.23	42.80	0.35	
21	Nigeria	1,052.94	70.95	0.84	●	85	Bolivia, Plurinational St.	70.28	42.65	0.34	
22	Poland	959.85	70.00	0.83	●	86	Cameroon	67.78	42.25	0.33	
23	Argentina	951.00	69.90	0.83	●	87	Nepal	67.14	42.15	0.32	
24	Egypt	946.59	69.86	0.82	●	88	Bahrain	62.17	41.30	0.31	
25	Pakistan	884.23	69.16	0.81	●	89	Slovenia	61.56	41.19	0.31	○
26	Netherlands	808.80	68.24	0.80		90	Zambia	61.39	41.16	0.30	
27	Malaysia	769.45	67.73	0.80		91	Paraguay	58.49	40.62	0.29	
28	South Africa	707.10	66.86	0.79	●	92	Luxembourg	53.67	39.66	0.28	
29	Philippines	693.42	66.66	0.78	●	93	El Salvador	51.19	39.13	0.28	
30	Colombia	642.47	65.88	0.77		94	Cambodia	50.16	38.90	0.27	
31	United Arab Emirates	617.14	65.46	0.76		95	Latvia	48.36	38.49	0.26	○
32	Algeria	548.58	64.25	0.76	●	96	Honduras	39.22	36.08	0.25	
33	Venezuela, Bolivarian Rep.	540.90	64.11	0.75	●	97	Bosnia and Herzegovina	38.29	35.80	0.24	
34	Bangladesh	536.48	64.02	0.74	●	98	Estonia	36.78	35.33	0.24	○
35	Viet Nam	512.58	63.55	0.73	●	99	Botswana	35.87	35.03	0.23	
36	Belgium	483.33	62.95	0.72		100	Mongolia	34.87	34.70	0.22	
37	Switzerland	473.33	62.73	0.72		101	Georgia	34.35	34.52	0.21	
38	Singapore	454.35	62.31	0.71		102	Senegal	34.20	34.47	0.20	
39	Sweden	450.52	62.22	0.70		103	Madagascar	34.05	34.42	0.20	
40	Kazakhstan	420.01	61.50	0.69		104	Albania	31.59	33.52	0.19	
41	Chile	410.85	61.27	0.69		105	Mozambique	31.21	33.37	0.18	
42	Hong Kong (China)	400.36	61.01	0.68		106	Nicaragua	29.69	32.76	0.17	
43	Austria	396.81	60.91	0.67		107	Burkina Faso	29.42	32.65	0.17	
44	Romania	393.83	60.84	0.66		108	TFYR of Macedonia	27.72	31.92	0.16	○
45	Peru	372.69	60.27	0.65		109	Cyprus	27.52	31.83	0.15	○
46	Ukraine	371.81	60.24	0.65		110	Mali	27.50	31.82	0.14	
47	Norway	346.34	59.51	0.64		111	Armenia	24.37	30.30	0.13	
48	Czech Republic	315.86	58.55	0.63		112	Jamaica	24.10	30.16	0.13	○
49	Qatar	306.62	58.25	0.62		113	Mauritius	23.53	29.85	0.12	○
50	Greece	285.30	57.50	0.61		114	Namibia	23.48	29.82	0.11	○
51	Kuwait	282.64	57.40	0.61		115	Tajikistan	22.40	29.22	0.10	
52	Portugal	281.36	57.35	0.60		116	Benin	19.86	27.62	0.09	
53	Israel	272.11	57.01	0.59		117	Malawi	19.58	27.43	0.09	
54	Morocco	259.24	56.50	0.58		118	Kyrgyzstan	19.23	27.18	0.08	
55	Denmark	250.68	56.15	0.57		119	Rwanda	18.90	26.95	0.07	
56	Hungary	247.11	56.01	0.57		120	Niger	18.00	26.27	0.06	
57	Ireland	236.40	55.54	0.56	○	121	Moldova, Rep.	17.78	26.10	0.06	○
58	Finland	221.65	54.87	0.55	○	122	Guinea	15.13	23.75	0.05	
59	Sri Lanka	218.24	54.71	0.54		123	Iceland	14.34	22.93	0.04	○
60	Ecuador	181.15	52.76	0.54		124	Malta	14.12	22.70	0.03	○
61	Belarus	172.76	52.26	0.53		125	Togo	10.16	17.00	0.02	○
62	Azerbaijan	165.93	51.84	0.52		126	Montenegro	9.43	15.47	0.02	○
63	Oman	162.97	51.65	0.51		127	Burundi	8.41	12.89	0.01	○
64	New Zealand	160.80	51.51	0.50		128	Bhutan	5.87	0.00	0.00	○

SOURCE: World Bank, International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

5.1.1 Employment in knowledge-intensive services

Employment in knowledge-intensive services (% of workforce) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Luxembourg	62.30	100.00	1.00	●
2	Singapore	53.07	85.02	0.99	●
3	Switzerland	52.09	83.41	0.98	●
4	Norway	50.66	81.09	0.97	●
5	Sweden	49.39	79.03	0.96	●
6	Iceland	48.15	77.02	0.95	
7	Israel	47.68	76.25	0.94	
8	United Kingdom	47.44	75.86	0.93	
9	Netherlands	46.44	74.24	0.92	
10	Belgium	46.20	73.84	0.91	●
11	Denmark	45.27	72.34	0.90	
12	Finland	45.21	72.23	0.90	
13	Australia	44.90	71.74	0.89	
14	Russian Federation	44.22	70.63	0.88	●
15	France	43.98	70.25	0.87	
16	Canada	43.72	69.82	0.86	
17	Germany	43.50	69.46	0.85	
18	New Zealand (2008)	42.92	68.52	0.84	
19	Estonia	42.72	68.19	0.83	
20	Lithuania	42.65	68.09	0.82	
21	Slovenia	41.68	66.50	0.81	
22	Austria	40.43	64.47	0.80	
23	Ireland	40.30	64.26	0.79	
24	Latvia	39.59	63.11	0.78	
25	Malta	39.33	62.68	0.77	
26	United States of America (2013)	38.01	60.55	0.76	
27	Hong Kong (China)	37.91	60.38	0.75	
28	Czech Republic	37.85	60.29	0.74	
29	Montenegro (2012)	37.21	59.25	0.73	
30	Poland	36.78	58.55	0.72	
31	Egypt (2013)	36.25	57.68	0.71	●
32	United Arab Emirates (2008)	36.09	57.42	0.70	
33	Belarus (2009)	35.88	57.09	0.70	
34	Cyprus	35.79	56.94	0.69	
35	Croatia	35.66	56.73	0.68	
36	Italy	35.62	56.65	0.67	
37	Hungary	35.35	56.22	0.66	
38	Portugal	34.83	55.38	0.65	
39	Ukraine (2013)	33.74	53.60	0.64	
40	Spain	33.09	52.55	0.63	
41	Kazakhstan (2013)	32.33	51.32	0.62	
42	Slovakia	31.94	50.67	0.61	
43	Bulgaria	31.93	50.66	0.60	
44	Lebanon (2007)	31.86	50.55	0.59	
45	Greece	30.59	48.49	0.58	
46	Serbia	29.13	46.11	0.57	
47	Moldova, Rep.	28.69	45.41	0.56	
48	Saudi Arabia	28.09	44.42	0.55	
49	Armenia (2011)	26.89	42.47	0.54	
50	TFYR of Macedonia	26.33	41.56	0.53	
51	Malaysia	25.19	39.70	0.52	
52	Mongolia	25.01	39.42	0.51	
53	Costa Rica (2013)	25.01	39.42	0.50	
54	Bosnia and Herzegovina	24.88	39.20	0.50	
55	Chile	24.83	39.13	0.49	
56	South Africa	24.78	39.04	0.48	
57	Japan	24.37	38.39	0.47	
58	Panama	23.99	37.77	0.46	
59	Argentina	23.92	37.65	0.45	
60	Philippines	23.49	36.96	0.44	
61	Azerbaijan	23.43	36.85	0.43	
62	Georgia (2007)	22.25	34.94	0.42	
63	Brazil	21.63	33.92	0.41	
64	Korea, Rep.	21.56	33.82	0.40	
65	Romania	21.46	33.66	0.39	
66	Uruguay	20.95	32.82	0.38	
67	Tunisia (2012)	20.94	32.81	0.37	
68	Mauritius (2012)	20.37	31.89	0.36	
69	Jamaica (2008)	20.11	31.47	0.35	
70	Bangladesh (2011)	20.01	31.30	0.34	
71	Turkey	19.73	30.84	0.33	
72	Pakistan (2008)	19.48	30.43	0.32	
73	Mexico	19.46	30.40	0.31	
74	Venezuela, Bolivarian Rep. (2013)	19.17	29.94	0.30	
75	Qatar (2013)	18.24	28.43	0.30	
76	Paraguay	18.09	28.18	0.29	
77	Botswana (2010)	17.92	27.89	0.28	
78	Kyrgyzstan	17.88	27.84	0.27	
79	Algeria (2013)	17.57	27.33	0.26	
80	Dominican Republic (2013)	17.18	26.69	0.25	
81	Iran, Islamic Rep.	17.14	26.63	0.24	
82	Sri Lanka	16.88	26.20	0.23	
83	Colombia (2010)	16.82	26.11	0.22	
84	Albania (2009)	16.08	24.91	0.21	
85	Bolivia, Plurinational St. (2009)	15.25	23.57	0.20	
86	Peru (2013)	14.96	23.08	0.19	
87	Nicaragua (2006)	14.82	22.87	0.18	
88	Bhutan	14.78	22.80	0.17	
89	Namibia (2013)	14.54	22.40	0.16	
90	Thailand	13.80	21.20	0.15	○
91	Ecuador	12.33	18.83	0.14	
92	El Salvador (2013)	12.13	18.50	0.13	
93	Guatemala	10.90	16.50	0.12	
94	Viet Nam	10.30	15.53	0.11	○
95	Ghana (2010)	9.61	14.41	0.10	
96	Indonesia (2013)	8.90	13.24	0.10	
97	Zambia (2010)	7.28	10.62	0.09	
98	Morocco (2008)	6.79	9.81	0.08	○
99	Nepal (2008)	4.28	5.74	0.07	○
100	Cambodia (2010)	4.12	5.48	0.06	○
101	Uganda (2013)	4.09	5.43	0.05	○
102	Ethiopia (2013)	3.77	4.91	0.04	
103	Rwanda (2012)	3.76	4.89	0.03	○
104	Madagascar (2012)	3.54	4.54	0.02	○
105	Tanzania, United Rep. (2006)	2.57	2.96	0.01	○
106	Guinea (2010)	0.75	0.00	0.00	○
n/a	Bahrain	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	India	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: International Labour Organization (ILO), *ILOSTAT Database of Labour Statistics* (2006–14)
NOTE: ● indicates a strength; ○ a weakness

5.1.2 Firms offering formal training

Firms offering formal training (% of firms) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China (2012)	79.20	100.00	1.00	●	65	Lebanon	26.60	30.61	0.31	
2	Thailand (2006)	75.30	94.85	0.99	●	66	Morocco	26.30	30.21	0.30	
3	Sweden (2014)	70.30	88.26	0.98	●	67	Bhutan (2015)	26.00	29.82	0.29	
4	Cambodia	67.90	85.09	0.97	●	68	Jamaica (2010)	25.90	29.68	0.28	
5	Ecuador (2010)	65.90	82.45	0.96	●	69	Mauritius (2009)	25.60	29.29	0.27	
6	Colombia (2010)	65.20	81.53	0.95	●	70	Cameroon (2009)	25.50	29.16	0.26	
7	Argentina (2010)	63.60	79.42	0.94	●	71	Namibia (2014)	25.40	29.02	0.25	
8	Kyrgyzstan	62.70	78.23	0.92	●	72	Latvia	25.20	28.76	0.24	○
9	El Salvador (2010)	61.00	75.99	0.91	●	73	Burkina Faso (2009)	24.80	28.23	0.23	
10	Mongolia	60.90	75.86	0.90	●	74	Albania	23.80	26.91	0.22	
11	Peru (2010)	60.10	74.80	0.89	●	75	Montenegro	23.70	26.78	0.20	○
12	Chile (2010)	57.50	71.37	0.88	●	76	Ukraine	22.60	25.33	0.19	
13	Bolivia, Plurinational St. (2010)	57.10	70.84	0.87	●	77	Mozambique (2007)	22.10	24.67	0.18	
14	Dominican Republic (2010)	57.00	70.71	0.86	●	78	Bangladesh	21.90	24.41	0.17	
15	Venezuela, Bolivarian Rep. (2010)	56.00	69.39	0.85	●	79	Guinea (2006)	21.10	23.35	0.16	
16	Rwanda (2011)	55.40	68.60	0.84	●	80	Azerbaijan	20.20	22.16	0.15	
17	Czech Republic	55.10	68.21	0.83		81	Côte d'Ivoire (2009)	19.10	20.71	0.14	
18	Paraguay (2010)	54.90	67.94	0.82	●	82	Israel	18.60	20.05	0.13	○
19	Costa Rica (2010)	54.70	67.68	0.81		83	Sri Lanka (2011)	18.40	19.79	0.12	○
20	Bosnia and Herzegovina	52.40	64.64	0.80	●	84	Senegal (2014)	17.40	18.47	0.11	
21	Botswana (2010)	51.90	63.98	0.77	●	85	Algeria (2007)	17.30	18.34	0.10	
21	Guatemala (2010)	51.90	63.98	0.77	●	86	Armenia	16.20	16.89	0.09	○
23	Belarus	51.10	62.93	0.76	●	87	Hungary	15.80	16.36	0.08	○
24	Mexico (2010)	50.80	62.53	0.75	●	88	Yemen	14.30	14.38	0.06	
25	Malaysia (2007)	50.10	61.61	0.74		89	Madagascar	12.70	12.27	0.05	
26	Croatia	49.30	60.55	0.73		90	Panama (2010)	11.00	10.03	0.04	○
27	Uruguay (2010)	48.60	59.63	0.72	●	91	Georgia	10.50	9.37	0.03	○
28	Nicaragua (2010)	47.20	57.78	0.71	●	92	Egypt	5.20	2.37	0.02	○
29	TFYR of Macedonia	46.90	57.39	0.70		93	Indonesia (2009)	4.70	1.72	0.01	○
30	Russian Federation (2012)	46.10	56.33	0.69		94	Jordan	3.40	0.00	0.00	○
31	Slovakia	43.50	52.90	0.67		n/a	Australia	n/a	n/a	n/a	
31	Viet Nam (2009)	43.50	52.90	0.67		n/a	Austria	n/a	n/a	n/a	
33	Bulgaria	42.70	51.85	0.66		n/a	Bahrain	n/a	n/a	n/a	
34	Brazil (2009)	42.20	51.19	0.65		n/a	Belgium	n/a	n/a	n/a	
35	Lithuania	42.00	50.92	0.63		n/a	Canada	n/a	n/a	n/a	
36	Slovenia	41.50	50.26	0.62		n/a	Cyprus	n/a	n/a	n/a	
37	Romania	40.70	49.21	0.61		n/a	Denmark	n/a	n/a	n/a	
38	Kenya	40.60	49.08	0.60		n/a	Finland	n/a	n/a	n/a	
39	Ghana	40.10	48.42	0.59	●	n/a	France	n/a	n/a	n/a	
40	Serbia	37.80	45.38	0.58		n/a	Germany	n/a	n/a	n/a	
41	South Africa (2007)	36.80	44.06	0.57		n/a	Greece	n/a	n/a	n/a	
42	India (2014)	35.90	42.88	0.56		n/a	Hong Kong (China)	n/a	n/a	n/a	
43	Honduras (2010)	35.80	42.74	0.55		n/a	Iceland	n/a	n/a	n/a	
44	Estonia	35.20	41.95	0.54		n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
45	Uganda	34.70	41.29	0.53		n/a	Ireland	n/a	n/a	n/a	
46	Poland	34.60	41.16	0.52		n/a	Italy	n/a	n/a	n/a	
47	Tajikistan	33.10	39.18	0.51		n/a	Japan	n/a	n/a	n/a	
48	Malawi (2014)	32.90	38.92	0.49		n/a	Korea, Rep.	n/a	n/a	n/a	
49	Moldova, Rep.	32.40	38.26	0.48		n/a	Kuwait	n/a	n/a	n/a	
50	Mali (2010)	32.10	37.86	0.46		n/a	Luxembourg	n/a	n/a	n/a	
50	Niger (2009)	32.10	37.86	0.46		n/a	Malta	n/a	n/a	n/a	
52	Burundi (2014)	32.00	37.73	0.44		n/a	Netherlands	n/a	n/a	n/a	
52	Pakistan	32.00	37.73	0.44		n/a	New Zealand	n/a	n/a	n/a	
54	Nepal	31.90	37.60	0.43	●	n/a	Norway	n/a	n/a	n/a	
55	Philippines (2009)	31.10	36.54	0.42		n/a	Oman	n/a	n/a	n/a	
56	Togo (2009)	31.00	36.41	0.41	●	n/a	Portugal	n/a	n/a	n/a	
57	Nigeria (2014)	30.80	36.15	0.40		n/a	Qatar	n/a	n/a	n/a	
58	Tanzania, United Rep.	30.70	36.02	0.39		n/a	Saudi Arabia	n/a	n/a	n/a	
59	Ethiopia (2011)	30.00	35.09	0.38		n/a	Singapore	n/a	n/a	n/a	
60	Tunisia	28.90	33.64	0.37		n/a	Spain	n/a	n/a	n/a	
61	Kazakhstan	28.40	32.98	0.34		n/a	Switzerland	n/a	n/a	n/a	
61	Turkey	28.40	32.98	0.34		n/a	United Arab Emirates	n/a	n/a	n/a	
63	Zambia	28.20	32.72	0.33		n/a	United Kingdom	n/a	n/a	n/a	
64	Benin (2009)	27.00	31.13	0.32		n/a	United States of America	n/a	n/a	n/a	

SOURCE: World Bank, *Enterprise Surveys* (2006–15)
NOTE: ● indicates a strength; ○ a weakness

5.1.3 GERD performed by business enterprise

GERD: Performed by business enterprise (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Israel	3.47	100.00	1.00	●
2	Korea, Rep.	3.36	96.74	0.99	●
3	Japan	2.79	80.31	0.98	●
4	Finland	2.15	61.93	0.97	
5	Sweden	2.12	61.07	0.95	
6	Austria	2.11	60.94	0.94	●
7	Switzerland (2012)	2.05	59.21	0.93	
8	Denmark	1.98	56.92	0.92	
9	Germany	1.93	55.57	0.91	
10	United States of America (2013)	1.92	55.43	0.90	
11	Slovenia	1.85	53.19	0.88	
12	Belgium	1.76	50.58	0.87	
13	China	1.58	45.57	0.86	
14	France	1.46	42.11	0.85	
15	Australia (2013)	1.24	35.63	0.84	
16	Singapore (2013)	1.19	34.26	0.83	
17	Czech Republic	1.12	32.21	0.81	
18	Ireland	1.11	32.11	0.80	
19	Netherlands	1.11	31.98	0.79	
20	United Kingdom	1.10	31.56	0.78	
21	Iceland	1.07	30.95	0.77	
22	Hungary	0.98	28.25	0.76	
23	Norway	0.92	26.43	0.74	
24	Canada	0.80	23.17	0.73	
25	Italy	0.72	20.65	0.72	
26	Russian Federation	0.71	20.39	0.71	
27	Malaysia (2012)	0.70	20.29	0.70	
28	Luxembourg	0.66	19.03	0.69	
29	Spain	0.64	18.51	0.67	
30	Estonia	0.62	17.90	0.66	
31	Portugal	0.59	17.09	0.65	
32	New Zealand (2013)	0.54	15.67	0.64	
33	United Arab Emirates	0.52	14.98	0.63	
34	Bulgaria	0.51	14.76	0.62	
35	Malta	0.51	14.61	0.60	
36	Turkey	0.50	14.44	0.59	
37	Belarus (2013)	0.44	12.68	0.58	
38	Poland	0.44	12.62	0.57	
39	Croatia	0.38	10.98	0.56	
40	Ukraine	0.37	10.70	0.55	
41	Hong Kong (China) (2013)	0.33	9.45	0.53	
42	Slovakia	0.33	9.41	0.52	
43	South Africa (2012)	0.32	9.33	0.51	
44	Lithuania	0.30	8.64	0.50	
45	India (2011)	0.29	8.40	0.49	
46	Greece	0.28	8.18	0.48	
47	Latvia	0.25	7.06	0.47	
48	Serbia	0.23	6.63	0.45	
49	Morocco (2010)	0.21	6.16	0.44	
50	Ecuador (2011)	0.20	5.69	0.43	
51	Montenegro (2013)	0.18	5.32	0.42	
52	Thailand (2011)	0.18	5.27	0.41	
53	Costa Rica (2013)	0.18	5.10	0.40	
54	Mexico (2011)	0.17	4.78	0.38	
55	Uganda (2010)	0.17	4.76	0.37	
56	Romania	0.16	4.58	0.36	
57	Argentina (2013)	0.15	4.27	0.35	
58	Chile	0.13	3.66	0.34	
59	Qatar (2012)	0.12	3.50	0.33	
60	Cyprus	0.08	2.35	0.31	
61	Iran, Islamic Rep. (2008)	0.07	2.05	0.30	
62	Moldova, Rep.	0.07	1.97	0.29	
63	Kenya (2010)	0.07	1.96	0.28	
64	Egypt	0.05	1.57	0.27	
65	Kazakhstan (2013)	0.05	1.48	0.26	
66	Bosnia and Herzegovina	0.05	1.46	0.24	
67	Colombia	0.05	1.45	0.23	
68	Viet Nam (2011)	0.05	1.43	0.22	
69	Philippines (2013)	0.05	1.42	0.21	
70	Sri Lanka (2013)	0.05	1.30	0.20	
71	Oman (2013)	0.04	1.18	0.19	
72	TFYR of Macedonia (2011)	0.03	1.00	0.17	
73	Uruguay (2013)	0.03	0.94	0.16	○
74	Botswana (2012)	0.03	0.78	0.15	
75	Indonesia (2013)	0.02	0.63	0.14	
76	Azerbaijan	0.02	0.60	0.13	
77	Namibia (2010)	0.02	0.52	0.12	
78	Kyrgyzstan	0.02	0.52	0.10	
79	Mongolia	0.01	0.32	0.09	○
80	Mali (2007)	0.01	0.21	0.08	
81	Ethiopia (2013)	0.01	0.20	0.07	
82	Zambia (2008)	0.01	0.16	0.06	○
83	Panama (2011)	0.00	0.10	0.05	○
84	Senegal (2010)	0.00	0.05	0.03	○
85	Ghana (2010)	0.00	0.01	0.02	○
86	Paraguay (2011)	0.00	0.01	0.01	○
87	Guatemala (2012)	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Brazil	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

5.1.4 GERD financed by business enterprise

GERD: Financed by business enterprise (% of total GERD) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Japan	77.26	100.00	1.00	●
2	China	75.42	97.61	0.99	●
3	Korea, Rep.	75.33	97.49	0.98	●
4	United Arab Emirates	74.29	96.14	0.97	●
5	Slovenia	68.39	88.50	0.96	●
6	Germany (2013)	65.44	84.68	0.95	
7	Australia (2008)	61.91	80.10	0.93	
8	Sweden (2013)	60.96	78.87	0.92	
9	United States of America (2013)	60.85	78.74	0.91	
10	Switzerland (2012)	60.78	78.64	0.90	
11	Malaysia (2012)	60.20	77.89	0.89	
12	Denmark	57.88	74.88	0.88	
13	Belgium (2013)	56.97	73.70	0.87	
14	France (2013)	55.03	71.19	0.86	
15	Ireland	53.62	69.37	0.85	
16	Finland	53.53	69.25	0.84	
17	Singapore (2013)	52.67	68.14	0.83	
18	Thailand (2011)	51.74	66.94	0.82	●
19	Netherlands	51.53	66.66	0.80	
20	Turkey	50.87	65.80	0.79	
21	Malta	50.02	64.70	0.78	
22	Hungary	48.28	62.45	0.77	
23	Hong Kong (China) (2013)	47.58	61.54	0.76	
24	Austria (2015)	47.16	60.99	0.75	
25	United Kingdom	46.48	60.11	0.74	
26	Spain (2013)	46.30	59.89	0.73	
27	Canada	45.39	58.70	0.72	
28	Italy (2013)	45.19	58.45	0.71	
29	Belarus (2013)	43.79	56.63	0.70	
30	Norway (2013)	43.14	55.79	0.68	
31	Croatia	42.91	55.50	0.67	
32	Montenegro (2013)	42.32	54.72	0.66	
33	Portugal (2013)	42.27	54.66	0.65	
34	Sri Lanka (2013)	40.68	52.61	0.64	●
35	Brazil (2013)	40.35	52.17	0.63	
36	New Zealand (2013)	39.78	51.43	0.62	
37	Iceland (2013)	39.16	50.63	0.61	
38	Poland	39.00	50.42	0.60	
39	South Africa (2012)	38.34	49.57	0.59	
40	Czech Republic (2013)	37.60	48.60	0.58	
41	Estonia	36.97	47.79	0.57	
42	Philippines (2013)	36.86	47.65	0.55	
43	Israel (2013)	36.54	47.24	0.54	
44	Ukraine	35.17	45.46	0.53	
45	Romania	32.91	42.54	0.52	
46	Slovakia	32.21	41.63	0.51	
47	Chile	31.96	41.31	0.50	
48	Lithuania	31.68	40.94	0.49	
49	Iran, Islamic Rep. (2008)	30.92	39.95	0.48	
50	Colombia	30.52	39.43	0.47	
51	Greece	29.98	38.74	0.46	
52	Morocco (2010)	29.94	38.68	0.45	
53	Kazakhstan (2013)	28.92	37.37	0.43	
54	Viet Nam (2011)	28.40	36.70	0.42	
55	Latvia	27.83	35.95	0.41	
56	Russian Federation	27.07	34.97	0.40	
57	Argentina (2008)	26.52	34.26	0.39	
58	Oman (2013)	24.55	31.70	0.38	
59	Bosnia and Herzegovina	24.24	31.30	0.37	
60	Qatar (2012)	24.18	31.23	0.36	
61	Mexico	23.76	30.68	0.35	
62	Namibia (2010)	19.83	25.59	0.34	
63	Bulgaria (2013)	19.51	25.18	0.33	
64	Panama (2011)	18.86	24.33	0.32	
65	Tunisia (2012)	18.70	24.12	0.30	
66	Luxembourg (2013)	16.51	21.29	0.29	
67	Uganda (2010)	13.67	17.61	0.28	
68	Cyprus (2013)	12.11	15.59	0.27	
69	Burkina Faso (2009)	11.93	15.36	0.26	
70	Uruguay (2013)	10.24	13.16	0.25	
71	Mali (2007)	10.10	12.98	0.24	
72	Serbia	8.19	10.51	0.23	
73	Egypt	8.09	10.38	0.22	
74	Mongolia	7.47	9.58	0.21	
75	Kyrgyzstan	7.41	9.50	0.20	
76	Botswana (2012)	5.81	7.43	0.18	
77	Azerbaijan	5.25	6.70	0.17	
78	Bolivia, Plurinational St. (2009)	5.20	6.64	0.16	
79	Costa Rica (2013)	4.97	6.33	0.15	○
80	Kenya (2010)	4.34	5.52	0.14	
81	Senegal (2010)	4.10	5.20	0.13	
82	Albania (2008)	3.26	4.12	0.12	
83	Zambia (2008)	3.23	4.08	0.11	
84	Tajikistan (2011)	1.65	2.03	0.10	
85	Kuwait (2013)	1.41	1.73	0.09	○
86	Paraguay (2012)	0.85	1.00	0.08	
87	Ethiopia (2013)	0.75	0.87	0.07	
88	El Salvador (2013)	0.71	0.82	0.05	○
89	Ecuador (2011)	0.42	0.44	0.04	○
90	Mauritius (2012)	0.27	0.25	0.03	○
91	Nigeria (2007)	0.16	0.10	0.02	
92	Ghana (2010)	0.10	0.03	0.01	○
93	Tanzania, United Rep. (2010)	0.08	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	India	n/a	n/a	n/a	
n/a	Indonesia	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

5.1.5 Females employed with advanced degrees

Females employed with advanced degrees, % total employed (25+ years old) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Belarus (2009)	33.84	100.00	1.00	●
2	Russian Federation	32.98	97.43	0.99	●
3	Israel (2013)	28.38	83.83	0.98	●
4	Ukraine (2013)	28.10	83.01	0.97	●
5	Armenia (2013)	27.45	81.08	0.95	●
6	Lithuania	26.13	77.19	0.94	●
7	Finland	26.00	76.81	0.93	
8	Estonia	25.13	74.23	0.92	●
9	Ireland	24.18	71.40	0.91	
10	Cyprus	24.10	71.16	0.90	
11	Norway	24.05	71.03	0.89	
12	Sweden	23.27	68.72	0.87	
13	Belgium	23.18	68.45	0.86	
14	Singapore (2013)	22.73	67.13	0.85	
15	Australia (2013)	22.64	66.85	0.84	
16	Latvia	22.54	66.54	0.83	
17	Luxembourg	22.34	65.97	0.82	
18	United Kingdom	21.74	64.18	0.80	
19	Iceland	21.50	63.48	0.79	
20	Spain	21.48	63.42	0.78	
21	Denmark	21.08	62.25	0.77	
22	New Zealand (2013)	20.83	61.49	0.76	
23	France	20.45	60.36	0.75	
24	Japan	19.66	58.04	0.74	
25	Bulgaria	19.37	57.18	0.72	
26	Poland	18.95	55.94	0.71	
27	Slovenia	18.77	55.40	0.70	
28	Netherlands	18.32	54.06	0.69	
29	Kazakhstan (2013)	17.55	51.80	0.68	
30	Switzerland	17.00	50.16	0.67	
31	Mongolia	16.71	49.32	0.66	
32	Venezuela, Bolivarian Rep. (2012)	16.69	49.24	0.64	●
33	Panama (2012)	16.59	48.94	0.63	
34	Greece	16.50	48.67	0.62	
35	Argentina	16.44	48.52	0.61	
36	Canada (2015)	16.31	48.13	0.60	
37	Austria	15.81	46.66	0.59	
38	Chile	15.48	45.68	0.57	
39	Croatia	15.04	44.37	0.56	
40	Portugal	14.90	43.95	0.55	
41	Hungary	14.89	43.92	0.54	
42	Georgia	14.82	43.73	0.53	
43	Moldova, Rep. (2013)	13.95	41.13	0.52	
44	Peru (2013)	13.89	40.98	0.51	
45	Uruguay	13.70	40.41	0.49	
46	Colombia (2013)	13.16	38.81	0.48	
47	Costa Rica (2013)	13.16	38.80	0.47	
48	Azerbaijan (2013)	12.87	37.94	0.46	
49	Hong Kong (China)	12.71	37.47	0.45	○
50	Philippines	12.71	37.46	0.44	
51	Dominican Republic (2013)	12.52	36.93	0.43	
52	Paraguay (2013)	12.43	36.66	0.41	
53	Germany	12.42	36.61	0.40	○
54	Serbia (2013)	12.22	36.02	0.39	
55	Slovakia	12.00	35.37	0.38	
56	Malta	11.96	35.25	0.37	
57	TFYR of Macedonia	11.87	35.00	0.36	
58	Malaysia	11.42	33.66	0.34	
59	Czech Republic	11.11	32.75	0.33	○
60	Italy	11.05	32.57	0.32	○
61	Kyrgyzstan (2013)	10.81	31.85	0.31	
62	South Africa	10.16	29.93	0.30	
63	Ecuador	9.96	29.34	0.29	
64	Romania	9.59	28.25	0.28	
65	Bosnia and Herzegovina	9.55	28.12	0.26	
66	Botswana (2010)	9.16	26.97	0.25	
67	Brazil	9.14	26.92	0.24	
68	Albania	8.97	26.42	0.23	
69	Mexico (2013)	8.16	24.01	0.22	○
70	Sri Lanka (2012)	7.58	22.29	0.21	
71	Thailand (2013)	7.55	22.20	0.20	○
72	Turkey	7.37	21.69	0.18	○
73	Mauritius (2010)	7.35	21.63	0.17	
74	Viet Nam	6.58	19.34	0.16	○
75	Ethiopia (2012)	6.02	17.69	0.15	
76	Saudi Arabia	5.76	16.91	0.14	○
77	Egypt (2013)	5.51	16.19	0.13	
78	Qatar (2013)	4.50	13.19	0.11	
79	Algeria (2010)	4.41	12.93	0.10	
80	Indonesia (2013)	3.94	11.53	0.09	
81	Guatemala (2013)	3.52	10.30	0.08	
82	Uganda (2013)	2.71	7.90	0.07	
83	Madagascar (2012)	2.31	6.72	0.06	
84	Bhutan (2013)	1.12	3.18	0.05	○
85	Senegal (2011)	0.74	2.05	0.03	○
86	Tanzania, United Rep. (2013)	0.67	1.86	0.02	○
87	Mozambique (2012)	0.51	1.39	0.01	○
88	El Salvador (2013)	0.04	0.00	0.00	○
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	India	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Korea, Rep.	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Morocco	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	United States of America	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: International Labour Organization (ILO), ILOSTAT *Annual Indicators* (2006–2014) and Statistics Canada, Table 282-0004

NOTE: ● indicates a strength; ○ a weakness

5.2.1 University/industry research collaboration

Average answer to the survey question: In your country, to what extent do people collaborate and share ideas in between companies and universities/research institutions? [1 = not at all; 7 = to a great extent] | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	5.97	82.80	1.00	●
2	United States of America	5.85	80.83	0.99	●
3	Switzerland	5.79	79.83	0.98	●
4	United Kingdom	5.67	77.76	0.98	●
5	Singapore	5.58	76.29	0.97	
6	Belgium	5.58	76.29	0.96	●
7	Israel	5.50	75.08	0.95	●
8	Qatar	5.44	73.96	0.94	●
9	Netherlands	5.38	72.99	0.93	
10	Germany	5.34	72.25	0.93	
11	Sweden	5.33	72.12	0.92	
12	Malaysia	5.33	72.10	0.91	●
13	Ireland	5.24	70.71	0.90	
14	Norway	5.02	66.98	0.89	
15	Japan	5.00	66.74	0.89	
16	New Zealand	4.91	65.10	0.88	
17	Luxembourg	4.90	65.05	0.87	
18	Canada	4.90	65.01	0.86	
19	Denmark	4.90	64.96	0.85	
20	Australia	4.84	64.06	0.84	
21	United Arab Emirates	4.72	62.07	0.84	
22	Portugal	4.68	61.38	0.83	
23	Austria	4.68	61.30	0.82	
24	Iceland	4.62	60.32	0.81	
25	Korea, Rep.	4.62	60.27	0.80	
26	Lithuania	4.61	60.11	0.80	
27	Hong Kong (China)	4.59	59.78	0.79	
28	France	4.58	59.72	0.78	
29	Indonesia	4.55	59.12	0.77	●
30	South Africa	4.49	58.11	0.76	
31	China	4.40	56.69	0.75	
32	Costa Rica	4.36	55.96	0.75	
33	Estonia	4.36	55.92	0.74	
34	Bosnia and Herzegovina	4.32	55.29	0.73	●
35	Hungary	4.27	54.56	0.72	
36	Kenya	4.22	53.62	0.71	
37	Saudi Arabia	4.20	53.33	0.70	
38	Chile	4.20	53.32	0.70	
39	Cyprus	4.19	53.18	0.69	
40	Panama	4.04	50.63	0.68	
41	Czech Republic	4.00	50.00	0.67	
42	Mexico	3.97	49.52	0.66	
43	Slovenia	3.96	49.26	0.66	
44	Thailand	3.95	49.23	0.65	
45	Montenegro	3.95	49.13	0.64	
46	Ecuador	3.94	49.05	0.63	●
47	Honduras	3.94	49.05	0.62	●
48	Colombia	3.93	48.77	0.61	
49	India	3.87	47.85	0.61	
50	Malta	3.86	47.59	0.60	
51	Jordan	3.82	47.07	0.59	
52	El Salvador	3.81	46.84	0.58	
53	Brazil	3.80	46.65	0.57	
54	Philippines	3.79	46.57	0.57	
55	Jamaica	3.79	46.56	0.56	
56	Spain	3.77	46.19	0.55	
57	Italy	3.73	45.47	0.54	
58	TFYR of Macedonia	3.71	45.18	0.53	
59	Turkey	3.69	44.78	0.52	
60	Uganda	3.68	44.69	0.52	
61	Latvia	3.67	44.55	0.51	
62	Rwanda	3.65	44.20	0.50	
63	Senegal	3.64	43.96	0.49	
64	Argentina	3.64	43.92	0.48	
65	Russian Federation	3.63	43.87	0.48	
66	Guatemala	3.62	43.63	0.47	
67	Oman	3.62	43.58	0.46	
68	Uruguay	3.59	43.21	0.45	
69	Romania	3.59	43.16	0.44	
70	Bolivia, Plurinational St.	3.54	42.28	0.43	
71	Poland	3.50	41.73	0.43	
72	Ukraine	3.50	41.71	0.42	
73	Zambia	3.48	41.36	0.41	
74	Ghana	3.46	40.96	0.40	
75	Ethiopia	3.46	40.96	0.39	
76	Namibia	3.46	40.95	0.39	
77	Croatia	3.39	39.86	0.38	
78	Cameroon	3.37	39.56	0.37	
79	Tanzania, United Rep.	3.37	39.47	0.36	
80	Slovakia	3.36	39.31	0.35	
81	Côte d'Ivoire	3.34	38.99	0.34	
82	Kazakhstan	3.29	38.24	0.34	
83	Mozambique	3.28	38.04	0.33	
84	Bahrain	3.27	37.90	0.32	
85	Tajikistan	3.27	37.89	0.31	
86	Viet Nam	3.27	37.84	0.30	
87	Madagascar	3.26	37.62	0.30	
88	Dominican Republic	3.25	37.57	0.29	
89	Serbia	3.24	37.35	0.28	
90	Morocco	3.23	37.21	0.27	
91	Pakistan	3.21	36.87	0.26	
92	Mali	3.20	36.66	0.25	
93	Mauritius	3.19	36.49	0.25	
94	Iran, Islamic Rep.	3.18	36.35	0.24	
95	Azerbaijan	3.16	35.95	0.23	
96	Botswana	3.14	35.74	0.22	
97	Venezuela, Bolivarian Rep.	3.13	35.45	0.21	
98	Kuwait	3.10	35.06	0.20	
99	Peru	3.10	34.97	0.20	
100	Sri Lanka	3.08	34.61	0.19	
101	Greece	3.06	34.35	0.18	○
102	Armenia	3.05	34.20	0.17	
103	Bulgaria	3.00	33.33	0.16	○
104	Mongolia	2.99	33.10	0.16	
105	Cambodia	2.98	32.95	0.15	
106	Nicaragua	2.95	32.55	0.14	
107	Tunisia	2.92	32.01	0.13	○
108	Lebanon	2.88	31.39	0.12	○
109	Malawi	2.84	30.66	0.11	
110	Burundi	2.78	29.75	0.11	
111	Nigeria	2.75	29.20	0.10	
112	Moldova, Rep.	2.74	28.99	0.09	○
113	Paraguay	2.70	28.29	0.08	
114	Bhutan	2.68	28.08	0.07	
115	Benin	2.68	27.94	0.07	
116	Nepal	2.64	27.34	0.06	○
117	Georgia	2.64	27.28	0.05	○
118	Kyrgyzstan	2.57	26.19	0.04	○
119	Bangladesh	2.56	25.96	0.03	○
120	Egypt	2.43	23.78	0.02	○
121	Albania	2.34	22.32	0.02	○
122	Algeria	2.26	21.07	0.01	○
123	Guinea	2.18	19.72	0.00	○
n/a	Belarus	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Economic Forum, *Executive Opinion Survey 2014–2015*
NOTE: ● indicates a strength; ○ a weakness

5.2.2 State of cluster development

Average answer to the survey question on the role of clusters in the economy: In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? [1 = nonexistent; 7 = widespread in many fields] | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United Arab Emirates	5.49	74.83	1.00	●
2	United States of America	5.49	74.78	0.99	●
3	Germany	5.46	74.40	0.98	●
4	Italy	5.46	74.27	0.98	●
5	Malaysia	5.32	72.02	0.97	●
6	Switzerland	5.30	71.70	0.96	
7	United Kingdom	5.30	71.69	0.95	
8	Qatar	5.28	71.41	0.94	●
9	Japan	5.28	71.26	0.93	
10	Netherlands	5.22	70.28	0.93	
11	Norway	5.21	70.13	0.92	
12	Singapore	5.13	68.81	0.91	
13	Luxembourg	5.07	67.76	0.90	
14	Hong Kong (China)	5.04	67.28	0.89	
15	Austria	4.93	65.42	0.89	
16	Finland	4.91	65.10	0.88	
17	Ireland	4.89	64.81	0.87	
18	Sweden	4.82	63.74	0.86	
19	Canada	4.80	63.27	0.85	
20	Saudi Arabia	4.60	60.03	0.84	●
21	Belgium	4.58	59.63	0.84	
22	Korea, Rep.	4.53	58.77	0.83	
23	China	4.53	58.77	0.82	
24	Denmark	4.46	57.74	0.81	
25	France	4.46	57.65	0.80	
26	Bahrain	4.45	57.51	0.80	
27	Indonesia	4.37	56.15	0.79	●
28	India	4.36	55.97	0.78	
29	Israel	4.34	55.72	0.77	
30	Jordan	4.27	54.55	0.76	●
31	Egypt	4.27	54.48	0.75	●
32	South Africa	4.21	53.58	0.75	
33	Mexico	4.19	53.24	0.74	
34	Portugal	4.16	52.64	0.73	
35	Brazil	4.15	52.52	0.72	
36	Kenya	4.08	51.29	0.71	
37	Zambia	4.07	51.22	0.70	●
38	Thailand	4.07	51.16	0.70	
39	Australia	4.06	51.04	0.69	
40	Panama	4.04	50.61	0.68	
41	Costa Rica	4.02	50.41	0.67	
42	Rwanda	4.01	50.11	0.66	●
43	Mauritius	4.01	50.10	0.66	
44	Philippines	3.98	49.64	0.65	
45	New Zealand	3.98	49.59	0.64	
46	Iceland	3.97	49.57	0.63	
47	Honduras	3.97	49.51	0.62	●
48	Malta	3.96	49.33	0.61	
49	Spain	3.92	48.72	0.61	
50	Turkey	3.91	48.58	0.60	
51	Cyprus	3.89	48.19	0.59	
52	Czech Republic	3.88	48.05	0.58	
53	Slovakia	3.88	48.00	0.57	
54	Namibia	3.87	47.90	0.57	
55	Guatemala	3.83	47.21	0.56	
56	Viet Nam	3.82	47.00	0.55	
57	Kuwait	3.78	46.26	0.54	
58	Bangladesh	3.76	45.98	0.53	●
59	Estonia	3.76	45.93	0.52	
60	Sri Lanka	3.75	45.90	0.52	
61	Cambodia	3.74	45.70	0.51	●
62	Colombia	3.70	44.94	0.50	
63	Mali	3.69	44.75	0.49	
64	Pakistan	3.68	44.68	0.48	
65	Lebanon	3.68	44.66	0.48	
66	El Salvador	3.67	44.47	0.47	
67	Chile	3.66	44.38	0.46	
68	TFYR of Macedonia	3.66	44.27	0.45	
69	Romania	3.65	44.14	0.44	
70	Hungary	3.63	43.79	0.43	
71	Ghana	3.62	43.68	0.43	
72	Senegal	3.60	43.39	0.42	
73	Latvia	3.60	43.25	0.41	
74	Oman	3.59	43.14	0.40	
75	Poland	3.58	43.02	0.39	
76	Iran, Islamic Rep.	3.56	42.69	0.39	
77	Dominican Republic	3.54	42.33	0.38	
78	Nigeria	3.52	42.06	0.37	
79	Bhutan	3.52	41.97	0.36	
80	Lithuania	3.52	41.93	0.35	
81	Uganda	3.49	41.52	0.34	
82	Tanzania, United Rep.	3.46	40.98	0.34	
83	Mozambique	3.46	40.97	0.33	
84	Jamaica	3.46	40.95	0.32	
85	Slovenia	3.46	40.94	0.31	○
86	Morocco	3.43	40.45	0.30	
87	Benin	3.42	40.36	0.30	
88	Azerbaijan	3.40	40.08	0.29	
89	Ecuador	3.40	40.06	0.28	
90	Cameroon	3.34	38.94	0.27	
91	Tunisia	3.33	38.77	0.26	
92	Uruguay	3.31	38.56	0.25	
93	Botswana	3.31	38.55	0.25	
94	Ethiopia	3.29	38.18	0.24	
95	Peru	3.19	36.50	0.23	
96	Armenia	3.17	36.18	0.22	
97	Nepal	3.17	36.15	0.21	
98	Malawi	3.16	36.05	0.20	
99	Algeria	3.16	36.05	0.20	
100	Bulgaria	3.16	35.98	0.19	○
101	Russian Federation	3.13	35.56	0.18	○
102	Bolivia, Plurinational St.	3.13	35.44	0.17	
103	Serbia	3.12	35.39	0.16	○
104	Nicaragua	3.11	35.24	0.16	
105	Kazakhstan	3.11	35.22	0.15	
106	Argentina	3.08	34.60	0.14	
107	Croatia	3.05	34.15	0.13	○
108	Guinea	3.02	33.75	0.12	
109	Georgia	3.02	33.67	0.11	○
110	Tajikistan	2.99	33.22	0.11	
111	Bosnia and Herzegovina	2.96	32.67	0.10	○
112	Madagascar	2.95	32.57	0.09	
113	Ukraine	2.95	32.50	0.08	○
114	Greece	2.95	32.47	0.07	○
115	Montenegro	2.94	32.36	0.07	○
116	Kyrgyzstan	2.87	31.24	0.06	
117	Côte d'Ivoire	2.87	31.22	0.05	○
118	Mongolia	2.86	30.98	0.04	○
119	Albania	2.85	30.87	0.03	○
120	Paraguay	2.78	29.63	0.02	○
121	Burundi	2.73	28.88	0.02	
122	Venezuela, Bolivarian Rep.	2.33	22.13	0.01	○
123	Moldova, Rep.	2.32	22.05	0.00	○
n/a	Belarus	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Economic Forum, *Executive Opinion Survey 2014–2015*
NOTE: ● indicates a strength; ○ a weakness

5.2.3 GERD financed by abroad

GERD: Financed by abroad (% of total GERD) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Mozambique (2010)	78.14	100.00	1.00	●
2	Burkina Faso (2009)	59.61	76.28	0.99	●
3	Uganda (2010)	57.30	73.34	0.98	●
4	Guatemala (2012)	49.01	62.72	0.97	●
5	Israel (2013)	48.83	62.50	0.96	●
6	Bulgaria (2013)	48.27	61.78	0.95	●
7	Kenya (2010)	47.14	60.33	0.94	●
8	Latvia	44.23	56.60	0.93	●
9	Tanzania, United Rep. (2010)	42.00	53.76	0.92	●
10	Senegal (2010)	40.53	51.87	0.91	●
11	Burundi (2008)	39.92	51.08	0.90	●
12	Lithuania	34.25	43.84	0.89	●
13	Luxembourg (2013)	32.34	41.39	0.88	
14	Ghana (2010)	31.22	39.95	0.87	●
15	Czech Republic (2013)	27.15	34.75	0.86	●
16	Slovakia	23.68	30.30	0.85	●
17	Montenegro (2013)	22.52	28.82	0.84	●
18	Malta	21.49	27.50	0.83	
19	Panama (2011)	20.73	26.53	0.82	●
20	Iceland (2013)	20.07	25.69	0.81	
21	Ukraine	19.80	25.33	0.80	●
22	Cyprus (2013)	19.58	25.05	0.79	
23	Ireland	19.27	24.66	0.78	
24	United Kingdom	18.89	24.18	0.77	
25	Hungary	17.54	22.45	0.76	
26	Finland	17.32	22.17	0.74	
27	Romania	17.00	21.75	0.73	●
28	El Salvador (2013)	16.38	20.96	0.72	●
29	Austria (2015)	15.13	19.37	0.71	
30	Georgia	14.27	18.26	0.70	
31	Chile	13.77	17.62	0.69	
32	Poland	13.36	17.10	0.68	
33	Greece	13.28	17.00	0.67	
34	Belgium (2013)	13.13	16.80	0.66	
35	South Africa (2012)	13.06	16.71	0.65	
36	Croatia	12.84	16.43	0.64	
37	Moldova, Rep.	12.79	16.37	0.63	
38	Netherlands	12.49	15.98	0.62	○
39	Serbia	12.45	15.93	0.61	
40	Estonia	12.45	15.93	0.60	
41	Switzerland (2012)	12.07	15.45	0.59	
42	Togo (2012)	12.06	15.43	0.58	●
43	Bosnia and Herzegovina	12.05	15.43	0.57	
44	Madagascar (2009)	10.58	13.54	0.56	●
45	Italy (2013)	9.65	12.35	0.55	
46	Norway (2013)	9.47	12.12	0.54	
47	Slovenia	9.26	11.86	0.53	
48	Mali (2010)	8.81	11.27	0.52	●
49	France (2013)	8.02	10.26	0.51	○
50	Belarus (2013)	7.95	10.17	0.50	
51	Paraguay (2012)	7.71	9.87	0.49	
52	Denmark	7.40	9.47	0.48	○
53	Albania (2008)	7.37	9.43	0.47	
54	Spain (2013)	7.36	9.42	0.46	○
55	Costa Rica (2013)	7.32	9.36	0.45	
56	New Zealand (2013)	7.23	9.25	0.44	○
57	Botswana (2012)	6.81	8.72	0.43	
58	Hong Kong (China) (2013)	6.79	8.69	0.42	○
59	Sweden (2013)	6.71	8.59	0.41	○
60	Mauritius (2012)	6.43	8.23	0.40	
61	Portugal (2013)	6.12	7.83	0.39	○
62	Canada	6.01	7.70	0.38	○
63	Singapore (2013)	5.84	7.47	0.37	○
64	Uruguay (2013)	5.38	6.88	0.36	
65	Germany (2013)	5.15	6.60	0.35	○
66	Armenia	5.11	6.54	0.34	
67	Sri Lanka (2013)	5.03	6.43	0.33	
68	Malaysia (2012)	4.59	5.88	0.32	○
69	Ecuador (2011)	4.46	5.71	0.31	
70	United States of America (2013)	4.45	5.70	0.30	○
71	Tunisia (2012)	4.40	5.63	0.29	
72	Viet Nam (2011)	3.99	5.11	0.28	
73	Colombia	3.18	4.07	0.27	
74	Mongolia	2.85	3.64	0.26	
75	Thailand (2011)	2.50	3.20	0.24	
76	Russian Federation	2.48	3.17	0.23	○
77	Qatar (2012)	2.42	3.10	0.22	
78	Ethiopia (2013)	2.15	2.75	0.21	
79	Bolivia, Plurinational St. (2009)	1.86	2.38	0.20	
80	Philippines (2013)	1.84	2.35	0.19	
81	Morocco (2010)	1.71	2.19	0.18	○
82	Zambia (2008)	1.62	2.07	0.17	
83	Australia (2008)	1.61	2.06	0.16	○
84	Namibia (2010)	1.54	1.97	0.15	
85	Pakistan (2013)	1.31	1.67	0.14	
86	Kuwait (2009)	1.18	1.50	0.13	
87	Turkey	1.08	1.38	0.12	○
88	Nigeria (2007)	1.04	1.32	0.11	
89	Kyrgyzstan	0.95	1.22	0.10	
90	China	0.83	1.06	0.09	○
91	Kazakhstan (2013)	0.76	0.97	0.08	○
92	Korea, Rep.	0.71	0.90	0.07	○
93	Argentina (2008)	0.60	0.76	0.06	○
94	Mexico	0.45	0.58	0.05	○
95	Japan	0.44	0.57	0.04	○
96	Tajikistan (2013)	0.21	0.27	0.03	○
97	Azerbaijan	0.16	0.21	0.02	○
98	Egypt	0.12	0.15	0.01	○
99	Oman (2013)	0.00	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Brazil	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	India	n/a	n/a	n/a	
n/a	Indonesia	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*

NOTE: ● indicates a strength; ○ a weakness

5.2.4 Joint venture/strategic alliance deals

Joint ventures / strategic alliances: Number of deals, fractional counting (per billion PPP$ GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	0.09	100.00	0.99	●
1	Luxembourg	0.07	100.00	0.99	●
3	Bahrain	0.06	76.28	0.97	●
4	Australia	0.06	74.37	0.96	●
5	Cyprus	0.05	72.47	0.95	●
6	Singapore	0.05	68.19	0.93	
7	Canada	0.05	64.95	0.92	
8	Qatar	0.04	54.31	0.91	●
9	United Arab Emirates	0.04	51.17	0.89	
10	Oman	0.04	51.15	0.88	●
11	United Kingdom	0.03	40.21	0.86	
12	Malaysia	0.03	37.80	0.85	
13	Switzerland	0.03	34.42	0.84	
14	Norway	0.02	29.49	0.82	
15	Kuwait	0.02	28.86	0.81	●
16	Chile	0.02	28.55	0.80	
17	United States of America	0.02	27.58	0.78	
18	New Zealand	0.02	27.29	0.77	
19	Mauritius	0.02	26.34	0.76	●
20	Ireland	0.02	25.76	0.74	
21	Sweden	0.02	25.74	0.73	
22	Israel	0.02	25.13	0.72	
23	Finland	0.02	24.80	0.70	
24	Cambodia	0.02	23.66	0.69	●
25	Denmark	0.02	19.64	0.68	
26	Saudi Arabia	0.02	18.97	0.66	
27	Egypt	0.02	18.96	0.65	●
28	Netherlands	0.01	17.95	0.64	○
29	Thailand	0.01	17.49	0.62	
30	Korea, Rep.	0.01	17.20	0.61	
31	Kazakhstan	0.01	16.87	0.59	
32	Japan	0.01	16.63	0.58	
33	Sri Lanka	0.01	15.80	0.57	
34	Lithuania	0.01	14.96	0.55	
35	Philippines	0.01	14.90	0.54	
36	Jordan	0.01	14.79	0.53	
37	India	0.01	14.70	0.51	
38	Lebanon	0.01	14.62	0.50	
39	France	0.01	14.37	0.49	○
40	Belgium	0.01	13.74	0.47	○
41	Greece	0.01	12.86	0.46	
42	Viet Nam	0.01	12.76	0.45	
43	Serbia	0.01	12.34	0.43	
44	South Africa	0.01	11.82	0.42	
45	Italy	0.01	11.38	0.41	○
46	Spain	0.01	11.23	0.39	○
47	Germany	0.01	11.14	0.38	○
48	Ghana	0.01	10.33	0.36	
49	China	0.01	10.19	0.35	
50	Austria	0.01	7.83	0.34	○
51	Russian Federation	0.01	7.38	0.32	
52	Panama	0.01	6.54	0.31	
53	Belarus	0.01	6.34	0.30	
54	Hungary	0.01	6.20	0.28	○
55	Azerbaijan	0.01	6.06	0.27	
56	Turkey	0.01	5.58	0.26	
57	Portugal	0.01	5.31	0.24	○
58	Zambia	0.01	5.26	0.23	
59	Ecuador	0.00	4.46	0.22	
60	Mexico	0.00	4.25	0.20	○
61	Peru	0.00	3.51	0.19	○
62	Poland	0.00	3.18	0.18	○
63	Tanzania, United Rep.	0.00	3.12	0.16	
64	Indonesia	0.00	2.91	0.15	
65	Czech Republic	0.00	2.30	0.14	○
66	Brazil	0.00	2.15	0.12	○
67	Venezuela, Bolivarian Rep.	0.00	1.87	0.11	
68	Romania	0.00	1.49	0.09	○
69	Bangladesh	0.00	1.12	0.08	
70	Argentina	0.00	0.99	0.07	○
71	Morocco	0.00	0.64	0.05	○
72	Pakistan	0.00	0.35	0.04	○
73	Colombia	0.00	0.20	0.03	○
74	Ukraine	0.00	0.15	0.01	○
75	Nigeria	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Bulgaria	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Estonia	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Latvia	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Slovakia	n/a	n/a	n/a	
n/a	Slovenia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: Thomson Reuters, *Thomson One Banker Private Equity, SDC Platinum* database; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

5.2.5 Patent families filed in two offices

Number of patent families filed by residents in at least two offices (per billion PPP$ GDP) | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Japan	15.39	100.00	1.00	●
2	Korea, Rep.	13.70	96.03	0.99	●
3	Finland	8.38	79.68	0.98	●
4	Sweden	7.74	77.11	0.97	●
5	Switzerland	6.90	73.46	0.96	
6	Luxembourg	6.24	70.30	0.96	
7	Germany	5.87	68.41	0.95	
8	Israel	5.28	65.16	0.94	
9	Austria	4.28	58.89	0.93	●
10	Denmark	4.27	58.78	0.92	
11	France	3.52	53.25	0.91	
12	Netherlands	3.43	52.51	0.90	
13	United States of America	2.75	46.51	0.89	
14	Malta	2.48	43.86	0.88	
15	New Zealand	2.42	43.25	0.88	
16	United Kingdom	2.22	41.05	0.87	
17	Belgium	2.12	39.98	0.86	
18	Canada	2.11	39.83	0.85	
19	Iceland	1.91	37.40	0.84	
20	Singapore	1.78	35.81	0.83	
21	Slovenia	1.69	34.70	0.82	
22	Ireland	1.69	34.68	0.81	
23	Italy	1.68	34.47	0.81	
24	Norway	1.62	33.64	0.80	
25	Australia	1.03	24.60	0.79	
26	China	0.94	23.08	0.78	
27	Hong Kong (China)	0.83	20.94	0.77	
28	Cyprus	0.73	18.97	0.76	
29	Spain	0.69	18.14	0.75	
30	Czech Republic	0.68	18.03	0.74	
31	Hungary	0.55	15.02	0.73	
32	Poland	0.48	13.57	0.73	
33	Estonia	0.47	13.26	0.72	
34	Portugal	0.39	11.32	0.71	
35	South Africa	0.39	11.31	0.70	
36	Lithuania	0.37	10.83	0.69	
37	India	0.35	10.32	0.68	
38	Greece	0.35	10.31	0.67	
39	Turkey	0.34	10.02	0.66	
40	Belarus	0.34	9.97	0.65	
41	Armenia	0.32	9.45	0.65	
42	Slovakia	0.30	9.01	0.64	
43	Ukraine	0.29	8.71	0.63	
44	Bulgaria	0.29	8.66	0.62	
45	Latvia	0.27	8.27	0.61	
46	Moldova, Rep.	0.27	8.06	0.60	
47	Montenegro	0.23	7.06	0.59	
48	Malaysia	0.23	7.05	0.58	
49	Chile	0.21	6.37	0.58	
50	Croatia	0.20	6.06	0.57	
51	Mauritius	0.19	5.85	0.56	
52	Russian Federation	0.18	5.51	0.55	
53	Burundi (2009)	0.16	5.06	0.54	●
54	Qatar	0.12	3.73	0.53	
55	Romania	0.11	3.64	0.52	
56	Kazakhstan	0.11	3.47	0.51	
57	Serbia	0.11	3.46	0.50	
58	Brazil	0.11	3.44	0.50	
59	Saudi Arabia	0.11	3.40	0.49	
60	Panama	0.09	2.97	0.48	
61	Jamaica	0.09	2.76	0.47	
62	Guinea (2009)	0.08	2.62	0.46	●
63	TFYR of Macedonia (2011)	0.08	2.58	0.45	
64	Costa Rica	0.08	2.49	0.44	
65	Argentina	0.07	2.27	0.43	
66	Mexico	0.07	2.27	0.42	
67	Jordan	0.07	2.20	0.42	
68	United Arab Emirates	0.07	2.11	0.41	
69	Colombia	0.07	2.09	0.40	
70	Georgia	0.07	2.09	0.39	
71	Niger	0.06	2.06	0.38	
72	Kyrgyzstan	0.06	1.97	0.37	
73	Honduras (2011)	0.06	1.89	0.36	
74	Lebanon	0.05	1.70	0.35	
75	Bolivia, Plurinational St.	0.05	1.58	0.35	
76	Ecuador	0.05	1.58	0.34	
77	Namibia	0.05	1.54	0.33	
78	Azerbaijan	0.05	1.51	0.32	
79	Uruguay	0.05	1.50	0.31	
80	Kenya	0.04	1.37	0.30	
81	Mongolia (2011)	0.04	1.29	0.29	
82	Bahrain (2011)	0.04	1.22	0.28	
83	Mozambique	0.04	1.21	0.27	
84	Nicaragua	0.04	1.20	0.27	
85	Thailand	0.04	1.17	0.26	
86	Albania (2011)	0.03	1.10	0.25	
87	Madagascar (2010)	0.03	1.09	0.24	
88	Bosnia and Herzegovina	0.03	0.87	0.23	
89	Uganda (2007)	0.02	0.69	0.22	
90	Viet Nam	0.02	0.68	0.21	
91	Philippines	0.02	0.67	0.20	
92	Sri Lanka	0.02	0.66	0.19	
93	El Salvador (2011)	0.02	0.66	0.19	
94	Cameroon (2007)	0.02	0.66	0.18	
95	Paraguay (2011)	0.02	0.64	0.17	
96	Zambia	0.02	0.56	0.16	
97	Dominican Republic	0.02	0.49	0.15	
98	Peru	0.02	0.43	0.14	○
99	Kuwait	0.01	0.42	0.13	
100	Egypt	0.01	0.39	0.12	
101	Venezuela, Bolivarian Rep.	0.01	0.36	0.12	
102	Morocco	0.01	0.36	0.11	○
103	Tanzania, United Rep. (2009)	0.01	0.32	0.10	
104	Ghana (2011)	0.01	0.32	0.09	
105	Yemen (2009)	0.01	0.28	0.08	
106	Guatemala	0.01	0.24	0.07	
107	Tunisia	0.01	0.22	0.06	○
108	Oman	0.01	0.15	0.05	○
109	Bangladesh	0.01	0.14	0.04	○
110	Algeria	0.01	0.13	0.04	
111	Pakistan	0.01	0.09	0.03	○
112	Indonesia	0.00	0.01	0.02	○
113	Iran, Islamic Rep.	0.00	0.00	0.01	○
114	Nigeria (2011)	0.00	0.00	0.00	○
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

5.3.1 Intellectual property payments

Charges for use of intellectual property n.i.e., payments (%, total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Ireland	24.74	100.00	0.98	●
1	Luxembourg	3.44	100.00	0.98	●
1	Singapore	4.12	100.00	0.98	●
4	Switzerland	3.06	89.01	0.97	●
5	Malta	3.01	87.57	0.96	●
6	Argentina	2.38	69.15	0.96	●
7	Japan	2.26	65.71	0.95	
8	Brazil	2.04	59.25	0.94	●
9	Finland (2013)	1.88	54.46	0.93	
10	Canada	1.78	51.82	0.92	
11	New Zealand	1.64	47.72	0.91	
12	United States of America	1.63	47.46	0.90	
13	Sweden	1.61	46.65	0.89	
14	Russian Federation	1.59	46.15	0.88	●
15	South Africa	1.54	44.83	0.88	●
16	Korea, Rep.	1.51	43.96	0.87	
17	Thailand	1.49	43.29	0.86	●
18	Hungary	1.40	40.63	0.85	
19	Australia	1.35	39.06	0.84	
20	Iceland	1.29	37.59	0.83	
21	France	1.23	35.65	0.82	
22	Poland	1.16	33.56	0.81	●
23	Romania	1.07	31.06	0.81	●
24	Jamaica	1.06	30.77	0.80	●
25	Croatia	1.05	30.62	0.79	●
26	Chile (2013)	1.04	30.12	0.78	
27	United Kingdom	1.04	30.10	0.77	
28	Serbia	1.02	29.67	0.76	●
29	Guatemala	0.98	28.37	0.75	●
30	China	0.97	28.14	0.74	
31	Kenya	0.97	28.08	0.73	●
32	India	0.93	27.15	0.73	
33	Indonesia	0.92	26.78	0.72	●
34	Italy	0.88	25.52	0.71	
35	Denmark	0.86	24.87	0.70	
36	Austria	0.83	24.14	0.69	
37	TFYR of Macedonia	0.83	24.12	0.68	
38	Ukraine	0.82	23.74	0.67	
39	El Salvador	0.79	22.99	0.66	●
40	Belgium	0.76	21.93	0.65	
41	Czech Republic	0.75	21.70	0.65	
42	Colombia	0.72	20.92	0.64	
43	Philippines	0.70	20.38	0.63	
44	Slovenia	0.67	19.51	0.62	
45	Greece	0.62	18.12	0.61	
46	Portugal	0.60	17.50	0.60	
47	Bulgaria	0.60	17.38	0.59	
48	Malaysia	0.59	17.26	0.58	
49	Slovakia	0.58	16.73	0.58	
50	Venezuela, Bolivarian Rep.	0.55	16.06	0.57	
51	Cyprus	0.55	15.96	0.56	
52	Madagascar (2013)	0.54	15.80	0.55	●
53	Israel (2013)	0.54	15.74	0.54	
54	Bolivia, Plurinational St.	0.52	15.01	0.53	●
55	Moldova, Rep.	0.51	14.72	0.52	
56	Germany	0.49	14.23	0.51	
57	Honduras	0.48	14.03	0.50	
58	Belarus	0.46	13.42	0.50	
59	Mexico	0.44	12.78	0.49	
60	Peru (2013)	0.43	12.58	0.48	
61	Albania	0.43	12.35	0.47	
62	Costa Rica	0.42	12.33	0.46	
63	Egypt	0.41	11.85	0.45	
64	Pakistan	0.41	11.82	0.44	
65	Dominican Republic (2013)	0.40	11.47	0.43	
66	Norway	0.39	11.43	0.42	○
67	Ecuador	0.37	10.68	0.42	
68	Panama	0.36	10.58	0.41	
69	Hong Kong (China) (2013)	0.33	9.64	0.40	○
70	Nigeria	0.30	8.80	0.39	
71	Mozambique	0.28	8.26	0.38	
72	Turkey	0.28	8.21	0.37	
73	Uruguay	0.27	7.80	0.36	
74	Estonia	0.26	7.41	0.35	○
75	Latvia	0.24	7.10	0.35	○
76	Algeria (2013)	0.24	7.06	0.34	
77	Kazakhstan	0.23	6.76	0.33	
78	Montenegro	0.23	6.70	0.32	
79	Georgia	0.23	6.70	0.31	
80	Mauritius	0.23	6.57	0.30	
81	Mongolia	0.20	5.80	0.29	
82	Morocco (2013)	0.19	5.46	0.28	
83	Uganda	0.19	5.40	0.27	
84	Cambodia	0.19	5.38	0.27	
85	Benin (2013)	0.17	5.03	0.26	
86	Iran, Islamic Rep. (2013)	0.17	4.99	0.25	
87	Côte d'Ivoire (2010)	0.15	4.40	0.24	
88	Lebanon	0.13	3.91	0.23	
89	Paraguay	0.13	3.88	0.22	
90	Botswana (2013)	0.13	3.72	0.21	
91	Namibia	0.12	3.51	0.20	
92	Lithuania	0.12	3.47	0.19	○
93	Niger (2009)	0.11	3.18	0.19	
94	Kyrgyzstan	0.11	3.11	0.18	
95	Togo (2010)	0.11	3.09	0.17	
96	Azerbaijan (2012)	0.10	3.03	0.16	
97	Cameroon (2013)	0.09	2.72	0.15	
98	Bosnia and Herzegovina	0.08	2.39	0.14	
99	Malawi	0.08	2.27	0.13	
100	Bhutan	0.07	2.16	0.12	
101	Mali (2010)	0.07	1.90	0.12	
102	Guinea (2013)	0.06	1.77	0.11	
103	Bangladesh (2013)	0.06	1.66	0.10	
104	Tunisia (2013)	0.06	1.65	0.09	○
105	Rwanda (2012)	0.05	1.49	0.08	
106	Yemen (2013)	0.04	1.24	0.07	
107	Tanzania, United Rep. (2013)	0.02	0.71	0.06	
108	Ethiopia (2012)	0.02	0.71	0.05	
109	Senegal (2013)	0.02	0.61	0.04	○
110	Zambia	0.02	0.51	0.04	○
111	Nicaragua	0.01	0.38	0.03	○
112	Burkina Faso (2013)	0.01	0.21	0.02	○
113	Burundi (2012)	0.00	0.08	0.01	○
114	Tajikistan	0.00	0.00	0.00	○
n/a	Armenia	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Netherlands	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Spain	n/a	n/a	n/a	
n/a	Sri Lanka	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	

SOURCE: World Trade Organization, *Trade in Commercial Services* database, based on the International Monetary Fund *Balance of Payments* database

NOTE: ● indicates a strength; ○ a weakness

5.3.2 High-tech imports

High-tech net imports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Costa Rica (2013)	23.74	100.00	0.99	●
1	Hong Kong (China)	43.78	100.00	0.99	●
3	Malaysia	23.09	97.11	0.98	●
4	Singapore	20.12	83.92	0.98	
5	Panama (2011)	20.10	83.84	0.97	●
6	Viet Nam	19.82	82.59	0.96	●
7	China	18.51	76.78	0.95	
8	Mexico	16.92	69.73	0.94	●
9	United States of America	16.37	67.30	0.93	
10	Colombia	16.17	66.40	0.93	●
11	Czech Republic	15.86	65.07	0.92	●
12	Thailand	14.90	60.80	0.91	●
13	Slovakia	14.80	60.34	0.90	●
14	Ethiopia	14.28	58.02	0.89	●
15	Paraguay	13.88	56.28	0.88	●
16	Japan	13.72	55.56	0.88	
17	Rwanda	13.41	54.16	0.87	●
18	Estonia	12.85	51.69	0.86	
19	Hungary	12.80	51.48	0.85	●
20	Korea, Rep.	12.55	50.37	0.84	
21	Netherlands	12.46	49.95	0.83	
22	Brazil	12.33	49.40	0.83	●
23	United Kingdom	12.32	49.36	0.82	
24	Burundi	11.22	44.45	0.81	●
25	France	11.15	44.15	0.80	
26	Germany	10.87	42.93	0.79	
27	Kenya (2013)	10.84	42.76	0.78	●
28	Argentina	10.76	42.45	0.78	●
29	New Zealand	10.66	41.99	0.77	
30	Peru	10.24	40.11	0.76	●
31	Australia	9.95	38.85	0.75	
32	Canada	9.87	38.47	0.74	
33	Israel	9.85	38.39	0.73	
34	South Africa	9.72	37.80	0.73	
35	Poland	9.70	37.74	0.72	
36	El Salvador	9.70	37.72	0.71	●
37	Nepal	9.58	37.19	0.70	●
38	Malawi	9.54	37.00	0.69	●
39	Belgium	9.49	36.80	0.68	
40	Guatemala	9.49	36.77	0.68	●
41	Pakistan	9.41	36.46	0.67	●
42	Bolivia, Plurinational St.	9.38	36.29	0.66	●
43	Algeria	9.36	36.21	0.65	●
44	Uruguay	9.28	35.84	0.64	
45	Latvia	9.16	35.33	0.63	
46	Bangladesh (2011)	9.04	34.82	0.63	●
47	Ecuador	8.98	34.52	0.62	
48	Sweden	8.95	34.42	0.61	○
49	Turkey	8.93	34.30	0.60	
50	Austria	8.78	33.64	0.59	
51	Nicaragua	8.56	32.69	0.58	●
52	Mauritius	8.44	32.16	0.58	
53	Chile	8.29	31.47	0.57	
54	Russian Federation	8.27	31.37	0.56	
55	Tunisia (2013)	8.16	30.89	0.55	
56	Switzerland	8.14	30.82	0.54	○
57	Malta	8.14	30.79	0.53	
58	Tanzania, United Rep.	7.84	29.49	0.53	●
59	Moldova, Rep.	7.83	29.41	0.52	
60	Indonesia	7.77	29.15	0.51	
61	Niger	7.74	29.03	0.50	
62	Georgia	7.62	28.50	0.49	
63	Finland	7.56	28.24	0.48	○
64	Italy	7.42	27.61	0.48	
65	Honduras	7.40	27.53	0.47	
66	India	7.06	26.00	0.46	
67	Egypt	6.97	25.61	0.45	
68	Croatia	6.86	25.12	0.44	
69	Bulgaria	6.81	24.91	0.43	
70	Bosnia and Herzegovina	6.77	24.75	0.43	
71	Kazakhstan	6.77	24.73	0.42	
72	TFYR of Macedonia	6.71	24.48	0.41	
73	Ukraine	6.69	24.39	0.40	
74	Spain	6.60	23.96	0.39	○
75	Portugal	6.56	23.79	0.38	○
76	Denmark	6.28	22.56	0.38	○
77	Uganda	6.18	22.13	0.37	
78	Saudi Arabia (2013)	6.04	21.51	0.36	
79	Namibia	6.00	21.33	0.35	
80	Norway	5.99	21.28	0.34	○
81	Côte d'Ivoire	5.95	21.09	0.33	
82	Cameroon	5.94	21.05	0.33	
83	Mozambique	5.84	20.63	0.32	
84	Slovenia	5.74	20.16	0.31	○
85	Greece	5.72	20.09	0.30	
86	Armenia	5.61	19.58	0.29	
87	Dominican Republic	5.50	19.10	0.28	
88	Kyrgyzstan (2013)	5.50	19.09	0.28	
89	United Arab Emirates (2008)	5.46	18.91	0.27	○
90	Iceland	5.32	18.29	0.26	○
91	Belarus	5.31	18.25	0.25	
92	Lithuania	5.29	18.18	0.24	○
93	Mali (2012)	5.12	17.41	0.23	
94	Jordan	5.12	17.41	0.23	
95	Mongolia	5.11	17.38	0.22	
96	Ghana (2013)	5.08	17.24	0.21	
97	Bahrain	5.01	16.92	0.20	
98	Sri Lanka	4.81	16.03	0.19	
99	Jamaica	4.80	16.02	0.18	○
100	Ireland	4.72	15.64	0.18	○
101	Senegal	4.70	15.57	0.17	
102	Madagascar	4.66	15.37	0.16	
103	Yemen	4.61	15.16	0.15	
104	Guinea	4.59	15.05	0.14	
105	Kuwait	4.47	14.53	0.13	
106	Benin	4.44	14.38	0.13	
107	Cambodia (2013)	4.31	13.84	0.12	
108	Burkina Faso	4.24	13.50	0.11	
109	Iran, Islamic Rep. (2011)	4.03	12.57	0.10	○
110	Lebanon	3.91	12.07	0.09	○
111	Botswana	3.50	10.22	0.08	○
112	Zambia	3.41	9.84	0.08	
113	Nigeria	3.39	9.75	0.07	
114	Cyprus	3.32	9.45	0.06	○
115	Bhutan (2012)	3.31	9.40	0.05	
116	Oman	3.14	8.64	0.04	○
117	Luxembourg	2.84	7.29	0.03	○
118	Qatar	2.68	6.61	0.03	○
119	Azerbaijan	2.23	4.59	0.02	○
120	Togo (2013)	1.98	3.48	0.01	○
121	Albania	1.19	0.00	0.00	○
n/a	Montenegro	n/a	n/a	n/a	
n/a	Morocco	n/a	n/a	n/a	
n/a	Philippines	n/a	n/a	n/a	
n/a	Romania	n/a	n/a	n/a	
n/a	Serbia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	

SOURCE: United Nations, *COMTRADE* database; Eurostat, *'High-technology' aggregations based on SITC Rev. 4*; WTO *Trade in Commercial Services* database

NOTE: ● indicates a strength; ○ a weakness

5.3.3 ICT services imports

Telecommunications, computers, and information services imports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bhutan	5.49	100.00	0.99	●
1	Cyprus	7.42	100.00	0.99	●
3	Niger (2013)	4.43	80.69	0.98	●
4	Luxembourg	3.54	64.39	0.98	●
5	Switzerland	3.33	60.52	0.97	
6	Sweden	3.20	58.17	0.96	●
7	Finland (2013)	3.15	57.30	0.95	
8	Mali (2013)	3.11	56.46	0.94	●
9	Madagascar (2013)	2.90	52.59	0.93	●
10	Qatar	2.59	47.03	0.93	●
11	Burkina Faso (2013)	2.43	44.04	0.92	●
12	France	2.33	42.25	0.91	
13	Senegal (2013)	2.29	41.61	0.90	●
14	Denmark	2.16	39.22	0.89	
15	Montenegro	2.16	39.17	0.89	●
16	Estonia	2.01	36.46	0.88	
17	Moldova, Rep.	2.01	36.36	0.87	●
18	Sri Lanka	1.97	35.70	0.86	●
19	Benin (2013)	1.95	35.30	0.85	●
20	Iceland	1.93	35.00	0.84	
21	Austria	1.91	34.51	0.84	
22	Belgium	1.87	33.85	0.83	
23	Mongolia	1.77	32.09	0.82	
24	Slovenia	1.77	32.01	0.81	
25	Nigeria	1.77	32.01	0.80	●
26	Serbia	1.73	31.23	0.80	●
27	Lebanon	1.71	30.93	0.79	●
28	Italy	1.66	30.08	0.78	
29	Ethiopia (2012)	1.65	29.80	0.77	●
30	Germany	1.58	28.65	0.76	
31	Norway	1.58	28.52	0.75	
32	Romania	1.56	28.20	0.75	●
33	United Kingdom	1.48	26.67	0.74	
34	Guinea (2013)	1.45	26.23	0.73	●
35	TFYR of Macedonia	1.41	25.40	0.72	●
36	Argentina	1.38	24.92	0.71	
37	Portugal	1.37	24.76	0.70	
38	Singapore	1.37	24.65	0.70	
39	Croatia	1.36	24.51	0.69	
40	Russian Federation	1.36	24.48	0.68	
41	Burundi (2013)	1.33	23.94	0.67	●
42	Albania	1.32	23.89	0.66	●
43	Brazil	1.26	22.78	0.66	
44	United States of America	1.26	22.65	0.65	
45	Mauritius	1.25	22.58	0.64	
46	Hungary	1.25	22.52	0.63	
47	Czech Republic	1.24	22.39	0.62	
48	Malaysia	1.23	22.19	0.61	
49	Japan	1.23	22.11	0.61	
50	Greece	1.22	21.92	0.60	
51	New Zealand	1.20	21.60	0.59	
52	Israel (2013)	1.19	21.40	0.58	
53	Latvia	1.17	21.02	0.57	
54	Uganda	1.16	20.91	0.57	
55	Poland	1.16	20.83	0.56	
56	Canada	1.07	19.29	0.55	○
57	Tajikistan	1.03	18.55	0.54	●
58	Mozambique	1.03	18.50	0.53	●
59	Armenia	1.02	18.39	0.52	
60	Rwanda (2013)	1.00	18.06	0.52	
61	Peru (2013)	0.99	17.74	0.51	
62	Malta	0.98	17.53	0.50	
63	Pakistan	0.94	16.86	0.49	●
64	South Africa	0.93	16.79	0.48	
65	Bulgaria	0.88	15.82	0.48	
66	Australia	0.88	15.75	0.47	○
67	Chile (2013)	0.87	15.66	0.46	
68	Ukraine	0.86	15.34	0.45	
69	Slovakia	0.84	14.97	0.44	
70	India	0.83	14.92	0.43	
71	Bosnia and Herzegovina	0.82	14.60	0.43	
72	Philippines	0.81	14.57	0.42	
73	Indonesia	0.80	14.37	0.41	
74	Colombia	0.78	13.99	0.40	
75	Côte d'Ivoire (2010)	0.78	13.91	0.39	
76	Honduras	0.77	13.82	0.39	
77	Saudi Arabia	0.76	13.61	0.38	
78	Nepal (2013)	0.75	13.49	0.37	
79	Malawi	0.71	12.72	0.36	
80	Ireland	0.70	12.46	0.35	○
81	Lithuania	0.68	12.05	0.34	
82	Egypt	0.66	11.73	0.34	
83	Bolivia, Plurinational St.	0.64	11.41	0.33	
84	Kyrgyzstan	0.61	10.87	0.32	
85	Iran, Islamic Rep. (2013)	0.60	10.66	0.31	
86	Jamaica	0.59	10.45	0.30	
87	Cambodia	0.58	10.34	0.30	
88	Venezuela, Bolivarian Rep.	0.56	9.93	0.29	
89	Azerbaijan	0.56	9.90	0.28	
90	Togo (2013)	0.56	9.87	0.27	
91	Botswana (2013)	0.56	9.85	0.26	
92	Georgia	0.55	9.74	0.25	
93	Morocco (2013)	0.53	9.43	0.25	
94	Belarus	0.51	9.04	0.24	
95	El Salvador	0.51	8.98	0.23	
96	Costa Rica	0.51	8.94	0.22	
97	Kazakhstan	0.47	8.32	0.21	
98	China	0.46	8.13	0.20	
99	Tanzania, United Rep. (2013)	0.46	8.03	0.20	
100	Kuwait	0.45	8.02	0.19	
101	Cameroon (2013)	0.45	8.02	0.18	
102	Tunisia (2013)	0.45	7.93	0.17	
103	Nicaragua	0.42	7.41	0.16	
104	Guatemala	0.40	7.00	0.16	
105	Uruguay	0.39	6.78	0.15	○
106	Zambia	0.37	6.55	0.14	
107	Yemen (2013)	0.37	6.49	0.13	
108	Algeria (2013)	0.35	6.11	0.12	
109	Namibia	0.35	6.09	0.11	
110	Dominican Republic (2013)	0.33	5.76	0.11	○
111	Bahrain (2013)	0.30	5.13	0.10	○
112	Korea, Rep.	0.29	5.04	0.09	○
113	Panama	0.27	4.71	0.08	○
114	Hong Kong (China) (2013)	0.27	4.66	0.07	○
115	Thailand	0.25	4.37	0.07	○
116	Oman	0.24	4.14	0.06	○
117	Kenya	0.14	2.30	0.05	○
118	Turkey	0.08	1.21	0.04	○
119	Bangladesh (2013)	0.07	0.98	0.03	○
120	Viet Nam	0.05	0.64	0.02	○
121	Mexico	0.03	0.35	0.02	○
122	Ecuador	0.03	0.33	0.01	○
123	Paraguay	0.02	0.00	0.00	○
n/a	Ghana	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Netherlands	n/a	n/a	n/a	
n/a	Spain	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	

SOURCE: World Trade Organization, *Trade in Commercial Services* database, based on the International Monetary Fund *Balance of Payments* database

NOTE: ● indicates a strength; ○ a weakness

5.3.4 Foreign direct investment net inflows

Foreign direct investment (FDI), net inflows (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	39.87	100.00	0.97	●
1	Ireland	34.59	100.00	0.97	●
1	Malawi	16.81	100.00	0.97	●
1	Mozambique	31.36	100.00	0.97	●
1	Singapore	21.93	100.00	0.97	●
6	Panama	11.28	73.16	0.96	●
7	Luxembourg	10.92	71.42	0.95	
8	Montenegro	10.83	70.96	0.94	●
9	Cambodia	10.31	68.46	0.94	●
10	Georgia	9.97	66.77	0.93	●
11	Niger	9.41	64.09	0.92	●
12	Hungary	8.96	61.90	0.91	●
13	Ghana	8.71	60.67	0.91	●
14	Albania	8.70	60.62	0.90	●
15	Guinea	8.54	59.86	0.89	●
16	Chile	8.53	59.77	0.88	●
17	Nicaragua	7.48	54.71	0.87	●
18	Croatia	6.89	51.84	0.87	●
19	Honduras	6.68	50.79	0.86	●
20	Togo	6.46	49.76	0.85	●
21	Lebanon	6.46	49.73	0.84	●
22	Estonia	5.93	47.18	0.83	
23	Azerbaijan	5.89	46.98	0.83	●
24	Zambia	5.57	45.42	0.82	●
25	Netherlands	5.48	45.00	0.81	
26	Finland	5.44	44.79	0.80	
27	Portugal	5.39	44.56	0.80	
28	Costa Rica	5.20	43.63	0.79	
29	Viet Nam	4.94	42.36	0.78	●
30	Jordan	4.91	42.23	0.77	●
31	Uruguay	4.88	42.07	0.76	●
32	Serbia	4.56	40.50	0.76	
33	Moldova, Rep.	4.39	39.71	0.75	
34	Iceland	4.38	39.63	0.74	
35	Jamaica	4.28	39.17	0.73	●
36	Colombia	4.28	39.13	0.72	
37	Tanzania, United Rep.	4.25	39.03	0.72	●
38	Uganda	4.25	38.99	0.71	●
39	Brazil	4.13	38.42	0.70	
40	Malta (2013)	4.08	38.20	0.69	
41	Benin	3.94	37.50	0.69	●
42	Peru	3.89	37.27	0.68	
43	Namibia	3.80	36.80	0.67	●
44	Dominican Republic	3.72	36.43	0.66	●
45	Cyprus	3.71	36.37	0.65	
46	Rwanda	3.70	36.32	0.65	
47	Kazakhstan	3.49	35.30	0.64	
48	Bulgaria	3.48	35.24	0.63	
49	Armenia	3.47	35.23	0.62	
50	Mauritius	3.31	34.45	0.61	
51	Madagascar	3.31	34.44	0.61	●
52	Morocco	3.26	34.18	0.60	
53	Switzerland	3.24	34.12	0.59	○
54	Canada	3.20	33.92	0.58	
55	Mongolia	3.20	33.88	0.57	
56	Australia	3.19	33.83	0.57	
57	Poland	3.17	33.76	0.56	
58	Malaysia	3.14	33.60	0.55	
59	Indonesia	2.97	32.77	0.54	
60	Kyrgyzstan	2.84	32.17	0.54	
61	Bahrain	2.83	32.11	0.53	
62	Tajikistan	2.82	32.07	0.52	●
63	Latvia	2.81	32.00	0.51	
64	China	2.79	31.92	0.50	
65	Burkina Faso	2.73	31.60	0.50	●
66	Bosnia and Herzegovina	2.72	31.56	0.49	
67	United Arab Emirates	2.52	30.60	0.48	
68	Botswana	2.49	30.44	0.47	
69	Spain	2.48	30.40	0.46	○
70	Belarus	2.45	30.24	0.46	
71	Czech Republic	2.37	29.89	0.45	
72	Israel	2.20	29.07	0.44	
73	Senegal	2.19	28.99	0.43	
74	Philippines	2.18	28.94	0.43	
75	Ethiopia	2.16	28.84	0.42	
76	Norway	2.12	28.65	0.41	○
77	Slovenia	2.08	28.47	0.40	
78	Tunisia	2.07	28.40	0.39	
79	Guatemala	2.05	28.31	0.39	
80	Romania	1.94	27.79	0.38	
81	El Salvador	1.89	27.53	0.37	
82	Austria	1.88	27.48	0.36	○
83	Mexico	1.87	27.43	0.35	
84	Paraguay	1.69	26.59	0.35	
85	Egypt	1.67	26.47	0.34	
86	India	1.65	26.39	0.33	
87	Mali	1.65	26.39	0.32	
88	South Africa	1.64	26.33	0.31	
89	Turkey	1.60	26.13	0.31	
90	Cameroon	1.56	25.96	0.30	
91	Kenya	1.55	25.89	0.29	
92	United Kingdom	1.52	25.75	0.28	○
93	Bangladesh	1.44	25.38	0.28	
94	Côte d'Ivoire	1.35	24.92	0.27	
95	Russian Federation	1.23	24.34	0.26	
96	Sri Lanka	1.20	24.18	0.25	
97	Argentina	1.13	23.83	0.24	
98	Saudi Arabia	1.07	23.58	0.24	○
99	Thailand	0.92	22.83	0.23	
100	Oman	0.90	22.75	0.22	
101	New Zealand (2011)	0.82	22.37	0.21	○
102	Nigeria	0.82	22.34	0.20	
103	Ecuador	0.77	22.08	0.20	
104	United States of America	0.76	22.04	0.19	○
105	Pakistan	0.73	21.91	0.18	
106	Lithuania	0.73	21.89	0.17	○
107	Greece	0.71	21.83	0.17	○
108	Algeria	0.70	21.79	0.16	
109	Korea, Rep.	0.70	21.77	0.15	○
110	Ukraine	0.64	21.49	0.14	
111	Italy	0.64	21.48	0.13	○
112	Venezuela, Bolivarian Rep. (2012)	0.58	21.17	0.13	
113	TFYR of Macedonia	0.54	20.98	0.12	○
114	Qatar	0.50	20.77	0.11	○
115	Iran, Islamic Rep.	0.50	20.77	0.10	
116	Bhutan	0.43	20.44	0.09	
117	Kuwait	0.30	19.81	0.09	○
118	France	0.28	19.73	0.08	○
119	Burundi (2013)	0.25	19.60	0.07	
120	Bolivia, Plurinational St.	0.22	19.43	0.06	○
121	Germany	0.22	19.42	0.06	○
122	Japan	0.20	19.32	0.05	○
123	Slovakia	0.08	18.78	0.04	○
124	Nepal	0.03	18.51	0.03	○
125	Denmark	−0.20	17.40	0.02	○
126	Yemen (2013)	−0.37	16.56	0.02	
127	Sweden	−0.44	16.21	0.01	○
128	Belgium	−3.78	0.00	0.00	○

SOURCE: International Monetary Fund (with World Bank and OECD GDP estimates), extracted from World Bank *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

5.3.5 Research talent in business enterprise

Researchers in business enterprise, per thousand population (%) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Israel (2012)	83.68	100.00	1.00	●
2	Korea, Rep.	79.50	94.99	0.99	●
3	Japan	74.11	88.55	0.98	●
4	Costa Rica (2011)	69.18	82.65	0.96	●
5	United States of America (2012)	68.69	82.07	0.95	
6	Sweden	66.67	79.65	0.94	
7	Ireland	64.45	77.00	0.93	
8	Austria	63.70	76.10	0.91	●
9	China	62.07	74.14	0.90	
10	Netherlands	60.84	72.68	0.89	
11	France	60.41	72.16	0.88	
12	Malta	59.82	71.45	0.86	
13	Denmark	59.52	71.09	0.85	
14	Hungary	59.42	70.98	0.84	
15	Germany	56.85	67.90	0.83	
16	Canada (2013)	56.01	66.90	0.81	
17	Finland	55.82	66.67	0.80	
18	Philippines (2013)	54.10	64.61	0.79	●
19	Slovenia	54.08	64.59	0.78	
20	Singapore (2013)	50.88	60.76	0.76	
21	Belgium	50.79	60.66	0.75	
22	Czech Republic	50.72	60.57	0.74	
23	Uganda (2010)	50.61	60.43	0.73	●
24	Norway	49.27	58.83	0.71	
25	Mali (2010)	49.04	58.56	0.70	●
26	Turkey	46.67	55.73	0.69	
27	Russian Federation	46.66	55.72	0.68	
28	Switzerland (2012)	46.16	55.12	0.66	
29	Luxembourg	40.34	48.15	0.65	
30	Hong Kong (China) (2013)	39.89	47.62	0.64	
31	India (2010)	38.73	46.22	0.63	
32	Italy	38.31	45.73	0.61	
33	United Kingdom	38.19	45.59	0.60	○
34	Iceland (2013)	37.69	44.98	0.59	
35	Spain	36.52	43.59	0.58	
36	Thailand (2011)	36.11	43.09	0.56	
37	Indonesia (2009)	35.54	42.41	0.55	
38	Ukraine (2013)	35.27	42.09	0.54	
39	New Zealand (2013)	34.08	40.66	0.53	
40	Poland	31.79	37.93	0.51	
41	Sri Lanka (2013)	30.67	36.58	0.50	
42	Mexico (2011)	30.01	35.80	0.49	
43	Chile	29.79	35.53	0.48	
44	Estonia	29.04	34.63	0.46	○
45	Romania	28.96	34.54	0.45	
46	Qatar (2012)	27.97	33.35	0.44	
47	Australia (2010)	27.87	33.24	0.43	○
48	Portugal	27.37	32.64	0.41	○
49	Bulgaria	26.36	31.43	0.40	
50	Brazil (2010)	25.94	30.93	0.39	
51	Lithuania	23.12	27.55	0.38	
52	South Africa (2012)	21.31	25.38	0.36	
53	Montenegro (2013)	21.29	25.36	0.35	
54	Cyprus	20.81	24.79	0.34	
55	Latvia	20.70	24.66	0.33	○
56	Oman (2012)	20.21	24.08	0.31	
57	Slovakia	17.94	21.36	0.30	○
58	Greece	16.63	19.79	0.29	
59	Croatia	15.09	17.95	0.28	○
60	Iran, Islamic Rep. (2008)	14.96	17.80	0.26	
61	Ecuador (2008)	14.95	17.78	0.25	
62	TFYR of Macedonia	11.70	13.89	0.24	
63	Kenya (2010)	11.41	13.55	0.23	
64	Serbia	10.91	12.95	0.21	○
65	Malaysia (2012)	10.75	12.76	0.20	○
66	Botswana (2012)	10.49	12.45	0.19	
67	Morocco (2012)	9.32	11.04	0.18	○
68	Argentina (2013)	7.03	8.30	0.16	
69	Moldova, Rep.	6.63	7.83	0.15	○
70	Bosnia and Herzegovina	5.67	6.68	0.14	
71	Egypt	5.51	6.48	0.13	
72	Zambia (2008)	4.85	5.70	0.11	
73	Venezuela, Bolivarian Rep. (2012)	4.52	5.31	0.10	
74	Malawi (2007)	1.73	1.96	0.09	
75	Ghana (2010)	0.99	1.08	0.08	
76	Uruguay	0.99	1.08	0.06	○
77	Panama (2008)	0.86	0.93	0.05	○
78	Colombia (2013)	0.83	0.89	0.04	○
79	Ethiopia (2013)	0.48	0.48	0.03	
80	Bolivia, Plurinational St. (2010)	0.36	0.33	0.01	○
81	Senegal (2010)	0.09	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kazakhstan	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Peru	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*; United Nations, *World Population Prospects: The 2015 Revision* (population)

NOTE: ● indicates a strength; ○ a weakness

6.1.1 Patent applications by origin

Number of resident patent applications filed at a given national or regional patent office (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	44.29	100.00	0.97	●
1	Germany	19.70	100.00	0.97	●
1	Japan	55.79	100.00	0.97	●
1	Korea, Rep.	91.97	100.00	0.97	●
1	Switzerland	17.61	100.00	0.97	●
6	United States of America	16.43	93.33	0.96	
7	Finland	16.31	92.62	0.95	
8	Denmark	13.40	76.08	0.94	
9	Sweden	12.99	73.74	0.93	
10	Netherlands	11.31	64.21	0.92	
11	Luxembourg	10.92	61.97	0.92	
12	Austria	10.23	58.03	0.91	●
13	New Zealand	10.17	57.73	0.90	
14	Iran, Islamic Rep.	10.08	57.22	0.89	●
15	France	9.69	55.00	0.88	
16	United Kingdom	7.75	43.97	0.87	
17	Kyrgyzstan	7.12	40.40	0.86	●
18	Russian Federation	6.81	38.62	0.86	●
19	Ukraine	6.61	37.46	0.85	●
20	Iceland	6.42	36.37	0.84	
21	Belgium	5.82	32.95	0.83	
22	Italy	5.73	32.48	0.82	
23	Armenia	4.96	28.11	0.81	●
24	Norway	4.71	26.68	0.81	
25	Poland	4.61	26.09	0.80	
26	Malta	4.53	25.65	0.79	
27	Belarus	4.52	25.59	0.78	●
28	Kazakhstan	4.33	24.52	0.77	●
29	Israel	4.13	23.39	0.76	
30	Mongolia	3.99	22.55	0.75	
31	Moldova, Rep.	3.77	21.31	0.75	
32	Ireland	3.73	21.07	0.74	
33	Turkey	3.41	19.29	0.73	
34	Czech Republic	3.41	19.27	0.72	
35	Georgia	3.20	18.09	0.71	
36	Portugal	2.96	16.74	0.70	
37	Singapore	2.87	16.19	0.69	
38	Spain	2.81	15.86	0.69	
39	Hungary	2.67	15.05	0.68	
40	Canada	2.63	14.84	0.67	
41	Greece	2.61	14.73	0.66	
42	Romania	2.49	14.03	0.65	
43	Latvia	2.30	12.93	0.64	
44	Serbia	2.20	12.40	0.64	
45	Estonia	2.17	12.25	0.63	
46	Croatia	2.05	11.55	0.62	
47	Slovenia	2.01	11.34	0.61	
48	Bulgaria	1.94	10.89	0.60	
49	Cyprus	1.85	10.42	0.59	
50	Lithuania	1.84	10.34	0.58	
51	Australia	1.81	10.16	0.58	
52	Malaysia	1.76	9.88	0.57	
53	Sri Lanka (2013)	1.64	9.21	0.56	
54	India	1.62	9.12	0.55	
55	Slovakia	1.55	8.72	0.54	
56	Brazil	1.42	7.97	0.53	
57	Montenegro	1.38	7.72	0.53	
58	Morocco	1.37	7.67	0.52	
59	Jamaica	1.37	7.67	0.51	
60	Azerbaijan	1.24	6.91	0.50	
61	Tunisia	1.14	6.36	0.49	
62	South Africa	1.13	6.33	0.48	
63	Chile	1.10	6.14	0.47	
64	Bosnia and Herzegovina	1.07	5.97	0.47	
65	Kenya	0.99	5.53	0.46	
66	Viet Nam	0.95	5.29	0.45	
67	Thailand	0.94	5.23	0.44	
68	Egypt	0.79	4.40	0.43	
69	Senegal	0.76	4.21	0.42	
70	Saudi Arabia	0.59	3.23	0.42	
71	Mexico	0.58	3.18	0.41	
72	Bhutan (2013)	0.55	3.03	0.40	
73	Argentina	0.54	2.93	0.39	
74	Uruguay	0.52	2.82	0.38	
75	Jordan	0.50	2.73	0.37	
76	Niger	0.50	2.73	0.36	
77	Philippines	0.48	2.62	0.36	
78	Hong Kong (China)	0.48	2.61	0.35	○
79	Albania	0.41	2.22	0.34	
80	Paraguay (2010)	0.41	2.19	0.33	
81	Colombia	0.40	2.18	0.32	
82	Cameroon	0.37	1.98	0.31	
83	Mali	0.33	1.74	0.31	
84	Côte d'Ivoire	0.31	1.63	0.30	
85	Benin	0.30	1.60	0.29	
86	Togo	0.30	1.56	0.28	
87	Nepal (2013)	0.29	1.52	0.27	
88	Yemen	0.28	1.47	0.26	●
89	Rwanda	0.26	1.39	0.25	
90	Indonesia	0.26	1.37	0.25	
91	Zambia	0.23	1.18	0.24	
92	Costa Rica	0.22	1.16	0.23	
93	Peru	0.22	1.15	0.22	
94	Algeria	0.17	0.86	0.21	
95	Burkina Faso	0.17	0.85	0.20	
96	Panama	0.17	0.85	0.19	
97	Pakistan	0.17	0.82	0.19	
98	Honduras (2013)	0.16	0.79	0.18	
99	Madagascar	0.15	0.72	0.17	
100	Guinea (2012)	0.14	0.69	0.16	
101	Bolivia, Plurinational St.	0.13	0.61	0.15	
102	Bahrain	0.11	0.52	0.14	
103	Botswana	0.11	0.52	0.14	
104	Dominican Republic	0.09	0.42	0.13	
105	Mauritius (2013)	0.09	0.39	0.12	○
106	Guatemala	0.08	0.36	0.11	
107	Bangladesh	0.08	0.35	0.10	
108	United Arab Emirates	0.08	0.33	0.09	○
109	Uganda	0.07	0.26	0.08	
110	Venezuela, Bolivarian Rep. (2011)	0.07	0.26	0.08	
111	Nigeria (2013)	0.05	0.18	0.07	
112	Tajikistan	0.04	0.14	0.06	
113	Cambodia	0.04	0.11	0.05	○
114	TFYR of Macedonia	0.04	0.09	0.04	○
115	Nicaragua	0.03	0.08	0.03	○
116	Qatar	0.03	0.05	0.03	○
117	Ecuador (2010)	0.03	0.05	0.02	○
118	Kuwait	0.02	0.00	0.01	○
119	Oman (2012)	0.02	0.00	0.00	○
n/a	Burundi	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

6.1.2 PCT international applications by origin

Number of international patent applications filed by residents at the Patent Cooperation Treaty (per billion PPP$ GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Japan	9.13	100.00	0.96	●
1	Korea, Rep.	7.91	100.00	0.96	●
1	Luxembourg	7.16	100.00	0.96	●
1	Sweden	8.25	100.00	0.96	●
1	Switzerland	8.87	100.00	0.96	●
6	Finland	7.08	98.97	0.95	
7	Israel	6.03	84.18	0.94	
8	Netherlands	5.24	73.20	0.93	
9	Denmark	5.18	72.35	0.92	
10	Germany	4.70	65.70	0.91	
11	Malta	4.54	63.44	0.89	
12	Austria	3.48	48.56	0.88	
13	France	3.20	44.72	0.87	
14	United States of America	3.19	44.60	0.86	
15	Iceland	3.03	42.33	0.85	
16	Belgium	2.40	33.45	0.84	
17	New Zealand	2.17	30.28	0.83	
18	United Kingdom	2.00	27.88	0.82	
19	Singapore	1.94	27.09	0.81	
20	Norway	1.92	26.87	0.80	
21	Ireland	1.83	25.49	0.79	
22	Cyprus	1.76	24.50	0.78	
23	Canada	1.75	24.41	0.77	
24	Australia	1.54	21.50	0.76	
25	China	1.53	21.35	0.75	
26	Italy	1.42	19.79	0.74	
27	Slovenia	1.32	18.43	0.73	
28	Estonia	0.95	13.25	0.72	
29	Spain	0.94	13.10	0.71	
30	Turkey	0.64	8.98	0.69	
31	Czech Republic	0.58	8.02	0.68	
32	Hungary	0.58	8.02	0.67	
33	Latvia	0.56	7.81	0.66	
34	Portugal	0.56	7.77	0.65	
35	Lithuania	0.45	6.26	0.64	
36	Senegal	0.44	6.13	0.63	●
37	Poland	0.44	6.10	0.62	
38	South Africa	0.43	6.03	0.61	
39	Greece	0.43	6.03	0.60	
40	Bulgaria	0.41	5.77	0.59	
41	Ukraine	0.41	5.66	0.58	
42	Moldova, Rep.	0.39	5.47	0.57	
43	Chile	0.39	5.47	0.56	
44	Serbia	0.39	5.43	0.55	
45	Malaysia	0.33	4.57	0.54	
46	Croatia	0.31	4.30	0.53	
47	Slovakia	0.24	3.30	0.52	
48	Russian Federation	0.23	3.16	0.51	
49	Armenia	0.20	2.74	0.49	
50	Panama	0.18	2.52	0.48	
51	India	0.18	2.45	0.47	
52	Brazil	0.17	2.35	0.46	
53	Georgia	0.17	2.34	0.45	
54	Namibia	0.16	2.22	0.44	
55	Mexico	0.14	1.98	0.43	
56	Colombia	0.13	1.78	0.42	
57	Morocco	0.13	1.75	0.41	
58	United Arab Emirates	0.12	1.65	0.40	
59	Thailand	0.12	1.64	0.39	
60	Montenegro (2014)	0.11	1.45	0.38	
61	Bosnia and Herzegovina	0.10	1.39	0.37	
62	Romania	0.08	1.13	0.36	
63	Costa Rica	0.08	1.10	0.35	
64	Bahrain	0.08	1.05	0.34	
65	Kenya	0.08	1.04	0.33	
66	Belarus	0.07	0.97	0.32	
67	TFYR of Macedonia	0.07	0.94	0.31	
68	Peru	0.06	0.88	0.29	
69	Tunisia	0.06	0.85	0.28	
70	Albania	0.06	0.82	0.27	
71	Sri Lanka	0.06	0.80	0.26	
72	Madagascar (2014)	0.06	0.79	0.25	
73	Qatar	0.06	0.79	0.24	
74	Egypt	0.06	0.78	0.23	
75	Uganda (2014)	0.05	0.71	0.22	
76	Niger	0.05	0.71	0.21	
77	Kazakhstan	0.05	0.68	0.20	
78	Kyrgyzstan	0.05	0.68	0.19	
79	Benin (2014)	0.05	0.67	0.18	
80	Rwanda	0.05	0.66	0.17	
81	Viet Nam	0.04	0.50	0.16	○
82	Philippines	0.04	0.48	0.15	
83	Dominican Republic	0.03	0.44	0.14	
84	Ecuador	0.03	0.35	0.13	
85	Mongolia	0.03	0.35	0.12	○
86	Côte d'Ivoire	0.03	0.33	0.11	
87	El Salvador	0.02	0.23	0.09	
88	Oman	0.02	0.21	0.08	○
89	Guatemala	0.02	0.19	0.07	
90	Tanzania, United Rep.	0.01	0.17	0.06	
91	Algeria	0.01	0.17	0.05	
92	Cameroon	0.01	0.16	0.04	○
93	Ghana	0.01	0.09	0.03	○
94	Azerbaijan	0.01	0.05	0.02	○
95	Nigeria	0.00	0.03	0.01	○
96	Indonesia	0.00	0.00	0.00	○
n/a	Argentina	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Hong Kong (China)	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database*, 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

6.1.3 Utility model applications by origin

Number of utility model applications filed by residents at the national patent office (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	47.60	100.00	0.95	●
1	Moldova, Rep.	8.77	100.00	0.95	●
1	Mongolia	5.45	100.00	0.95	●
1	Ukraine	24.86	100.00	0.95	●
5	Korea, Rep.	4.91	90.02	0.93	
6	Czech Republic	4.56	83.67	0.92	●
7	Russian Federation	3.63	66.58	0.90	●
8	Tajikistan (2013)	3.20	58.49	0.89	●
9	Germany	2.92	53.44	0.87	
10	Belarus	2.42	44.21	0.85	●
11	Turkey	2.30	41.92	0.84	●
12	Armenia	2.17	39.70	0.82	●
13	Slovakia	2.17	39.56	0.80	
14	Estonia	1.90	34.69	0.79	
15	Finland	1.88	34.29	0.77	
16	Bulgaria	1.70	31.03	0.75	
17	Spain	1.66	30.23	0.74	
18	Thailand	1.56	28.33	0.72	
19	Georgia	1.51	27.53	0.70	
20	Austria	1.39	25.17	0.69	
21	Philippines	1.29	23.36	0.67	●
22	Japan	1.14	20.62	0.66	
23	Italy	1.10	19.90	0.64	
24	Poland (2013)	1.08	19.54	0.62	
25	Hungary	1.01	18.20	0.61	
26	Australia	0.92	16.58	0.59	
27	Croatia	0.91	16.46	0.57	
28	Hong Kong (China)	0.90	16.21	0.56	
29	Brazil	0.81	14.48	0.54	
30	Serbia	0.68	12.14	0.52	
31	Kenya	0.62	11.14	0.51	
32	Denmark	0.58	10.37	0.49	○
33	Peru	0.52	9.13	0.48	
34	Viet Nam	0.48	8.48	0.46	
35	Kyrgyzstan	0.42	7.31	0.44	
36	Uruguay	0.33	5.81	0.43	
37	Kazakhstan	0.33	5.74	0.41	
38	Portugal	0.32	5.54	0.39	○
39	Mexico	0.28	4.89	0.38	
40	Colombia	0.28	4.75	0.36	
41	Chile (2013)	0.22	3.73	0.34	
42	Honduras (2013)	0.19	3.09	0.33	
43	Argentina	0.17	2.69	0.31	
44	Slovenia (2010)	0.16	2.53	0.30	○
45	Bolivia, Plurinational St.	0.16	2.53	0.28	
46	Azerbaijan	0.14	2.31	0.26	
47	Burkina Faso (2010)	0.14	2.18	0.25	
48	El Salvador	0.14	2.16	0.23	
49	Ecuador (2010)	0.13	2.07	0.21	
50	Romania	0.11	1.75	0.20	○
51	Malaysia	0.11	1.70	0.18	○
52	Guatemala	0.11	1.64	0.16	
53	Greece	0.09	1.39	0.15	○
54	Indonesia	0.08	1.18	0.13	
55	France	0.08	1.13	0.11	○
56	Dominican Republic	0.08	1.11	0.10	○
57	Panama	0.08	1.09	0.08	○
58	Costa Rica	0.07	0.94	0.07	○
59	Rwanda	0.05	0.62	0.05	○
60	Albania	0.03	0.23	0.03	○
61	Botswana	0.03	0.16	0.02	○
62	Yemen	0.02	0.00	0.00	○
n/a	Algeria	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	

Rank	Country/Economy	Value	Score (0–100)	Percent rank
n/a	Bangladesh	n/a	n/a	n/a
n/a	Belgium	n/a	n/a	n/a
n/a	Benin	n/a	n/a	n/a
n/a	Bhutan	n/a	n/a	n/a
n/a	Bosnia and Herzegovina	n/a	n/a	n/a
n/a	Burundi	n/a	n/a	n/a
n/a	Cambodia	n/a	n/a	n/a
n/a	Cameroon	n/a	n/a	n/a
n/a	Canada	n/a	n/a	n/a
n/a	Côte d'Ivoire	n/a	n/a	n/a
n/a	Cyprus	n/a	n/a	n/a
n/a	Egypt	n/a	n/a	n/a
n/a	Ethiopia	n/a	n/a	n/a
n/a	Ghana	n/a	n/a	n/a
n/a	Guinea	n/a	n/a	n/a
n/a	Iceland	n/a	n/a	n/a
n/a	India	n/a	n/a	n/a
n/a	Iran, Islamic Rep.	n/a	n/a	n/a
n/a	Ireland	n/a	n/a	n/a
n/a	Israel	n/a	n/a	n/a
n/a	Jamaica	n/a	n/a	n/a
n/a	Jordan	n/a	n/a	n/a
n/a	Kuwait	n/a	n/a	n/a
n/a	Latvia	n/a	n/a	n/a
n/a	Lebanon	n/a	n/a	n/a
n/a	Lithuania	n/a	n/a	n/a
n/a	Luxembourg	n/a	n/a	n/a
n/a	Madagascar	n/a	n/a	n/a
n/a	Malawi	n/a	n/a	n/a
n/a	Mali	n/a	n/a	n/a
n/a	Malta	n/a	n/a	n/a
n/a	Mauritius	n/a	n/a	n/a
n/a	Montenegro	n/a	n/a	n/a
n/a	Morocco	n/a	n/a	n/a
n/a	Mozambique	n/a	n/a	n/a
n/a	Namibia	n/a	n/a	n/a
n/a	Nepal	n/a	n/a	n/a
n/a	Netherlands	n/a	n/a	n/a
n/a	New Zealand	n/a	n/a	n/a
n/a	Nicaragua	n/a	n/a	n/a
n/a	Niger	n/a	n/a	n/a
n/a	Nigeria	n/a	n/a	n/a
n/a	Norway	n/a	n/a	n/a
n/a	Oman	n/a	n/a	n/a
n/a	Pakistan	n/a	n/a	n/a
n/a	Paraguay	n/a	n/a	n/a
n/a	Qatar	n/a	n/a	n/a
n/a	Saudi Arabia	n/a	n/a	n/a
n/a	Senegal	n/a	n/a	n/a
n/a	Singapore	n/a	n/a	n/a
n/a	South Africa	n/a	n/a	n/a
n/a	Sri Lanka	n/a	n/a	n/a
n/a	Sweden	n/a	n/a	n/a
n/a	Switzerland	n/a	n/a	n/a
n/a	Tanzania, United Rep.	n/a	n/a	n/a
n/a	TFYR of Macedonia	n/a	n/a	n/a
n/a	Togo	n/a	n/a	n/a
n/a	Tunisia	n/a	n/a	n/a
n/a	Uganda	n/a	n/a	n/a
n/a	United Arab Emirates	n/a	n/a	n/a
n/a	United Kingdom	n/a	n/a	n/a
n/a	United States of America	n/a	n/a	n/a
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a
n/a	Zambia	n/a	n/a	n/a

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

6.1.4 Scientific and technical publications

Number of scientific and technical journal articles (per billion PPP$ GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Iceland	64.85	100.00	1.00	●
2	Denmark	64.48	99.43	0.99	●
3	Slovenia	58.38	89.93	0.98	●
4	Switzerland	55.80	85.91	0.98	●
5	Finland	54.19	83.40	0.97	
6	Sweden	52.90	81.40	0.96	●
7	New Zealand	51.06	78.54	0.95	●
8	Serbia	48.99	75.31	0.94	●
9	Australia	48.33	74.29	0.94	
10	Israel	45.75	70.27	0.93	
11	Portugal	44.91	68.95	0.92	●
12	Estonia	44.09	67.68	0.91	
13	Netherlands	42.82	65.71	0.90	
14	United Kingdom	41.08	62.99	0.90	
15	Belgium	40.44	62.00	0.89	
16	Cyprus	37.15	56.88	0.88	
17	Canada	36.99	56.63	0.87	
18	Czech Republic	35.20	53.85	0.87	●
19	Austria	34.96	53.46	0.86	
20	Croatia	33.77	51.60	0.85	●
21	Greece	33.59	51.34	0.84	●
22	Norway	33.32	50.92	0.83	
23	Spain	32.23	49.21	0.83	
24	Armenia	29.94	45.65	0.82	●
25	Korea, Rep.	29.74	45.33	0.81	
26	Tunisia	28.48	43.38	0.80	●
27	Ireland	27.92	42.50	0.79	
28	Italy	27.28	41.51	0.79	
29	Singapore	26.13	39.71	0.78	
30	Lithuania	25.93	39.41	0.77	
31	Germany	25.68	39.02	0.76	
32	France	25.35	38.50	0.75	
33	Hungary	25.14	38.17	0.75	
34	Poland	24.89	37.79	0.74	
35	Montenegro	20.86	31.51	0.73	
36	Slovakia	20.17	30.44	0.72	
37	Iran, Islamic Rep.	20.12	30.36	0.71	●
38	United States of America	19.88	29.99	0.71	
39	Malawi	19.17	28.87	0.70	●
40	Malta	18.03	27.11	0.69	
41	Luxembourg	17.92	26.94	0.68	
42	Romania	17.65	26.51	0.67	
43	Chile	17.01	25.52	0.67	
44	Turkey	16.81	25.20	0.66	
45	Georgia	16.77	25.14	0.65	
46	South Africa	15.56	23.26	0.64	
47	Japan	14.99	22.38	0.63	
48	Jordan	14.80	22.07	0.63	
49	Bulgaria	14.74	21.99	0.62	
50	China	13.91	20.69	0.61	
51	Latvia	13.73	20.41	0.60	
52	Benin	13.61	20.23	0.60	●
53	Lebanon	13.33	19.79	0.59	
54	TFYR of Macedonia	12.63	18.70	0.58	
55	Malaysia	12.59	18.63	0.57	
56	Uruguay	12.59	18.63	0.56	
57	Ukraine	12.55	18.57	0.56	
58	Moldova, Rep.	12.38	18.30	0.55	
59	Brazil	12.21	18.04	0.54	
60	Uganda	11.56	17.03	0.53	
61	Burkina Faso	11.32	16.66	0.52	●
62	Senegal	10.96	16.10	0.52	
63	Kenya	10.91	16.02	0.51	
64	Cameroon	10.55	15.46	0.50	●
65	Bosnia and Herzegovina	9.88	14.42	0.49	
66	Egypt	9.44	13.73	0.48	
67	Russian Federation	9.27	13.46	0.48	
68	Rwanda	8.86	12.82	0.47	
69	Argentina	8.55	12.35	0.46	
70	Ghana	8.07	11.60	0.45	
71	Pakistan	7.95	11.41	0.44	
72	Guinea	7.92	11.37	0.44	●
73	Saudi Arabia	7.51	10.73	0.43	
74	Nepal	7.36	10.50	0.42	
75	Namibia	7.17	10.19	0.41	
76	Togo	7.12	10.12	0.40	●
77	India	6.99	9.91	0.40	
78	Mozambique	6.79	9.60	0.39	
79	Costa Rica	6.76	9.56	0.38	
80	Ethiopia	6.73	9.51	0.37	
81	Niger	6.70	9.46	0.37	
82	Tanzania, United Rep.	6.59	9.30	0.36	
83	Madagascar	6.33	8.89	0.35	
84	Belarus	6.32	8.87	0.34	
85	Morocco	6.20	8.68	0.33	
86	Thailand	6.19	8.67	0.33	
87	Mongolia	6.12	8.56	0.32	
88	Mali	6.11	8.54	0.31	
89	Jamaica	5.69	7.89	0.30	
90	Mexico	5.53	7.64	0.29	
91	Colombia	5.52	7.63	0.29	
92	Bhutan	5.48	7.57	0.28	
93	Botswana	5.46	7.54	0.27	
94	Qatar	5.11	6.99	0.26	
95	Viet Nam	4.99	6.80	0.25	
96	Panama	4.82	6.54	0.25	
97	Albania	4.76	6.45	0.24	
98	Cambodia	4.71	6.36	0.23	
99	Kyrgyzstan	4.70	6.34	0.22	
100	Zambia	4.56	6.14	0.21	
101	Algeria	4.50	6.04	0.21	
102	Ecuador	4.41	5.89	0.20	
103	Mauritius	4.28	5.70	0.19	
104	Oman	4.27	5.69	0.18	
105	Burundi	3.93	5.16	0.17	
106	United Arab Emirates	3.18	3.98	0.17	○
107	Bolivia, Plurinational St.	3.10	3.86	0.16	
108	Tajikistan	3.05	3.78	0.15	
109	Côte d'Ivoire	2.99	3.68	0.14	
110	Sri Lanka	2.94	3.60	0.13	○
111	Bangladesh	2.82	3.42	0.13	
112	Azerbaijan	2.63	3.12	0.12	○
113	Peru	2.62	3.10	0.11	○
114	Yemen	2.42	2.81	0.10	
115	Kuwait	2.28	2.58	0.10	○
116	Bahrain	2.25	2.54	0.09	○
117	Nicaragua	2.08	2.28	0.08	
118	Nigeria	1.95	2.07	0.07	
119	Honduras	1.76	1.77	0.06	○
120	Paraguay	1.74	1.74	0.06	○
121	Kazakhstan	1.68	1.64	0.05	○
122	Venezuela, Bolivarian Rep.	1.59	1.51	0.04	
123	Philippines	1.54	1.43	0.03	○
124	Guatemala	1.29	1.04	0.02	○
125	El Salvador	1.27	1.01	0.02	○
126	Dominican Republic	0.66	0.07	0.01	○
127	Indonesia	0.62	0.00	0.00	○
n/a	Hong Kong (China)	n/a	n/a	n/a	

SOURCE: Thomson Reuters, Web of Science, SCI and SSCI; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)

NOTE: ● indicates a strength; ○ a weakness

6.1.5 Citable documents H index

The H index is the economy's number of published articles (H) that have received at least H citations in the period 1996–2014 | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United Kingdom	1,015.00	100.00	0.99	●
1	United States of America	1,648.00	100.00	0.99	●
3	Germany	887.00	87.10	0.98	●
4	France	811.00	79.44	0.98	●
5	Canada	794.00	77.72	0.97	●
6	Japan	745.00	72.78	0.96	
7	Italy	713.00	69.56	0.95	●
8	Netherlands	694.00	67.64	0.94	
9	Switzerland	686.00	66.83	0.94	
10	Australia	644.00	62.60	0.93	
11	Sweden	614.00	59.58	0.92	
12	Spain	591.00	57.26	0.91	●
13	Belgium	547.00	52.82	0.91	
14	Denmark	518.00	49.90	0.90	
15	Israel	496.00	47.68	0.89	
16	China	495.00	47.58	0.88	
17	Austria	449.00	42.94	0.87	
18	Finland	443.00	42.34	0.87	
19	Korea, Rep.	424.00	40.42	0.86	
20	Norway	402.00	38.21	0.85	
21	Russian Federation	390.00	37.00	0.84	
22	India	383.00	36.29	0.83	●
23	Brazil	379.00	35.89	0.83	●
24	Poland	371.00	35.08	0.82	●
25	Hong Kong (China)	359.00	33.87	0.81	
26	New Zealand	351.00	33.06	0.80	
27	Singapore	349.00	32.86	0.80	
28	Ireland	332.00	31.15	0.79	
29	Greece	326.00	30.54	0.78	
30	Hungary	301.00	28.02	0.77	
31	Portugal	297.00	27.62	0.76	
32	Czech Republic	294.00	27.32	0.76	
33	South Africa	292.00	27.12	0.75	
34	Mexico	289.00	26.81	0.74	
35	Argentina	273.00	25.20	0.73	●
36	Turkey	266.00	24.50	0.72	
37	Chile	233.00	21.17	0.72	
38	Thailand	213.00	19.15	0.71	
39	Iceland	198.00	17.64	0.70	
40	Slovenia	189.00	16.73	0.69	
41	Iran, Islamic Rep.	180.00	15.83	0.68	●
41	Slovakia	180.00	15.83	0.68	
43	Croatia	177.00	15.52	0.67	
44	Ukraine	174.00	15.22	0.66	
45	Colombia	169.00	14.72	0.65	
46	Bulgaria	167.00	14.52	0.64	
46	Romania	167.00	14.52	0.64	
48	Egypt	165.00	14.31	0.61	●
48	Kenya	165.00	14.31	0.61	
48	Malaysia	165.00	14.31	0.61	
51	Saudi Arabia	164.00	14.21	0.61	
52	Estonia	162.00	14.01	0.60	
53	Venezuela, Bolivarian Rep.	155.00	13.31	0.59	●
54	Pakistan	148.00	12.60	0.58	●
55	Philippines	147.00	12.50	0.57	
56	Indonesia	140.00	11.79	0.56	
56	Peru	140.00	11.79	0.56	
58	Lithuania	133.00	11.09	0.54	
58	Viet Nam	133.00	11.09	0.54	
60	Panama	128.00	10.58	0.54	
61	Costa Rica	127.00	10.48	0.53	
62	Armenia	126.00	10.38	0.52	
63	Bangladesh	124.00	10.18	0.50	●
63	Uruguay	124.00	10.18	0.50	
65	Belarus	122.00	9.98	0.49	
65	Lebanon	122.00	9.98	0.49	
67	Uganda	118.00	9.58	0.48	
68	Morocco	117.00	9.48	0.47	
69	Nigeria	115.00	9.27	0.46	●
70	Cyprus	113.00	9.07	0.45	
70	Tanzania, United Rep.	113.00	9.07	0.45	●
72	United Arab Emirates	112.00	8.97	0.44	
73	Tunisia	109.00	8.67	0.43	
74	Sri Lanka	107.00	8.47	0.43	
75	Luxembourg	105.00	8.27	0.42	
76	Latvia	104.00	8.17	0.41	
77	Jordan	102.00	7.96	0.40	
78	Georgia	101.00	7.86	0.39	
79	Ecuador	100.00	7.76	0.37	
79	Kuwait	100.00	7.76	0.37	
79	Serbia	100.00	7.76	0.37	
82	Algeria	97.00	7.46	0.35	
82	Malawi	97.00	7.46	0.35	
84	Ghana	92.00	6.96	0.35	
85	Senegal	89.00	6.65	0.34	
86	Ethiopia	88.00	6.55	0.33	
87	Nepal	87.00	6.45	0.32	
88	Cameroon	85.00	6.25	0.31	
89	Oman	83.00	6.05	0.30	
89	Zambia	83.00	6.05	0.30	
91	Côte d'Ivoire	82.00	5.95	0.29	
92	Bolivia, Plurinational St.	78.00	5.54	0.28	
93	Burkina Faso	77.00	5.44	0.28	
94	Malta	75.00	5.24	0.27	○
95	Moldova, Rep.	74.00	5.14	0.25	
95	TFYR of Macedonia	74.00	5.14	0.25	
97	Botswana	71.00	4.84	0.24	
97	Jamaica	71.00	4.84	0.24	
99	Qatar	70.00	4.74	0.23	
100	Madagascar	68.00	4.54	0.21	
100	Mali	68.00	4.54	0.21	
102	Namibia	67.00	4.44	0.20	
103	Mozambique	66.00	4.33	0.20	
104	Cambodia	65.00	4.23	0.18	
104	Mongolia	65.00	4.23	0.18	
106	Kazakhstan	64.00	4.13	0.17	
107	Guatemala	63.00	4.03	0.17	
108	Benin	59.00	3.63	0.16	
109	Azerbaijan	58.00	3.53	0.15	
110	Nicaragua	56.00	3.33	0.14	
111	Bosnia and Herzegovina	55.00	3.23	0.13	
112	Niger	54.00	3.13	0.12	
112	Paraguay	54.00	3.13	0.12	
114	Mauritius	50.00	2.72	0.11	○
115	Bahrain	48.00	2.52	0.09	○
115	Honduras	48.00	2.52	0.09	○
115	Rwanda	48.00	2.52	0.09	
118	Dominican Republic	47.00	2.42	0.08	○
119	Yemen	46.00	2.32	0.07	
120	Albania	43.00	2.02	0.06	
121	Guinea	41.00	1.81	0.06	
122	El Salvador	40.00	1.71	0.04	○
122	Kyrgyzstan	40.00	1.71	0.04	○
124	Togo	37.00	1.41	0.03	○
125	Burundi	28.00	0.50	0.01	○
125	Montenegro	28.00	0.50	0.01	○
125	Tajikistan	28.00	0.50	0.01	○
128	Bhutan	23.00	0.00	0.00	○

SOURCE: SCImago. (2016). SJR — SCImago Journal & Country Rank. Retrieved February 2016

NOTE: ● indicates a strength; ○ a weakness

6.2.1 Growth rate of GDP per person engaged

Growth rate of GDP per person engaged (constant 1990 PPP$) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Indonesia	7.81	100.00	1.00	●
2	Philippines	6.20	89.88	0.99	●
3	Ethiopia	5.42	84.96	0.98	●
4	Cambodia	5.24	83.83	0.97	●
5	Côte d'Ivoire	5.06	82.69	0.96	●
6	India	4.97	82.13	0.95	●
7	Mozambique	4.81	81.14	0.94	●
8	Georgia	4.77	80.87	0.94	●
9	Tajikistan	4.71	80.50	0.93	●
10	Viet Nam	4.54	79.45	0.92	●
11	Sri Lanka	4.38	78.44	0.91	●
12	Tanzania, United Rep.	4.26	77.64	0.90	●
13	Mali	4.12	76.80	0.89	●
14	Latvia	3.76	74.53	0.88	●
15	Nigeria	3.75	74.47	0.87	●
16	Kazakhstan	3.55	73.22	0.86	●
17	Moldova, Rep.	3.53	73.08	0.85	●
18	Niger	3.52	72.98	0.84	●
19	Bangladesh	3.43	72.41	0.83	●
20	China	3.38	72.11	0.82	
21	Malaysia	3.28	71.48	0.81	
22	Luxembourg	3.13	70.56	0.81	
23	Bahrain	3.07	70.17	0.80	
24	Thailand	3.06	70.14	0.79	
25	Bolivia, Plurinational St.	3.05	70.05	0.78	●
26	Morocco	3.04	69.98	0.77	●
27	Ireland	3.00	69.76	0.76	
28	Uruguay	2.89	69.03	0.75	●
29	Armenia	2.79	68.40	0.74	
30	Dominican Republic	2.66	67.62	0.73	●
31	Kenya	2.49	66.52	0.72	●
32	Malawi	2.46	66.30	0.71	●
33	Kyrgyzstan	2.35	65.66	0.70	●
34	Colombia	2.34	65.57	0.69	
35	Zambia	2.18	64.57	0.69	●
36	Pakistan	2.12	64.18	0.68	●
37	Algeria	2.11	64.12	0.67	●
38	TFYR of Macedonia	2.06	63.82	0.66	
39	Slovenia	1.95	63.14	0.65	
40	Romania	1.93	62.98	0.64	
41	Cameroon	1.84	62.46	0.63	●
42	Canada	1.80	62.18	0.62	
43	Mexico	1.74	61.78	0.61	
44	Poland	1.72	61.69	0.60	
45	Ecuador	1.72	61.68	0.59	
46	Senegal	1.68	61.41	0.58	●
47	Australia	1.54	60.55	0.57	
48	Guatemala	1.49	60.25	0.56	
49	Belarus	1.48	60.16	0.56	
50	Hong Kong (China)	1.46	60.02	0.55	
51	United Arab Emirates	1.45	59.99	0.54	
52	Czech Republic	1.42	59.76	0.53	
53	Jordan	1.34	59.30	0.52	
54	Azerbaijan	1.33	59.24	0.51	
55	Bulgaria	1.33	59.24	0.50	
56	Peru	1.33	59.23	0.49	
57	Estonia	1.31	59.07	0.48	
58	Turkey	1.24	58.63	0.47	
59	Netherlands	1.18	58.31	0.46	○
60	Uganda	1.18	58.29	0.45	
61	Korea, Rep.	1.16	58.14	0.44	
62	Ghana	1.10	57.75	0.44	
63	Norway	1.06	57.49	0.43	○
64	Iran, Islamic Rep.	1.01	57.18	0.42	
65	Slovakia	0.99	57.06	0.41	
66	Albania	0.98	57.02	0.40	
67	Qatar	0.94	56.75	0.39	
68	Lithuania	0.92	56.67	0.38	
69	Sweden	0.87	56.32	0.37	○
70	United States of America	0.83	56.06	0.36	○
71	Germany	0.75	55.59	0.35	○
72	United Kingdom	0.71	55.30	0.34	○
73	Tunisia	0.70	55.26	0.33	
74	Belgium	0.67	55.09	0.32	○
75	Saudi Arabia	0.64	54.89	0.31	
76	Egypt	0.56	54.39	0.31	
77	Burkina Faso	0.53	54.17	0.30	
78	Hungary	0.48	53.89	0.29	○
79	Denmark	0.44	53.62	0.28	○
80	Finland	0.44	53.60	0.27	○
81	Russian Federation	0.43	53.55	0.26	
82	Singapore	0.32	52.84	0.25	○
83	Switzerland	0.29	52.70	0.24	○
84	Iceland	0.28	52.62	0.23	○
85	Brazil	0.27	52.55	0.22	○
86	Chile	0.27	52.52	0.21	○
87	Spain	0.12	51.60	0.20	○
88	Costa Rica	0.09	51.39	0.19	○
89	Greece	0.04	51.09	0.19	○
90	France	−0.12	50.11	0.18	○
91	Madagascar	−0.13	50.05	0.17	
92	New Zealand	−0.23	49.40	0.16	○
93	Israel	−0.30	48.94	0.15	○
94	South Africa	−0.36	48.61	0.14	○
95	Cyprus	−0.39	48.40	0.13	○
96	Ukraine	−0.43	48.13	0.12	○
97	Italy	−0.50	47.70	0.11	○
98	Portugal	−0.52	47.57	0.10	○
99	Austria	−0.54	47.47	0.09	○
100	Japan	−0.72	46.33	0.08	○
101	Kuwait	−0.87	45.39	0.07	○
102	Malta	−0.92	45.04	0.06	○
103	Argentina	−1.07	44.10	0.06	○
104	Jamaica	−1.28	42.77	0.05	○
105	Oman	−1.96	38.54	0.04	○
106	Bosnia and Herzegovina	−1.99	38.32	0.03	○
107	Croatia	−2.99	32.02	0.02	○
108	Yemen	−4.35	23.45	0.01	
109	Venezuela, Bolivarian Rep.	−8.08	0.00	0.00	○
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Serbia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	

SOURCE: The Conference Board Total Economy Database[[™ Output, Labor and Labor Productivity, 1950–2015, September 2015

NOTE: ● indicates a strength; ○ a weakness

6.2.2 New business density

New business density (new registrations per thousand population 15–64 years old) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	31.30	100.00	0.99	●	65	Albania (2013)	1.11	6.41	0.40	
1	Malta	17.26	100.00	0.99	●	66	Costa Rica	1.10	6.36	0.39	
3	New Zealand	16.63	96.35	0.98	●	67	Kyrgyzstan	1.08	6.24	0.38	
4	Estonia	16.05	92.99	0.97	●	68	Belarus	1.05	6.07	0.37	
5	Australia	14.91	86.38	0.96	●	69	Oman (2013)	1.02	5.89	0.36	
6	Panama (2012)	14.10	81.69	0.95	●	70	Jamaica	1.00	5.78	0.35	
7	Cyprus	13.70	79.37	0.94	●	71	Azerbaijan	0.99	5.72	0.33	
8	Botswana	13.11	75.95	0.93	●	71	Jordan	0.99	5.72	0.33	
9	United Kingdom (2012)	12.90	74.73	0.92		73	Mexico	0.94	5.43	0.32	
10	Latvia	10.61	61.46	0.92	●	74	Ukraine (2012)	0.92	5.31	0.31	
11	Singapore	9.51	55.09	0.91		75	Thailand	0.90	5.20	0.30	
12	Iceland	9.48	54.92	0.90		76	Ghana (2012)	0.90	5.17	0.29	
13	Bulgaria	8.86	51.32	0.89	●	77	Namibia (2012)	0.85	4.91	0.28	
14	Chile	8.03	46.51	0.88	●	78	Bosnia and Herzegovina	0.83	4.79	0.27	
15	Norway	7.72	44.72	0.87		79	Greece (2010)	0.77	4.42	0.26	○
16	Sweden	6.87	39.79	0.86		80	Nigeria	0.76	4.39	0.25	
17	Montenegro	6.85	39.68	0.85	●	81	Austria	0.73	4.21	0.25	○
18	South Africa (2012)	6.54	37.86	0.84	●	82	Madagascar	0.70	4.04	0.24	
19	Mongolia	6.31	36.55	0.83	●	83	Nepal	0.69	3.98	0.23	
20	Luxembourg (2012)	6.10	35.33	0.82		84	Algeria	0.58	3.34	0.22	
21	Ireland	5.78	33.48	0.81		85	Bolivia, Plurinational St.	0.57	3.28	0.21	
22	Georgia	5.65	32.72	0.80		86	Poland (2009)	0.53	3.05	0.20	○
23	Netherlands	5.34	30.93	0.79		87	El Salvador	0.52	2.99	0.18	
24	Mauritius	5.14	29.77	0.78	●	87	Guatemala (2012)	0.52	2.99	0.18	
25	Croatia	4.63	26.81	0.77	●	89	Sri Lanka (2012)	0.51	2.94	0.17	
26	Portugal	4.62	26.75	0.76		90	Argentina	0.43	2.47	0.16	
27	Slovenia	4.44	25.71	0.75		91	Senegal	0.30	1.72	0.15	
28	Denmark	4.36	25.25	0.75		92	Indonesia (2012)	0.29	1.66	0.14	
29	Russian Federation	4.20	24.32	0.74		93	Philippines (2012)	0.27	1.55	0.13	
30	Lithuania	4.19	24.26	0.73		94	Tajikistan (2012)	0.26	1.49	0.11	
31	Romania	4.07	23.57	0.72		94	Togo	0.26	1.49	0.11	
32	TFYR of Macedonia	3.70	21.42	0.71		96	Cambodia (2009)	0.22	1.24	0.10	
33	Hungary	3.66	21.19	0.70		97	Burkina Faso (2012)	0.15	0.85	0.08	
34	Finland	3.43	19.86	0.69		97	Japan	0.15	0.85	0.08	○
35	Czech Republic	3.42	19.80	0.68		99	Guinea	0.13	0.73	0.08	
36	Israel	3.11	18.00	0.67		100	Egypt (2009)	0.13	0.72	0.07	○
37	Slovakia	3.10	17.94	0.66		101	India	0.12	0.68	0.06	○
38	Spain	2.97	17.19	0.65		102	Bangladesh (2012)	0.09	0.50	0.05	
39	Brazil	2.88	16.67	0.64		103	Malawi (2009)	0.08	0.44	0.04	
40	Switzerland (2012)	2.53	14.64	0.63		104	Bhutan	0.06	0.33	0.03	○
41	Uruguay (2012)	2.49	14.41	0.62		105	Pakistan	0.04	0.21	0.02	○
42	Peru	2.44	14.12	0.61		106	Ethiopia (2009)	0.03	0.15	0.01	○
43	Malaysia	2.37	13.71	0.60		107	Niger (2009)	0.00	0.00	0.00	○
44	Italy	2.32	13.42	0.59		n/a	Bahrain	n/a	n/a	n/a	
45	Korea, Rep.	2.30	13.31	0.58		n/a	Benin	n/a	n/a	n/a	
46	France	2.26	13.08	0.58	○	n/a	Burundi	n/a	n/a	n/a	
47	Belgium (2013)	2.05	11.86	0.57		n/a	Cameroon	n/a	n/a	n/a	
48	Colombia (2012)	2.00	11.57	0.56		n/a	China	n/a	n/a	n/a	
49	Kenya	1.80	10.41	0.55		n/a	Côte d'Ivoire	n/a	n/a	n/a	
50	Kazakhstan (2012)	1.71	9.89	0.54		n/a	Ecuador	n/a	n/a	n/a	
51	Qatar	1.70	9.83	0.53		n/a	Honduras	n/a	n/a	n/a	
52	Moldova, Rep. (2009)	1.63	9.43	0.52		n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
53	Serbia	1.62	9.37	0.51		n/a	Kuwait	n/a	n/a	n/a	
54	Morocco	1.54	8.91	0.50		n/a	Lebanon	n/a	n/a	n/a	
55	Armenia	1.52	8.79	0.48		n/a	Mali	n/a	n/a	n/a	
55	Tunisia (2013)	1.52	8.79	0.48		n/a	Mozambique	n/a	n/a	n/a	
57	Rwanda	1.49	8.62	0.47		n/a	Nicaragua	n/a	n/a	n/a	
58	United Arab Emirates (2012)	1.38	7.98	0.46		n/a	Paraguay	n/a	n/a	n/a	
59	Zambia	1.33	7.69	0.45		n/a	Saudi Arabia	n/a	n/a	n/a	
60	Germany (2013)	1.29	7.46	0.44	○	n/a	Tanzania, United Rep.	n/a	n/a	n/a	
61	Canada	1.28	7.40	0.43	○	n/a	United States of America	n/a	n/a	n/a	
62	Dominican Republic	1.20	6.93	0.42		n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
63	Uganda (2012)	1.17	6.76	0.42		n/a	Viet Nam	n/a	n/a	n/a	
64	Turkey	1.13	6.53	0.41		n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Bank, *Doing Business 2016, Entrepreneurship*

NOTE: ● indicates a strength; ○ a weakness

6.2.3 Total computer software spending

Total computer software spending (% of GDP) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United States of America	1.06	100.00	1.00	●
2	Canada	0.80	73.05	0.99	●
3	Switzerland	0.76	68.31	0.97	●
4	Ireland	0.74	66.65	0.96	●
5	Belgium	0.65	57.46	0.94	●
6	Spain	0.65	56.99	0.93	●
7	Netherlands	0.64	56.57	0.92	
8	United Kingdom	0.63	55.58	0.90	
9	Turkey	0.63	55.40	0.89	●
10	Portugal	0.63	55.13	0.88	
11	Denmark	0.61	53.53	0.86	
12	France	0.61	53.48	0.85	
13	Greece	0.60	52.26	0.83	
14	Austria	0.60	51.72	0.82	
15	Norway	0.60	51.53	0.81	
16	Italy	0.59	51.27	0.79	
17	Sweden	0.59	51.07	0.78	
18	Finland	0.57	48.35	0.76	
19	Germany	0.55	46.45	0.75	
20	Ukraine	0.45	36.18	0.74	
21	Malaysia	0.40	31.43	0.72	
22	Hong Kong (China)	0.37	28.21	0.71	
23	China	0.37	27.69	0.69	
24	Singapore	0.37	27.37	0.68	
25	South Africa	0.35	26.17	0.67	
26	Jamaica	0.35	25.29	0.65	●
27	Bahrain	0.34	24.49	0.64	
28	Sri Lanka	0.34	24.32	0.63	
29	Saudi Arabia	0.33	23.72	0.61	
30	Kuwait	0.32	23.01	0.60	
31	Thailand	0.32	22.82	0.58	
32	Indonesia	0.32	22.57	0.57	
33	Viet Nam	0.32	22.46	0.56	
34	New Zealand	0.32	22.29	0.54	
35	Korea, Rep.	0.31	21.42	0.53	
36	Tunisia	0.31	21.25	0.51	
37	Japan	0.30	20.67	0.50	
38	Czech Republic	0.30	20.67	0.49	
39	Australia	0.30	20.63	0.47	
40	Slovakia	0.30	20.52	0.46	
41	Romania	0.30	20.47	0.44	
42	Israel	0.30	20.32	0.43	
43	Bulgaria	0.30	20.04	0.42	
44	Chile	0.29	19.54	0.40	
45	Hungary	0.29	19.52	0.39	○
46	Costa Rica	0.29	18.91	0.38	
47	Senegal	0.28	18.73	0.36	
48	Pakistan	0.28	18.69	0.35	
49	Jordan	0.28	18.32	0.33	
50	Honduras	0.28	18.19	0.32	
51	Poland	0.28	17.88	0.31	○
52	Russian Federation	0.27	16.93	0.29	
53	Philippines	0.26	16.71	0.28	
54	Peru	0.26	16.68	0.26	
55	Brazil	0.26	16.46	0.25	
56	Morocco	0.26	16.12	0.24	
57	United Arab Emirates	0.26	16.08	0.22	○
58	Colombia	0.25	15.02	0.21	
59	Egypt	0.25	14.96	0.19	
60	Uruguay	0.24	14.59	0.18	
61	Qatar	0.24	14.23	0.17	
62	India	0.24	14.09	0.15	
63	Panama	0.24	14.07	0.14	
64	Iran, Islamic Rep.	0.24	14.05	0.13	
65	Ecuador	0.23	13.57	0.11	
66	Bolivia, Plurinational St.	0.23	13.15	0.10	
67	Mexico	0.23	13.14	0.08	○
68	Kenya	0.20	10.42	0.07	○
69	Argentina	0.20	10.20	0.06	○
70	Venezuela, Bolivarian Rep.	0.19	9.09	0.04	
71	Cameroon	0.17	7.11	0.03	○
72	Bangladesh	0.17	6.83	0.01	○
73	Nigeria	0.11	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Cyprus	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Estonia	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Kazakhstan	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Latvia	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Lithuania	n/a	n/a	n/a	
n/a	Luxembourg	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Serbia	n/a	n/a	n/a	
n/a	Slovenia	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: IHS Global Insight, *Information and Communication Technology Database;* International Monetary Fund, *World Economic Outlook Database,* 2015 (GDP)
NOTE: ● indicates a strength; ○ a weakness

6.2.4 ISO 9001 quality certificates

ISO 9001 Quality management systems—Requirements: Number of certificates issued (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Italy	79.12	100.00	0.99	●
1	Romania	48.21	100.00	0.99	●
3	Bulgaria	44.38	92.06	0.98	●
4	Czech Republic	41.88	86.87	0.98	●
5	Malta	33.00	68.45	0.97	●
6	Israel	32.56	67.54	0.96	●
7	Croatia	31.63	65.62	0.95	●
8	Slovakia	30.05	62.34	0.94	●
9	Portugal	28.45	59.02	0.94	●
10	Hungary	28.04	58.15	0.93	●
11	Estonia	27.95	57.97	0.92	●
12	Serbia	27.51	57.07	0.91	●
13	Slovenia	27.16	56.34	0.91	●
14	Switzerland	23.68	49.12	0.90	
15	Spain	22.90	47.50	0.89	●
16	Colombia	22.63	46.94	0.88	●
17	Bosnia and Herzegovina	22.09	45.83	0.87	●
18	Latvia	20.70	42.93	0.87	●
19	Greece	19.09	39.59	0.86	●
20	China	18.95	39.31	0.85	
21	Australia	17.94	37.21	0.84	
22	Belarus	17.15	35.58	0.83	●
23	TFYR of Macedonia	16.09	33.37	0.83	●
24	United Kingdom	15.65	32.45	0.82	
25	Lithuania	15.24	31.61	0.81	
26	Malaysia	14.93	30.97	0.80	
27	Germany	14.77	30.64	0.80	
28	Montenegro	13.79	28.60	0.79	●
29	Uruguay	12.99	26.94	0.78	●
30	Netherlands	12.90	26.76	0.77	
31	Singapore	12.72	26.38	0.76	
32	Finland	11.95	24.79	0.76	
33	France	11.24	23.31	0.75	
34	Sweden	11.09	23.01	0.74	
35	Chile	10.99	22.79	0.73	
36	Austria	10.62	22.02	0.72	
37	Cyprus	10.03	20.81	0.72	
38	Poland	10.01	20.76	0.71	
39	Japan	9.60	19.92	0.70	
40	Mauritius	9.44	19.57	0.69	
41	Lebanon	9.17	19.03	0.69	
42	Ireland	8.74	18.14	0.68	
43	Thailand	8.43	17.49	0.67	
44	New Zealand	8.02	16.64	0.66	
45	Belgium	7.58	15.73	0.65	
46	Ecuador	7.44	15.43	0.65	●
47	Viet Nam	7.39	15.32	0.64	
48	United Arab Emirates	7.14	14.81	0.63	
49	Argentina	7.11	14.75	0.62	
50	Moldova, Rep.	6.92	14.35	0.61	
51	Norway	6.86	14.24	0.61	
52	Denmark	6.75	14.00	0.60	
53	Korea, Rep.	6.63	13.76	0.59	
54	Canada	6.03	12.51	0.58	
55	Turkey	5.92	12.28	0.57	
56	Hong Kong (China)	5.73	11.89	0.57	
57	Tunisia	5.63	11.67	0.56	
58	Brazil	5.56	11.52	0.55	
59	India	5.53	11.48	0.54	
60	Albania	5.41	11.23	0.54	
61	South Africa	5.35	11.09	0.53	
62	Bahrain	4.99	10.34	0.52	
63	Iceland	4.74	9.84	0.51	
64	Honduras	4.64	9.62	0.50	
65	Paraguay	4.60	9.54	0.50	●
66	El Salvador	4.59	9.52	0.49	
67	Kenya	4.25	8.81	0.48	
68	Jordan	3.70	7.68	0.47	
69	Mexico	3.68	7.63	0.46	
70	Costa Rica	3.54	7.34	0.46	
71	Ukraine	3.53	7.31	0.45	
72	Georgia	3.44	7.13	0.44	
73	Sri Lanka	3.33	6.90	0.43	
74	Oman	3.28	6.81	0.43	
75	Russian Federation	3.16	6.55	0.42	
76	Morocco	3.14	6.52	0.41	
77	Bolivia, Plurinational St.	2.93	6.08	0.40	
78	Peru	2.89	5.99	0.39	
79	Pakistan	2.84	5.89	0.39	
80	Indonesia	2.82	5.86	0.38	
81	Luxembourg	2.79	5.80	0.37	
82	Benin	2.32	4.80	0.36	
83	Philippines	2.31	4.79	0.35	
84	Egypt	2.28	4.73	0.35	
85	Madagascar	2.14	4.45	0.34	
86	Qatar	2.07	4.30	0.33	
87	Iran, Islamic Rep.	1.98	4.10	0.32	
88	United States of America	1.90	3.95	0.31	○
89	Panama	1.86	3.86	0.31	
90	Saudi Arabia	1.86	3.86	0.30	
91	Guatemala	1.81	3.76	0.29	
92	Côte d'Ivoire	1.77	3.68	0.28	
93	Senegal	1.73	3.58	0.28	
94	Namibia	1.66	3.45	0.27	
95	Nicaragua	1.65	3.42	0.26	
96	Burkina Faso	1.50	3.10	0.25	
97	Azerbaijan	1.47	3.05	0.24	
98	Nepal	1.44	3.00	0.24	
99	Mozambique	1.44	2.99	0.23	
100	Uganda	1.39	2.87	0.22	
101	Dominican Republic	1.31	2.71	0.21	
102	Kazakhstan	1.20	2.48	0.20	
103	Bhutan	1.19	2.47	0.20	
104	Kuwait	1.10	2.28	0.19	
105	Venezuela, Bolivarian Rep.	1.05	2.17	0.18	
106	Jamaica	0.91	1.89	0.17	○
107	Togo	0.89	1.84	0.17	
108	Cameroon	0.83	1.71	0.16	
109	Algeria	0.82	1.71	0.15	
110	Malawi	0.77	1.59	0.14	
111	Zambia	0.77	1.59	0.13	
112	Bangladesh	0.70	1.45	0.13	
113	Armenia	0.66	1.36	0.12	○
114	Tanzania, United Rep.	0.62	1.28	0.11	
115	Guinea	0.59	1.23	0.10	
116	Ethiopia	0.57	1.17	0.09	
117	Cambodia	0.56	1.16	0.09	○
118	Mongolia	0.54	1.13	0.08	○
119	Ghana	0.54	1.13	0.07	○
120	Botswana	0.53	1.10	0.06	○
121	Niger	0.44	0.92	0.06	
122	Yemen	0.37	0.78	0.05	
123	Rwanda	0.32	0.66	0.04	○
124	Kyrgyzstan	0.21	0.43	0.03	○
125	Mali	0.18	0.38	0.02	○
126	Tajikistan	0.18	0.37	0.02	○
127	Nigeria	0.17	0.35	0.01	○
128	Burundi	0.00	0.00	0.00	○

SOURCE: International Organization for Standardization, *The ISO Survey of Management System Standard Certifications, 2014*; International Monetary Fund, World Economic Outlook 2015 (PPP$ GDP)

NOTE: ● indicates a strength; ○ a weakness

6.2.5 High-tech and medium-high-tech output

High-tech and medium-high-tech output (% of total manufactures output) | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Singapore	69.25	100.00	1.00	●
2	Switzerland	66.06	95.33	0.99	●
3	Slovakia	57.93	83.44	0.98	●
4	Ireland (2011)	57.61	82.97	0.97	●
5	Korea, Rep.	57.19	82.35	0.96	
6	Hungary	56.18	80.89	0.95	●
7	Germany	54.68	78.69	0.94	
8	Japan	51.81	74.50	0.93	
9	Slovenia	47.97	68.88	0.92	●
10	Sweden	47.27	67.86	0.91	
11	Denmark	44.12	63.25	0.90	
12	Philippines (2010)	44.03	63.12	0.89	●
13	France	43.87	62.88	0.88	
14	Mexico (2011)	43.70	62.63	0.87	●
15	United States of America (2008)	43.27	62.00	0.86	
16	Austria	43.25	61.97	0.85	
17	Czech Republic	43.24	61.97	0.84	
18	China (2011)	43.13	61.80	0.82	
19	Norway	42.85	61.39	0.81	
20	Thailand (2011)	42.27	60.55	0.80	
21	United Kingdom	41.38	59.24	0.79	
22	Netherlands	41.03	58.73	0.78	
23	Brazil	38.66	55.27	0.77	●
24	Estonia	38.65	55.24	0.76	
25	Italy	37.63	53.76	0.75	
26	Malaysia	37.40	53.41	0.74	
27	Oman	36.70	52.40	0.73	●
28	Saudi Arabia (2009)	35.85	51.15	0.72	
29	Finland	34.91	49.78	0.71	
30	Romania	34.91	49.78	0.70	
31	Spain	34.44	49.09	0.69	
32	Belgium	34.37	49.00	0.68	
33	Iran, Islamic Rep. (2011)	33.77	48.11	0.67	●
34	Poland	33.13	47.18	0.66	
35	Tunisia (2007)	32.43	46.15	0.65	
36	India (2011)	31.71	45.10	0.64	
37	Belarus (2011)	31.35	44.58	0.63	
38	Indonesia (2011)	30.88	43.88	0.62	
39	Canada	29.38	41.69	0.61	
40	Algeria (2010)	29.07	41.24	0.60	●
41	Israel (2011)	29.02	41.17	0.59	
42	South Africa (2010)	28.24	40.03	0.58	
43	Turkey (2009)	28.16	39.91	0.57	
44	Morocco	27.22	38.54	0.56	
45	Ukraine	26.49	37.47	0.55	
46	Russian Federation	26.28	37.16	0.54	
47	Portugal	26.21	37.05	0.53	
48	Viet Nam (2008)	26.17	36.99	0.52	
49	Australia	24.77	34.95	0.51	
50	Malta (2010)	24.49	34.53	0.49	
51	Pakistan (2006)	23.71	33.40	0.48	●
52	Hong Kong (China)	22.03	30.95	0.47	
53	Lebanon (2007)	22.00	30.90	0.46	
54	Egypt (2010)	21.45	30.10	0.45	
55	Serbia	20.97	29.39	0.44	
56	Qatar (2010)	20.78	29.11	0.43	
57	Jordan	20.35	28.49	0.42	
58	Colombia	20.03	28.02	0.41	
59	Lithuania	19.82	27.71	0.40	
60	TFYR of Macedonia (2011)	19.58	27.36	0.39	
61	Bulgaria	19.10	26.66	0.38	
62	Senegal	16.60	23.00	0.37	
63	Kazakhstan	16.53	22.89	0.36	
64	Latvia	15.64	21.60	0.35	
65	Paraguay (2010)	15.04	20.72	0.34	
66	New Zealand (2010)	14.80	20.37	0.33	○
67	Kuwait	14.29	19.62	0.32	
68	Ecuador (2008)	13.96	19.15	0.31	
69	Cyprus	13.78	18.88	0.30	
70	Uruguay (2010)	12.87	17.55	0.29	
71	Greece	12.14	16.48	0.28	○
72	Georgia	12.05	16.35	0.27	
73	Costa Rica	11.75	15.91	0.26	
74	Bosnia and Herzegovina (2011)	11.06	14.90	0.25	
75	Ethiopia (2009)	10.87	14.62	0.24	
76	Azerbaijan	10.36	13.87	0.23	
77	Tanzania, United Rep. (2010)	10.01	13.37	0.22	
78	Bahrain (2010)	9.93	13.25	0.21	
79	Bangladesh (2011)	9.74	12.97	0.20	
80	Peru (2011)	9.25	12.25	0.19	○
81	Moldova, Rep.	9.03	11.94	0.18	○
82	Kenya	8.75	11.53	0.16	
83	Malawi (2010)	8.62	11.34	0.15	
84	Mauritius	8.16	10.66	0.14	○
85	Iceland (2006)	7.13	9.16	0.13	○
86	Nepal (2011)	6.72	8.55	0.12	
87	Luxembourg	6.50	8.23	0.11	○
88	Sri Lanka (2011)	6.26	7.88	0.10	○
89	Tajikistan	5.81	7.22	0.09	
90	Mongolia (2011)	5.53	6.81	0.08	○
91	Cameroon (2008)	5.13	6.24	0.07	
92	Namibia	4.90	5.89	0.06	○
93	Armenia	4.33	5.06	0.05	○
94	Kyrgyzstan (2010)	3.26	3.49	0.04	○
95	Madagascar (2006)	2.42	2.26	0.03	○
96	Yemen (2009)	1.88	1.47	0.02	
97	Burundi (2010)	1.84	1.42	0.01	
98	Albania	0.87	0.00	0.00	○
n/a	Argentina	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Chile	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: United Nations Industrial Development Organization *Industrial Statistics Database* INDSTAT4 2012; OECD 'ISIC REV. 3 Technology Intensity Def.' (2006–12)
NOTE: ● indicates a strength; ○ a weakness

6.3.1 Intellectual property receipts

Charges for use of intellectual property n.i.e., receipts (%, total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland (2013)	3.16	100.00	0.95	●
1	Ireland	2.14	100.00	0.95	●
1	Japan	3.98	100.00	0.95	●
1	Sweden	3.68	100.00	0.95	●
1	Switzerland	4.13	100.00	0.95	●
1	United States of America	5.10	100.00	0.95	●
7	Malta	2.12	98.94	0.94	
8	Rwanda (2011)	2.02	94.46	0.93	●
9	Iceland	1.91	89.08	0.92	
10	Hungary	1.79	83.50	0.91	●
11	United Kingdom	1.75	81.95	0.90	
12	Denmark	1.44	67.08	0.89	
13	France	1.43	66.62	0.88	
14	Germany	0.82	38.29	0.87	
15	Luxembourg	0.80	37.57	0.86	
16	Korea, Rep.	0.75	35.11	0.85	
17	Belgium	0.72	33.73	0.84	
18	Canada	0.69	32.36	0.83	
19	Italy	0.60	28.13	0.82	
20	Singapore	0.58	27.25	0.81	
21	New Zealand	0.58	26.90	0.80	
22	Israel (2013)	0.55	25.87	0.79	
23	Austria	0.47	22.14	0.78	
24	Madagascar (2013)	0.46	21.27	0.77	●
25	Yemen (2009)	0.40	18.51	0.76	●
26	Kenya	0.39	18.26	0.75	●
27	Czech Republic	0.30	13.96	0.75	
28	Australia	0.30	13.87	0.74	
29	Egypt (2007)	0.25	11.80	0.73	●
30	El Salvador	0.22	10.32	0.72	●
31	Norway	0.21	9.79	0.71	
32	Uganda	0.20	9.20	0.70	●
33	Slovenia	0.19	8.89	0.69	
34	Serbia	0.19	8.73	0.68	
35	Ukraine	0.17	8.16	0.67	
36	Romania	0.17	7.86	0.66	
37	Moldova, Rep.	0.16	7.64	0.65	
38	TFYR of Macedonia	0.16	7.62	0.64	
39	Bosnia and Herzegovina	0.16	7.43	0.63	
40	Argentina	0.16	7.36	0.62	
41	Greece	0.15	7.15	0.61	
42	Bolivia, Plurinational St.	0.14	6.69	0.60	●
43	Russian Federation	0.13	6.14	0.59	
44	Brazil	0.13	6.03	0.58	
45	India	0.13	5.93	0.57	
46	Poland	0.12	5.70	0.56	
47	Jamaica	0.11	5.07	0.55	
48	Portugal	0.11	4.94	0.54	
49	Tunisia (2013)	0.10	4.90	0.53	
50	South Africa	0.10	4.85	0.52	
51	Hong Kong (China) (2013)	0.09	4.39	0.51	
52	Guatemala	0.09	4.34	0.50	
53	Belarus	0.09	4.14	0.49	
54	Bulgaria	0.09	4.12	0.48	
55	Chile (2013)	0.09	4.00	0.47	
56	Colombia	0.08	3.79	0.46	
57	Thailand	0.08	3.72	0.45	
58	Croatia	0.08	3.62	0.44	
59	Lebanon	0.07	3.34	0.43	
60	Lithuania	0.07	3.09	0.42	
61	Montenegro	0.05	2.31	0.41	
62	Estonia	0.04	1.91	0.40	○
63	Mongolia	0.04	1.74	0.39	
64	Mauritius	0.03	1.62	0.38	
65	Senegal (2013)	0.03	1.48	0.37	
66	Panama	0.03	1.43	0.36	
67	Pakistan	0.03	1.42	0.35	
68	Kyrgyzstan	0.03	1.41	0.34	
69	Cyprus	0.03	1.41	0.33	
70	Slovakia	0.03	1.38	0.32	○
71	Indonesia	0.03	1.38	0.31	
72	China	0.03	1.35	0.30	
73	Latvia	0.03	1.31	0.29	○
74	Malaysia	0.03	1.30	0.28	○
75	Cambodia	0.03	1.26	0.27	
76	Costa Rica	0.02	1.13	0.26	
77	Mexico	0.02	1.05	0.25	
78	Burkina Faso (2013)	0.02	0.95	0.25	
79	Georgia	0.02	0.94	0.24	
80	Tajikistan	0.02	0.84	0.23	
81	Peru (2013)	0.02	0.82	0.22	
82	Albania	0.01	0.68	0.21	
83	Iran, Islamic Rep. (2013)	0.01	0.60	0.20	
84	Philippines	0.01	0.58	0.19	
85	Burundi (2013)	0.01	0.42	0.18	
86	Uruguay	0.01	0.29	0.17	○
87	Guinea (2008)	0.01	0.29	0.16	
88	Mozambique (2013)	0.00	0.23	0.15	
89	Ethiopia (2010)	0.00	0.16	0.14	
90	Mali (2012)	0.00	0.15	0.13	
91	Morocco (2013)	0.00	0.12	0.12	○
92	Kazakhstan	0.00	0.12	0.11	○
93	Cameroon (2013)	0.00	0.11	0.10	
94	Bangladesh (2013)	0.00	0.06	0.09	
95	Botswana (2013)	0.00	0.05	0.08	○
96	Algeria (2013)	0.00	0.05	0.07	
97	Togo (2010)	0.00	0.04	0.06	
98	Bhutan	0.00	0.03	0.05	
99	Niger (2007)	0.00	0.01	0.04	
100	Namibia (2013)	0.00	0.01	0.03	○
101	Azerbaijan (2012)	0.00	0.00	0.02	○
102	Benin (2010)	0.00	0.00	0.01	○
103	Tanzania, United Rep. (2013)	0.00	0.00	0.00	○
n/a	Armenia	n/a	n/a	n/a	
n/a	Bahrain	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Netherlands	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Spain	n/a	n/a	n/a	
n/a	Sri Lanka	n/a	n/a	n/a	
n/a	Turkey	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Viet Nam	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: World Trade Organization, *Trade in Commercial Services* database, based on the International Monetary Fund *Balance of Payments* database

NOTE: ● indicates a strength; ○ a weakness

6.3.2 High-tech exports

High-tech net exports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	28.02	100.00	0.98	●	65	Chile	0.87	3.25	0.47	
1	Malaysia	28.25	100.00	0.98	●	66	Cambodia (2013)	0.73	2.71	0.46	
1	Singapore	26.85	100.00	0.98	●	67	Senegal	0.70	2.60	0.45	
4	Viet Nam	22.51	83.86	0.98	●	68	Pakistan	0.67	2.51	0.44	
5	Korea, Rep.	21.76	81.05	0.97		69	Luxembourg	0.63	2.34	0.43	
6	Costa Rica (2013)	19.07	71.05	0.96	●	70	Moldova, Rep.	0.61	2.28	0.43	
7	Panama (2011)	18.27	68.07	0.95	●	71	Kenya (2013)	0.56	2.08	0.42	
8	Czech Republic	16.28	60.63	0.94	●	72	Iran, Islamic Rep. (2011)	0.53	1.98	0.41	
9	Mexico	14.76	54.99	0.93	●	73	Mozambique	0.53	1.98	0.40	
10	Thailand	14.43	53.74	0.93	●	74	Honduras	0.53	1.96	0.39	
11	Switzerland	14.16	52.75	0.92		75	Mongolia	0.52	1.94	0.38	
12	France	13.88	51.71	0.91		76	Oman	0.49	1.82	0.38	
13	Hungary	13.18	49.11	0.90	●	77	Cyprus	0.48	1.79	0.37	
14	Netherlands	13.12	48.87	0.89		78	Jordan	0.47	1.75	0.36	
15	Germany	13.02	48.49	0.88		79	Paraguay	0.46	1.72	0.35	
16	Israel	12.92	48.12	0.88		80	Peru	0.44	1.65	0.34	
17	Estonia	12.47	46.45	0.87		81	Malawi	0.44	1.64	0.33	
18	Japan	11.61	43.26	0.86		82	Rwanda	0.40	1.48	0.33	
19	Belgium	10.05	37.43	0.85		83	Kyrgyzstan (2013)	0.36	1.33	0.32	
20	Austria	9.45	35.20	0.84		84	Sri Lanka	0.35	1.31	0.31	
21	Slovakia	9.22	34.33	0.83	●	85	Burkina Faso	0.35	1.30	0.30	
22	Ireland	9.14	34.06	0.83		86	Ghana (2013)	0.33	1.22	0.29	
23	United Kingdom	8.94	33.29	0.82		87	Georgia	0.31	1.17	0.28	
24	Sweden	8.81	32.81	0.81		88	Cameroon	0.31	1.16	0.28	
25	Latvia	7.02	26.15	0.80		89	Egypt	0.28	1.06	0.27	
26	United States of America	6.82	25.41	0.79		90	Ecuador	0.26	0.98	0.26	
27	Poland	6.56	24.45	0.78		91	Tanzania, United Rep.	0.25	0.94	0.25	
28	Denmark	6.13	22.84	0.78		92	Bolivia, Plurinational St.	0.25	0.93	0.24	
29	Canada	6.02	22.44	0.77		93	Bahrain	0.24	0.88	0.23	
30	Malta	5.69	21.20	0.76		94	Botswana	0.22	0.80	0.23	
31	Italy	5.52	20.55	0.75		95	Armenia	0.21	0.80	0.22	
32	Lithuania	5.29	19.69	0.74		96	Ethiopia	0.21	0.78	0.21	
33	Finland	5.04	18.77	0.73		97	Zambia	0.20	0.74	0.20	
34	Kazakhstan	4.76	17.73	0.73		98	Lebanon	0.19	0.71	0.19	
35	Slovenia	4.49	16.73	0.72		99	Uganda	0.18	0.66	0.18	
36	Spain	3.77	14.06	0.71		100	Nigeria	0.17	0.63	0.18	
37	India	3.53	13.16	0.70		101	Nicaragua	0.17	0.62	0.17	
38	Croatia	3.50	13.04	0.69		102	Guinea	0.15	0.55	0.16	
39	Tunisia (2013)	3.35	12.47	0.68	●	103	Benin	0.14	0.51	0.15	
40	Norway	3.31	12.33	0.68		104	Bangladesh (2011)	0.13	0.49	0.14	
41	Indonesia	3.26	12.15	0.67		105	Azerbaijan	0.13	0.49	0.13	
42	Brazil	3.03	11.29	0.66		106	Madagascar	0.12	0.44	0.13	
43	Bulgaria	3.02	11.24	0.65		107	Hong Kong (China) (2013)	0.11	0.42	0.12	○
44	Niger	3.00	11.16	0.64	●	108	Mali (2012)	0.11	0.41	0.11	
45	Ukraine	2.95	10.98	0.63		109	Saudi Arabia (2013)	0.10	0.37	0.10	○
46	El Salvador	2.59	9.65	0.63	●	110	Nepal	0.09	0.34	0.09	
47	Portugal	2.52	9.40	0.62		111	United Arab Emirates (2008)	0.09	0.34	0.08	○
48	South Africa	2.49	9.29	0.61		112	Burundi	0.08	0.28	0.08	
49	Côte d'Ivoire	2.07	7.70	0.60	●	113	Jamaica	0.06	0.22	0.07	○
50	TFYR of Macedonia	2.06	7.66	0.59		114	Togo (2013)	0.04	0.16	0.06	
51	Russian Federation	2.06	7.66	0.58		115	Albania	0.04	0.14	0.05	
52	Greece	1.88	7.00	0.58		116	Yemen	0.01	0.05	0.04	
53	Australia	1.81	6.75	0.57		117	Kuwait	0.01	0.03	0.03	○
54	Argentina	1.78	6.64	0.56		118	Bhutan (2012)	0.01	0.02	0.03	○
55	Namibia	1.61	6.00	0.55		119	Algeria	0.01	0.02	0.02	○
56	Belarus	1.58	5.90	0.54		120	Mauritius	0.00	0.02	0.01	○
57	Iceland	1.40	5.21	0.53		121	Qatar	0.00	0.00	0.00	○
58	Guatemala	1.37	5.09	0.53		n/a	Montenegro	n/a	n/a	n/a	
59	Uruguay	1.28	4.75	0.52		n/a	Morocco	n/a	n/a	n/a	
60	New Zealand	1.27	4.72	0.51		n/a	Philippines	n/a	n/a	n/a	
61	Dominican Republic	1.21	4.50	0.50		n/a	Romania	n/a	n/a	n/a	
62	Turkey	1.18	4.38	0.49		n/a	Serbia	n/a	n/a	n/a	
63	Bosnia and Herzegovina	1.12	4.16	0.48		n/a	Tajikistan	n/a	n/a	n/a	
64	Colombia	1.10	4.09	0.48		n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	

SOURCE: United Nations, *COMTRADE* database; Eurostat, *'High-technology' aggregations based on SITC Rev. 4*; WTO *Trade in Commercial Services* database

NOTE: ● indicates a strength; ○ a weakness

6.3.3 ICT services exports

Telecommunications, computers, and information services exports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Costa Rica	10.33	100.00	0.98	●	65	Jamaica	1.55	16.58	0.48	
1	Cyprus	9.13	100.00	0.98	●	66	Rwanda (2013)	1.53	16.35	0.47	
1	India	10.73	100.00	0.98	●	67	Portugal	1.53	16.33	0.46	
1	Ireland	23.17	100.00	0.98	●	68	Norway	1.45	15.47	0.45	○
5	Nepal (2013)	7.54	82.47	0.97	●	69	Italy	1.45	15.46	0.44	
6	Sweden	6.66	72.78	0.96	●	70	Panama	1.38	14.66	0.43	
7	Israel (2013)	6.53	71.41	0.95	●	71	United States of America	1.33	14.13	0.43	○
8	Finland (2013)	5.73	62.52	0.94		72	Cameroon (2013)	1.26	13.36	0.42	●
9	Senegal (2013)	5.23	57.06	0.93	●	73	Dominican Republic (2013)	1.21	12.87	0.41	
10	Luxembourg	4.97	54.23	0.93		74	New Zealand	1.08	11.41	0.40	○
11	Mali (2013)	4.58	49.92	0.92	●	75	Bangladesh (2013)	1.07	11.30	0.39	
12	Philippines	4.46	48.55	0.91	●	76	Malaysia	1.07	11.29	0.39	
13	Kenya	4.27	46.49	0.90	●	77	Bosnia and Herzegovina	1.03	10.84	0.38	
14	Moldova, Rep.	4.26	46.37	0.89	●	78	Slovakia	1.00	10.49	0.37	
15	Tajikistan	3.83	41.72	0.89	●	79	Singapore	0.98	10.31	0.36	○
16	Kuwait	3.82	41.61	0.88	●	80	Malta	0.94	9.90	0.35	○
17	Sri Lanka	3.70	40.26	0.87	●	81	Malawi	0.93	9.75	0.34	
18	Romania	3.66	39.75	0.86	●	82	Côte d'Ivoire (2010)	0.91	9.54	0.34	
19	Yemen (2013)	3.36	36.45	0.85	●	83	Russian Federation	0.89	9.31	0.33	
20	Bahrain (2013)	3.28	35.58	0.84		84	Togo (2013)	0.88	9.19	0.32	
21	Albania	3.21	34.88	0.84	●	85	China	0.86	9.04	0.31	
22	Honduras	3.03	32.90	0.83	●	86	Uganda	0.81	8.49	0.30	
23	Ukraine	3.02	32.80	0.82	●	87	Bolivia, Plurinational St.	0.73	7.51	0.30	
24	Armenia	2.98	32.34	0.81	●	88	Lithuania	0.72	7.41	0.29	○
25	Switzerland	2.95	32.01	0.80		89	Georgia	0.67	6.93	0.28	
26	Serbia	2.94	31.84	0.80	●	90	Australia	0.64	6.55	0.27	○
27	Morocco (2013)	2.91	31.56	0.79	●	91	Chile (2013)	0.62	6.30	0.26	○
28	Austria	2.83	30.67	0.78		92	Indonesia	0.56	5.74	0.25	
29	Burundi (2013)	2.81	30.47	0.77	●	93	Tanzania, United Rep. (2013)	0.56	5.68	0.25	
30	Niger (2013)	2.79	30.18	0.76	●	94	South Africa	0.54	5.46	0.24	○
31	Estonia	2.77	30.03	0.75		95	Brazil	0.50	5.01	0.23	
32	Lebanon	2.72	29.40	0.75	●	96	Mozambique	0.50	4.97	0.22	
33	Guinea (2013)	2.68	29.05	0.74	●	97	Azerbaijan	0.49	4.90	0.21	
34	Benin (2013)	2.62	28.40	0.73	●	98	Kyrgyzstan	0.45	4.46	0.20	
35	Nicaragua	2.61	28.27	0.72	●	99	Hong Kong (China) (2013)	0.43	4.28	0.20	○
36	Belgium	2.59	27.98	0.71		100	Korea, Rep.	0.42	4.15	0.19	○
37	TFYR of Macedonia	2.55	27.54	0.70		101	Cambodia	0.39	3.82	0.18	
38	Mauritius	2.54	27.44	0.70		102	Qatar	0.37	3.58	0.17	
39	United Kingdom	2.47	26.65	0.69		103	Ecuador	0.37	3.57	0.16	
40	Iceland	2.39	25.88	0.68		104	Japan	0.35	3.33	0.16	○
41	Bulgaria	2.30	24.84	0.67		105	Peru (2013)	0.34	3.26	0.15	○
42	Guatemala	2.24	24.14	0.66	●	106	Algeria (2013)	0.32	3.02	0.14	
43	Uruguay	2.19	23.65	0.66		107	Colombia	0.30	2.84	0.13	○
44	France	2.11	22.79	0.65		108	Zambia	0.29	2.74	0.12	
45	Montenegro	2.08	22.45	0.64		109	Bhutan	0.29	2.73	0.11	
46	Belarus	2.06	22.23	0.63		110	Botswana (2013)	0.23	2.03	0.11	○
47	Pakistan	2.05	22.06	0.62	●	111	Mongolia	0.23	2.02	0.10	○
48	Latvia	2.03	21.81	0.61		112	Kazakhstan	0.21	1.83	0.09	○
49	El Salvador	1.97	21.21	0.61		113	Thailand	0.20	1.71	0.08	○
50	Croatia	1.94	20.83	0.60		114	Oman	0.19	1.65	0.07	○
51	Denmark	1.87	20.11	0.59		115	Iran, Islamic Rep. (2013)	0.18	1.54	0.07	○
52	Burkina Faso (2013)	1.87	20.11	0.58	●	116	Turkey	0.12	0.86	0.06	○
53	Czech Republic	1.82	19.52	0.57		117	Venezuela, Bolivarian Rep.	0.11	0.73	0.05	
54	Germany	1.78	19.07	0.57		118	Paraguay	0.11	0.69	0.04	○
55	Egypt	1.71	18.36	0.56		119	Viet Nam	0.09	0.51	0.03	○
56	Tunisia (2013)	1.71	18.36	0.55		120	Saudi Arabia	0.07	0.32	0.02	○
57	Argentina	1.71	18.29	0.54		121	Nigeria	0.06	0.23	0.02	○
58	Slovenia	1.68	18.03	0.53		122	Namibia	0.05	0.09	0.01	○
59	Madagascar (2013)	1.65	17.73	0.52		123	Mexico	0.04	0.00	0.00	○
60	Ethiopia (2012)	1.65	17.68	0.52	●	n/a	Ghana	n/a	n/a	n/a	
61	Poland	1.65	17.66	0.51		n/a	Jordan	n/a	n/a	n/a	
62	Hungary	1.64	17.53	0.50		n/a	Netherlands	n/a	n/a	n/a	
63	Greece	1.62	17.31	0.49		n/a	Spain	n/a	n/a	n/a	
64	Canada	1.60	17.15	0.48	○	n/a	United Arab Emirates	n/a	n/a	n/a	

SOURCE: World Trade Organization, *Trade in Commercial Services* database, based on the International Monetary Fund *Balance of Payments* database

NOTE: ● indicates a strength; ○ a weakness

6.3.4 Foreign direct investment net outflows

Foreign direct investment (FDI), net outflows (% of GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Hong Kong (China)	53.43	100.00	0.96	●
1	Ireland (2013)	15.78	100.00	0.96	●
1	Luxembourg	198.73	100.00	0.96	●
1	Mauritius	182.10	100.00	0.96	●
1	Singapore	13.21	100.00	0.96	●
1	Togo (2012)	10.73	100.00	0.96	●
7	Cyprus	9.93	95.20	0.95	●
8	Hungary	8.38	85.87	0.94	●
9	Kuwait	8.01	83.64	0.93	●
10	Belgium	4.92	65.07	0.92	●
11	Chile	4.67	63.57	0.92	●
12	Malaysia (2013)	4.02	59.66	0.91	
13	Portugal	3.91	58.98	0.90	●
14	Sweden	3.62	57.28	0.89	
15	Mozambique (2013)	3.26	55.10	0.88	●
16	Qatar	3.21	54.80	0.87	●
17	Bahrain (2013)	3.20	54.73	0.86	●
18	Estonia	3.17	54.56	0.86	
19	Canada	3.16	54.48	0.85	
20	Germany	3.07	53.94	0.84	
21	Russian Federation	3.03	53.72	0.83	
22	Lebanon (2013)	2.69	51.68	0.82	●
23	Azerbaijan	2.64	51.38	0.81	●
24	Japan	2.60	51.13	0.81	
25	Switzerland	2.57	50.93	0.80	
26	Philippines	2.45	50.26	0.79	●
27	Denmark	2.45	50.25	0.78	
28	Spain	2.28	49.20	0.77	
29	Korea, Rep.	2.17	48.53	0.76	
30	Austria	2.07	47.96	0.75	
31	United States of America	2.05	47.83	0.75	
32	South Africa	1.99	47.48	0.74	
33	Thailand	1.94	47.15	0.73	
34	Panama	1.87	46.73	0.72	
35	Oman (2013)	1.77	46.13	0.71	
36	China (2013)	1.72	45.82	0.70	
37	Latvia	1.46	44.27	0.69	
38	Bulgaria	1.43	44.11	0.69	
39	Norway (2013)	1.38	43.81	0.68	
40	Italy	1.23	42.92	0.67	
41	Israel	1.20	42.72	0.66	
42	Georgia	1.19	42.64	0.65	
43	Malawi (2012)	1.17	42.57	0.64	●
44	Indonesia	1.17	42.53	0.64	
45	Viet Nam (2013)	1.14	42.37	0.63	
46	Brazil	1.10	42.10	0.62	
47	France	1.07	41.92	0.61	
48	Colombia	1.03	41.71	0.60	
49	Costa Rica	1.02	41.66	0.59	
50	Turkey	0.88	40.81	0.58	
51	Kazakhstan (2013)	0.84	40.56	0.58	
52	El Salvador	0.80	40.30	0.57	
53	Albania	0.78	40.17	0.56	
54	United Arab Emirates	0.77	40.13	0.55	
55	Serbia (2013)	0.75	40.02	0.54	
56	Saudi Arabia	0.72	39.85	0.53	
57	Nicaragua	0.71	39.78	0.53	●
58	Montenegro	0.61	39.16	0.52	
59	Benin (2012)	0.50	38.49	0.51	
60	India	0.48	38.36	0.50	
61	Moldova, Rep.	0.43	38.09	0.49	
62	Ukraine	0.42	38.01	0.48	
63	Morocco (2013)	0.41	38.00	0.47	
64	Mexico	0.40	37.92	0.47	
65	Argentina	0.39	37.87	0.46	
66	Venezuela, Bolivarian Rep. (2012)	0.38	37.78	0.45	
67	Greece	0.36	37.68	0.44	
68	Slovakia	0.35	37.61	0.43	
69	Nigeria (2012)	0.33	37.51	0.42	
70	Mongolia (2013)	0.33	37.49	0.42	
71	Senegal (2011)	0.33	37.48	0.41	
72	Lithuania	0.32	37.43	0.40	
73	Cambodia (2013)	0.30	37.31	0.39	
74	Uganda (2013)	0.24	36.98	0.38	
75	Namibia (2013)	0.20	36.72	0.37	
76	Honduras (2013)	0.19	36.67	0.36	
77	Iceland	0.18	36.60	0.36	
78	Madagascar (2013)	0.15	36.39	0.35	
79	Armenia	0.14	36.34	0.34	
80	Egypt	0.09	36.04	0.33	
81	Sri Lanka	0.08	36.02	0.32	
82	Uruguay	0.08	35.97	0.31	
83	Peru (2013)	0.07	35.92	0.31	
84	Pakistan	0.05	35.79	0.30	
85	Jordan (2013)	0.05	35.79	0.29	
86	Belarus	0.04	35.77	0.28	
87	Romania	0.04	35.76	0.27	○
88	Mali (2013)	0.03	35.66	0.26	
89	Burkina Faso (2010)	0.01	35.55	0.25	
90	Burundi (2013)	0.01	35.54	0.25	
91	Niger (2012)	0.01	35.54	0.24	
92	Bangladesh	0.00	35.52	0.23	
93	Ghana (2013)	0.00	35.52	0.22	
94	Bolivia, Plurinational St. (2011)	0.00	35.51	0.21	
95	Kyrgyzstan	0.00	35.51	0.20	
96	Guinea (2013)	0.00	35.50	0.19	
97	Botswana (2013)	0.00	35.49	0.19	
98	Jamaica	–0.02	35.42	0.18	○
99	Côte d'Ivoire (2013)	–0.02	35.39	0.17	
100	Bosnia and Herzegovina	–0.03	35.33	0.16	
101	New Zealand (2011)	–0.05	35.19	0.15	○
102	Finland (2013)	–0.10	34.92	0.14	○
103	Paraguay (2013)	–0.12	34.76	0.14	
104	Slovenia	–0.13	34.75	0.13	○
105	Kenya	–0.13	34.73	0.12	
106	Algeria (2013)	–0.13	34.73	0.11	
107	Australia	–0.13	34.72	0.10	○
108	Guatemala	–0.27	33.87	0.09	
109	Croatia (2013)	–0.31	33.63	0.08	○
110	Poland (2013)	–0.63	31.69	0.08	○
111	Dominican Republic (2013)	–0.64	31.68	0.07	○
112	Czech Republic	–0.83	30.49	0.06	○
113	Cameroon (2013)	–1.28	27.80	0.05	○
114	Tajikistan (2013)	–1.87	24.28	0.04	
115	TFYR of Macedonia	–2.15	22.61	0.03	○
116	United Kingdom	–2.59	19.95	0.03	○
117	Zambia	–3.61	13.84	0.02	○
118	Malta (2013)	–92.89	0.00	0.00	○
118	Netherlands	–5.91	0.00	0.00	○
n/a	Bhutan	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: International Monetary Fund (with World Bank and OECD GDP estimates), extracted from World Bank *World Development Indicators* database

NOTE: ● indicates a strength; ○ a weakness

7.1.1 Trademark application class count by origin

Number of trademark applications issued to residents at a given national or regional office (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Moldova, Rep.	179.19	100.00	0.99	●
1	Paraguay (2010)	296.27	100.00	0.99	●
3	Malta (2013)	132.76	73.92	0.98	●
4	Turkey	131.15	73.02	0.97	●
5	Luxembourg	126.23	70.25	0.96	
6	Mongolia	120.42	66.99	0.95	●
7	Bulgaria	119.93	66.71	0.94	●
8	China	114.80	63.83	0.94	
9	Slovenia (2010)	111.57	62.01	0.93	●
10	France	106.48	59.16	0.92	●
11	Iceland	105.80	58.78	0.91	
12	Portugal	102.09	56.69	0.90	●
13	Armenia	99.34	55.15	0.89	●
14	New Zealand	97.26	53.98	0.88	
15	Korea, Rep.	92.06	51.06	0.87	
16	Estonia	77.40	42.82	0.86	
17	Viet Nam	75.80	41.92	0.85	●
18	Jamaica	75.11	41.53	0.84	●
19	Hong Kong (China)	73.55	40.66	0.83	
20	Switzerland	73.04	40.37	0.82	
21	Costa Rica	71.88	39.72	0.81	●
22	Chile	70.44	38.91	0.81	
23	Slovakia	70.15	38.75	0.80	
24	Ukraine	68.16	37.63	0.79	
25	Cyprus	68.07	37.58	0.78	
26	Madagascar	66.05	36.44	0.77	●
27	Australia	65.40	36.08	0.76	
28	Germany	65.34	36.05	0.75	
29	Austria	64.67	35.67	0.74	
30	Czech Republic	64.60	35.63	0.73	
31	Panama	64.53	35.59	0.72	
32	Ecuador (2010)	63.94	35.26	0.71	●
33	Spain	58.66	32.29	0.70	
34	Romania	57.99	31.92	0.69	
35	Netherlands	56.72	31.20	0.69	
36	Morocco	55.47	30.50	0.68	
37	Croatia	55.13	30.31	0.67	
38	Latvia	55.04	30.26	0.66	
39	Uruguay	53.37	29.32	0.65	
40	Finland	52.26	28.70	0.64	
41	Sweden	52.23	28.69	0.63	
42	United Kingdom	51.49	28.27	0.62	○
43	Lithuania	51.02	28.00	0.61	
44	Canada	50.01	27.43	0.60	
45	Honduras	49.87	27.36	0.59	
46	Italy	49.82	27.33	0.58	
47	Russian Federation	49.76	27.29	0.57	
48	Peru	49.50	27.15	0.56	
49	Denmark	47.63	26.10	0.56	○
50	Poland	47.54	26.05	0.55	
51	Argentina	46.41	25.41	0.54	
52	Georgia	45.39	24.84	0.53	
53	Dominican Republic	44.40	24.29	0.52	
54	Belgium	42.72	23.34	0.51	○
55	Nicaragua (2013)	41.08	22.42	0.50	●
56	Japan	40.31	21.99	0.49	
57	Hungary	40.03	21.83	0.48	
58	Guatemala (2010)	39.25	21.40	0.47	
59	Brazil	39.05	21.28	0.46	
60	Nepal	37.85	20.60	0.45	●
61	Mexico	37.74	20.54	0.44	
62	Mauritius (2013)	35.23	19.13	0.44	
63	Bolivia, Plurinational St.	35.10	19.06	0.43	
64	Jordan	31.95	17.29	0.42	
65	Colombia	31.05	16.79	0.41	
66	Norway	30.55	16.50	0.40	○
67	Belarus	30.16	16.29	0.39	
68	South Africa	28.96	15.61	0.38	
69	Philippines	28.84	15.54	0.37	
70	Serbia	27.81	14.96	0.36	
71	Sri Lanka (2013)	27.42	14.74	0.35	
72	India	27.01	14.51	0.34	
73	Thailand	25.73	13.80	0.33	
74	Cambodia	23.56	12.58	0.32	
75	Pakistan	23.27	12.42	0.31	
76	Azerbaijan	22.20	11.81	0.31	
77	Venezuela, Bolivarian Rep. (2011)	22.12	11.77	0.30	
78	United States of America	20.83	11.05	0.29	○
79	Malaysia	20.01	10.59	0.28	○
80	Singapore	20.01	10.58	0.27	○
81	Nigeria (2013)	19.84	10.49	0.26	
82	Yemen	19.42	10.25	0.25	
83	Kyrgyzstan	19.35	10.21	0.24	
84	Albania	18.39	9.67	0.23	
85	Kazakhstan (2013)	17.77	9.33	0.22	
86	Togo	17.42	9.13	0.21	
87	Bosnia and Herzegovina	14.89	7.71	0.20	
88	Bangladesh	14.78	7.65	0.19	
89	Uganda	14.33	7.40	0.19	
90	Israel	13.52	6.94	0.18	○
91	Egypt	13.34	6.84	0.17	
92	Senegal	12.87	6.57	0.16	
93	Indonesia	12.85	6.56	0.15	
94	Guinea	12.10	6.14	0.14	
95	Tajikistan (2013)	11.96	6.06	0.13	
96	United Arab Emirates	11.33	5.71	0.12	○
97	Benin	10.22	5.09	0.11	
98	Botswana	10.01	4.97	0.10	○
99	Côte d'Ivoire	9.71	4.80	0.09	○
100	Algeria	8.99	4.39	0.08	
101	Zambia	8.58	4.17	0.07	
102	Cameroon	7.29	3.44	0.06	
103	Bahrain	6.68	3.09	0.06	○
104	Rwanda (2012)	6.67	3.09	0.05	○
105	Qatar	4.58	1.92	0.04	○
106	Mali	3.35	1.22	0.03	○
107	Bhutan (2013)	2.95	1.00	0.02	○
108	Burkina Faso	2.82	0.93	0.01	○
109	Niger	1.17	0.00	0.00	○
n/a	Burundi	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Greece	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Ireland	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database,* 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

7.1.2 Industrial designs by origin

Number of designs contained in industrial design applications filed at a given national or regional office (per billion PPP$ GDP) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	30.32	100.00	0.97	●
1	Italy	18.52	100.00	0.97	●
1	Korea, Rep.	35.36	100.00	0.97	●
1	Turkey	27.22	100.00	0.97	●
5	Germany	18.07	97.60	0.96	●
6	Moldova, Rep.	17.38	93.85	0.95	●
7	Bulgaria	14.69	79.32	0.94	●
8	Morocco	14.25	76.91	0.94	●
9	Spain	13.67	73.77	0.93	●
10	Ukraine	13.34	71.98	0.92	●
11	Malta	13.24	71.46	0.91	
12	Portugal	12.18	65.70	0.90	●
13	Luxembourg	11.25	60.70	0.89	
14	Switzerland	9.01	48.59	0.88	
15	Austria	8.98	48.41	0.87	
16	France	8.28	44.60	0.86	
17	Mongolia	7.37	39.69	0.85	●
18	Croatia	7.10	38.23	0.84	●
19	Denmark	6.71	36.14	0.83	
20	Iran, Islamic Rep.	6.46	34.79	0.83	●
21	New Zealand	6.41	34.47	0.82	
22	Slovenia (2011)	6.39	34.39	0.81	
23	Madagascar	5.96	32.07	0.80	●
24	Czech Republic	5.96	32.05	0.79	
25	Finland	5.66	30.43	0.78	
26	Japan	5.22	28.04	0.77	
27	Sweden	4.99	26.79	0.76	
28	Guinea	4.30	23.06	0.75	●
29	Greece	4.27	22.93	0.74	
30	Estonia	4.19	22.47	0.73	
31	Hungary	4.03	21.65	0.72	
32	TFYR of Macedonia (2013)	3.96	21.22	0.72	
33	Hong Kong (China)	3.68	19.71	0.71	
34	Slovakia	3.61	19.35	0.70	
35	Netherlands	3.50	18.75	0.69	
36	Viet Nam	3.39	18.14	0.68	
37	Latvia	3.14	16.82	0.67	
38	Cyprus	3.13	16.73	0.66	
39	Romania	3.02	16.15	0.65	
40	Jamaica	2.99	15.98	0.64	●
41	Côte d'Ivoire	2.92	15.59	0.63	●
42	Thailand	2.83	15.12	0.62	
43	Belgium	2.78	14.86	0.61	
44	Paraguay (2010)	2.73	14.58	0.61	●
45	Iceland	2.72	14.53	0.60	
46	Georgia	2.53	13.52	0.59	
47	Kyrgyzstan	2.50	13.32	0.58	
48	Australia	2.39	12.75	0.57	
49	Bangladesh	2.32	12.37	0.56	●
50	Norway	2.02	10.72	0.55	
51	Lithuania	1.98	10.51	0.54	
52	Ireland (2010)	1.90	10.08	0.53	○
53	Singapore	1.80	9.56	0.52	○
54	Bosnia and Herzegovina	1.67	8.86	0.51	
55	Montenegro	1.59	8.42	0.50	
56	Serbia	1.58	8.34	0.50	
57	Algeria	1.50	7.95	0.49	●
58	Tunisia	1.31	6.93	0.48	
59	Sri Lanka (2013)	1.30	6.85	0.47	
60	Armenia	1.27	6.70	0.46	
61	Philippines	1.20	6.28	0.45	
62	United States of America	1.17	6.15	0.44	
63	Brazil	1.13	5.92	0.43	
64	South Africa	1.09	5.72	0.42	
65	Malaysia	1.07	5.63	0.41	
66	Belarus	0.99	5.17	0.40	
67	Indonesia	0.94	4.92	0.39	
68	El Salvador	0.92	4.78	0.39	
69	Russian Federation	0.89	4.63	0.38	
70	Nigeria (2013)	0.85	4.42	0.37	
71	Argentina	0.84	4.36	0.36	
72	India	0.83	4.32	0.35	
73	Mexico	0.83	4.28	0.34	
74	Cambodia	0.74	3.81	0.33	
75	Cameroon	0.60	3.09	0.32	
76	Kenya	0.59	2.99	0.31	
77	Guatemala	0.54	2.75	0.30	
78	Canada	0.54	2.73	0.29	○
79	Pakistan	0.54	2.72	0.28	
80	Zambia	0.47	2.37	0.28	
81	Mauritius (2013)	0.45	2.24	0.27	
82	Albania	0.44	2.21	0.26	
83	Colombia	0.42	2.10	0.25	
84	Senegal	0.38	1.87	0.24	
85	Ecuador (2010)	0.38	1.87	0.23	
86	Bolivia, Plurinational St.	0.37	1.82	0.22	
87	Azerbaijan (2013)	0.34	1.66	0.21	
88	Nepal (2013)	0.34	1.63	0.20	
89	Botswana	0.33	1.63	0.19	
90	Togo	0.30	1.41	0.18	
91	Peru	0.28	1.33	0.17	○
92	Uruguay	0.28	1.33	0.17	○
93	Chile	0.27	1.26	0.16	○
94	Kazakhstan	0.25	1.19	0.15	○
95	Mali	0.25	1.19	0.14	
96	Honduras (2013)	0.21	0.97	0.13	
97	Jordan	0.21	0.97	0.12	○
98	Dominican Republic	0.20	0.91	0.11	○
99	Bahrain	0.18	0.77	0.10	○
100	Yemen	0.17	0.75	0.09	
101	Panama	0.17	0.73	0.08	○
102	United Arab Emirates	0.15	0.61	0.07	○
103	Saudi Arabia	0.15	0.60	0.06	○
104	Rwanda	0.11	0.39	0.06	
105	Costa Rica	0.10	0.35	0.05	○
106	Niger	0.06	0.12	0.04	
107	Tajikistan (2013)	0.05	0.08	0.03	○
108	Ghana (2010)	0.04	0.04	0.02	○
109	Nicaragua (2013)	0.04	0.01	0.01	○
110	Burkina Faso	0.03	0.00	0.00	○
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Egypt	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Israel	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Lebanon	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Oman	n/a	n/a	n/a	
n/a	Poland	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	United Kingdom	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	

SOURCE: World Intellectual Property Organization, *WIPO Statistics Database*; International Monetary Fund, *World Economic Outlook Database*, 2015 (PPP$ GDP)
NOTE: ● indicates a strength; ○ a weakness

7.1.3 ICTs and business model creation

Average answer to the question: In your country, to what extent do ICTs enable new business models? [1 = not at all; 7 = to a great extent] | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Finland	5.95	82.46	1.00	●
2	United Kingdom	5.85	80.88	0.99	●
3	Qatar	5.81	80.14	0.98	●
4	Netherlands	5.81	80.11	0.98	●
5	Luxembourg	5.78	79.70	0.97	
6	Singapore	5.77	79.46	0.96	
7	United Arab Emirates	5.74	79.05	0.95	●
8	Switzerland	5.70	78.27	0.94	
9	Sweden	5.64	77.29	0.93	
10	Malaysia	5.62	77.08	0.93	●
11	Estonia	5.62	76.95	0.92	
12	Ireland	5.60	76.59	0.91	
13	Norway	5.59	76.52	0.90	
14	United States of America	5.52	75.41	0.89	
15	Israel	5.52	75.26	0.89	
16	Portugal	5.51	75.18	0.88	
17	Korea, Rep.	5.49	74.79	0.87	
18	Canada	5.47	74.42	0.86	
19	New Zealand	5.43	73.79	0.85	
20	Belgium	5.40	73.42	0.84	
21	Germany	5.38	72.99	0.84	
22	Iceland	5.38	72.95	0.83	
23	Japan	5.31	71.84	0.82	
24	Austria	5.26	70.96	0.81	
25	Hong Kong (China)	5.24	70.69	0.80	
26	Lithuania	5.16	69.38	0.80	
27	France	5.15	69.21	0.79	
28	Denmark	5.14	69.08	0.78	
29	Spain	5.14	68.93	0.77	
30	Chile	5.07	67.90	0.76	
31	Rwanda	5.05	67.53	0.75	●
32	Saudi Arabia	5.05	67.46	0.75	
33	Panama	5.04	67.39	0.74	
34	Czech Republic	5.04	67.35	0.73	
35	Guatemala	4.97	66.14	0.72	●
36	Malta	4.93	65.44	0.71	
37	Bahrain	4.90	65.05	0.70	
38	Uruguay	4.90	65.04	0.70	
39	Kenya	4.89	64.84	0.69	
40	Australia	4.89	64.83	0.68	
41	Thailand	4.82	63.61	0.67	
42	Dominican Republic	4.80	63.30	0.66	●
43	Costa Rica	4.79	63.25	0.66	
44	Azerbaijan	4.79	63.16	0.65	
45	Latvia	4.78	62.92	0.64	
46	Indonesia	4.76	62.74	0.63	
47	Honduras	4.75	62.57	0.62	●
48	China	4.72	62.01	0.61	
49	Jordan	4.69	61.52	0.61	
50	TFYR of Macedonia	4.68	61.26	0.60	
51	Turkey	4.67	61.19	0.59	
52	Sri Lanka	4.67	61.13	0.58	
53	Mexico	4.66	61.00	0.57	
54	Senegal	4.65	60.79	0.57	
55	Colombia	4.64	60.69	0.56	
56	Slovakia	4.63	60.43	0.55	
57	Philippines	4.62	60.28	0.54	
58	Hungary	4.61	60.18	0.53	
59	South Africa	4.55	59.15	0.52	
60	Slovenia	4.54	59.03	0.52	
61	Armenia	4.54	59.03	0.51	
62	Morocco	4.52	58.68	0.50	
63	Ecuador	4.52	58.62	0.49	
64	Mauritius	4.49	58.13	0.48	
65	Peru	4.48	57.92	0.48	
66	Viet Nam	4.46	57.67	0.47	
67	Jamaica	4.45	57.52	0.46	
68	Côte d'Ivoire	4.43	57.24	0.45	
69	Cambodia	4.41	56.78	0.44	
70	Italy	4.40	56.66	0.43	
71	Kazakhstan	4.39	56.57	0.43	
72	Bulgaria	4.39	56.42	0.42	
73	Cyprus	4.34	55.66	0.41	
74	Brazil	4.33	55.50	0.40	
75	Uganda	4.32	55.26	0.39	
76	Croatia	4.31	55.21	0.39	
77	Iran, Islamic Rep.	4.28	54.73	0.38	
78	Montenegro	4.25	54.17	0.37	
79	Romania	4.25	54.16	0.36	
80	Nigeria	4.24	54.00	0.35	
81	Poland	4.23	53.87	0.34	○
82	Namibia	4.20	53.30	0.34	
83	Mongolia	4.17	52.87	0.33	
84	Zambia	4.15	52.51	0.32	
85	Ghana	4.11	51.89	0.31	
86	Oman	4.10	51.69	0.30	
87	India	4.09	51.47	0.30	
88	Pakistan	4.08	51.28	0.29	
89	Tunisia	4.07	51.24	0.28	
90	Mali	4.07	51.22	0.27	
91	Cameroon	4.07	51.13	0.26	
92	El Salvador	4.06	51.00	0.25	
93	Greece	4.03	50.48	0.25	○
94	Russian Federation	4.02	50.39	0.24	○
95	Egypt	4.02	50.30	0.23	
96	Paraguay	4.00	49.97	0.22	
97	Kuwait	4.00	49.92	0.21	
98	Georgia	3.97	49.51	0.20	
99	Tajikistan	3.95	49.14	0.20	
100	Mozambique	3.92	48.70	0.19	
101	Botswana	3.89	48.15	0.18	
102	Serbia	3.88	48.07	0.17	○
103	Madagascar	3.88	47.92	0.16	
104	Tanzania, United Rep.	3.84	47.36	0.16	
105	Moldova, Rep.	3.84	47.34	0.15	○
106	Ukraine	3.82	47.04	0.14	
107	Benin	3.82	46.92	0.13	
108	Bolivia, Plurinational St.	3.79	46.46	0.12	
109	Bangladesh	3.79	46.46	0.11	
110	Lebanon	3.73	45.48	0.11	○
111	Albania	3.70	44.98	0.10	
112	Bhutan	3.68	44.70	0.09	
113	Ethiopia	3.62	43.65	0.08	
114	Bosnia and Herzegovina	3.62	43.63	0.07	○
115	Nicaragua	3.62	43.62	0.07	○
116	Argentina	3.61	43.48	0.06	○
117	Algeria	3.55	42.56	0.05	
118	Kyrgyzstan	3.52	42.03	0.04	○
119	Malawi	3.41	40.10	0.03	○
120	Nepal	3.38	39.71	0.02	○
121	Venezuela, Bolivarian Rep.	3.20	36.62	0.02	
122	Guinea	3.15	35.86	0.01	○
123	Burundi	2.74	28.98	0.00	○
n/a	Belarus	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Economic Forum, *Executive Opinion Survey 2014–2015*
NOTE: ● indicates a strength; ○ a weakness

7.1.4 ICTs and organizational model creation

Average answer to the question: In your country, to what extent do ICTs enable new organizational models (e.g., virtual teams, remote working, telecommuting) within companies? [1 = not at all; 7 = to a great extent] | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United Kingdom	5.77	79.43	1.00	●
2	United States of America	5.77	79.42	0.99	●
3	Finland	5.75	79.22	0.98	●
4	Netherlands	5.66	77.71	0.98	●
5	Estonia	5.64	77.34	0.97	●
6	Norway	5.63	77.23	0.96	●
7	Qatar	5.59	76.56	0.95	●
8	Malaysia	5.58	76.27	0.94	●
9	Sweden	5.54	75.73	0.93	
10	United Arab Emirates	5.49	74.82	0.93	●
11	Singapore	5.47	74.53	0.92	
12	Canada	5.44	73.98	0.91	
13	Iceland	5.42	73.68	0.90	
14	Ireland	5.40	73.26	0.89	
15	Luxembourg	5.31	71.84	0.89	
16	Hong Kong (China)	5.27	71.20	0.88	
17	Switzerland	5.26	70.95	0.87	
18	Germany	5.20	70.05	0.86	
19	Lithuania	5.16	69.33	0.85	●
20	Israel	5.12	68.65	0.84	
21	Belgium	5.08	68.01	0.84	
22	New Zealand	5.08	67.94	0.83	
23	Denmark	5.04	67.34	0.82	
24	Australia	4.98	66.31	0.81	
25	France	4.93	65.44	0.80	
26	Portugal	4.90	65.02	0.80	
27	Korea, Rep.	4.88	64.59	0.79	
28	Czech Republic	4.87	64.47	0.78	
29	Azerbaijan	4.75	62.51	0.77	●
30	China	4.74	62.28	0.76	
31	Austria	4.73	62.19	0.75	
32	Japan	4.72	61.92	0.75	
33	Guatemala	4.66	60.95	0.74	●
34	Honduras	4.65	60.79	0.73	●
35	Latvia	4.64	60.73	0.72	
36	Bahrain	4.64	60.68	0.71	
37	Panama	4.61	60.19	0.70	
38	Indonesia	4.59	59.78	0.70	●
39	Costa Rica	4.58	59.72	0.69	
40	Saudi Arabia	4.56	59.31	0.68	
41	Malta	4.56	59.26	0.67	
42	Colombia	4.49	58.16	0.66	
43	Slovakia	4.46	57.62	0.66	
44	Spain	4.45	57.50	0.65	
45	Slovenia	4.44	57.28	0.64	
46	Philippines	4.43	57.11	0.63	
47	Sri Lanka	4.42	57.02	0.62	
48	Chile	4.40	56.72	0.61	
49	Thailand	4.39	56.48	0.61	
50	Dominican Republic	4.39	56.42	0.60	●
51	Kenya	4.38	56.29	0.59	
52	Senegal	4.37	56.21	0.58	●
53	South Africa	4.37	56.15	0.57	
54	Mexico	4.36	56.07	0.57	
55	Jordan	4.36	55.96	0.56	
56	Côte d'Ivoire	4.34	55.69	0.55	●
57	Uruguay	4.32	55.35	0.54	
58	Ecuador	4.31	55.12	0.53	
59	Croatia	4.31	55.11	0.52	
60	Armenia	4.30	55.01	0.52	
61	TFYR of Macedonia	4.29	54.89	0.51	
62	Bulgaria	4.24	53.98	0.50	
63	Cambodia	4.23	53.81	0.49	
64	India	4.22	53.71	0.48	
65	Viet Nam	4.20	53.41	0.48	
66	Rwanda	4.20	53.37	0.47	
67	Mauritius	4.18	53.02	0.46	
68	Turkey	4.12	52.03	0.45	
69	Kazakhstan	4.11	51.80	0.44	
70	Romania	4.11	51.76	0.43	
71	Ukraine	4.06	50.95	0.43	
72	Hungary	4.05	50.85	0.42	
73	Poland	4.04	50.67	0.41	
74	Russian Federation	4.02	50.33	0.40	
75	Cyprus	4.01	50.19	0.39	
76	Jamaica	4.01	50.11	0.39	
77	Brazil	3.99	49.88	0.38	
78	Zambia	3.93	48.78	0.37	
79	El Salvador	3.92	48.65	0.36	
80	Namibia	3.91	48.55	0.35	
81	Peru	3.87	47.87	0.34	
82	Italy	3.84	47.41	0.34	○
83	Argentina	3.83	47.25	0.33	
84	Morocco	3.83	47.13	0.32	
85	Cameroon	3.77	46.15	0.31	
86	Egypt	3.74	45.68	0.30	
87	Uganda	3.73	45.58	0.30	
88	Madagascar	3.73	45.53	0.29	
89	Tajikistan	3.71	45.12	0.28	
90	Montenegro	3.68	44.72	0.27	○
91	Mali	3.63	43.85	0.26	
92	Kuwait	3.62	43.66	0.25	
93	Oman	3.62	43.65	0.25	
94	Greece	3.61	43.51	0.24	○
95	Nigeria	3.59	43.13	0.23	
96	Ghana	3.56	42.61	0.22	
97	Moldova, Rep.	3.55	42.56	0.21	
98	Mongolia	3.54	42.36	0.20	
99	Bangladesh	3.54	42.36	0.20	
100	Bolivia, Plurinational St.	3.54	42.34	0.19	
101	Iran, Islamic Rep.	3.54	42.31	0.18	
102	Kyrgyzstan	3.53	42.11	0.17	
103	Benin	3.52	42.05	0.16	
104	Ethiopia	3.51	41.84	0.16	
105	Tunisia	3.43	40.55	0.15	○
106	Serbia	3.43	40.45	0.14	○
107	Georgia	3.42	40.25	0.13	○
108	Botswana	3.40	40.08	0.12	
109	Tanzania, United Rep.	3.38	39.67	0.11	
110	Venezuela, Bolivarian Rep.	3.37	39.48	0.11	
111	Nepal	3.29	38.21	0.10	
112	Lebanon	3.26	37.68	0.09	○
113	Bhutan	3.26	37.65	0.08	
114	Pakistan	3.25	37.53	0.07	
115	Mozambique	3.25	37.42	0.07	
116	Paraguay	3.25	37.42	0.06	○
117	Nicaragua	3.21	36.90	0.05	○
118	Bosnia and Herzegovina	3.10	34.95	0.04	○
119	Malawi	2.96	32.59	0.03	○
120	Algeria	2.94	32.26	0.02	
121	Albania	2.89	31.46	0.02	○
122	Guinea	2.71	28.57	0.01	○
123	Burundi	2.43	23.90	0.00	○
n/a	Belarus	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	

SOURCE: World Economic Forum, *Executive Opinion Survey 2014–2015*
NOTE: ● indicates a strength; ○ a weakness

7.2.1 Cultural and creative services exports

Cultural and creative services exports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank		Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Costa Rica	7.01	100.00	0.98	●	65	Mali (2013)	0.03	1.61	0.24	
1	Luxembourg (2013)	4.90	100.00	0.98	●	66	Mexico	0.02	1.15	0.23	○
1	United States of America	1.65	100.00	0.98	●	67	Pakistan (2012)	0.01	0.65	0.21	
4	Romania (2013)	1.43	86.58	0.96	●	68	Venezuela, Bolivarian Rep.	0.01	0.61	0.20	
5	Belgium (2013)	1.37	83.09	0.95	●	69	Guatemala	0.01	0.60	0.19	
6	Latvia (2013)	1.36	82.63	0.94	●	70	Kazakhstan	0.01	0.53	0.18	
7	France (2013)	1.12	67.65	0.93	●	71	China	0.01	0.46	0.17	○
8	Estonia (2013)	1.06	64.06	0.92		72	Turkey	0.01	0.44	0.15	○
9	Poland (2013)	1.00	60.56	0.90	●	73	Benin (2011)	0.01	0.34	0.14	
10	Austria (2013)	0.99	59.71	0.89		74	Algeria	0.00	0.27	0.13	
11	Russian Federation (2013)	0.98	59.10	0.88	●	75	Paraguay	0.00	0.22	0.12	
12	Israel (2013)	0.94	57.02	0.87		76	Togo (2013)	0.00	0.21	0.11	
13	Slovenia (2013)	0.93	56.08	0.86		77	Bosnia and Herzegovina	0.00	0.18	0.10	○
14	Canada (2013)	0.92	55.94	0.85		78	Bangladesh	0.00	0.16	0.08	
15	United Kingdom	0.80	48.73	0.83		79	Ethiopia	0.00	0.11	0.07	
16	Bulgaria (2013)	0.78	46.99	0.82	●	80	Slovakia	0.00	0.09	0.06	○
17	Sweden (2013)	0.74	44.60	0.81		81	Uganda	0.00	0.07	0.05	○
18	Denmark (2013)	0.68	41.27	0.80		82	Rwanda	0.00	0.04	0.04	○
19	Greece (2013)	0.65	39.24	0.79		83	Kenya	0.00	0.02	0.02	○
20	Hungary (2013)	0.59	35.56	0.77		84	El Salvador (2013)	0.00	0.01	0.01	○
21	Germany (2013)	0.59	35.49	0.76		85	Honduras	0.00	0.00	0.00	○
22	Cyprus (2013)	0.58	35.23	0.75		n/a	Bahrain	n/a	n/a	n/a	
23	Portugal (2013)	0.56	33.92	0.74		n/a	Bhutan	n/a	n/a	n/a	
24	Czech Republic (2013)	0.53	31.91	0.73		n/a	Botswana	n/a	n/a	n/a	
25	Guinea (2013)	0.51	31.09	0.71	●	n/a	Burkina Faso	n/a	n/a	n/a	
26	Lithuania (2013)	0.41	24.65	0.70		n/a	Cambodia	n/a	n/a	n/a	
27	Lebanon	0.40	24.13	0.69		n/a	Chile	n/a	n/a	n/a	
28	Argentina	0.38	23.10	0.68		n/a	Côte d'Ivoire	n/a	n/a	n/a	
29	Moldova, Rep.	0.34	20.34	0.67		n/a	Dominican Republic	n/a	n/a	n/a	
30	Ecuador	0.33	20.04	0.65	●	n/a	Egypt	n/a	n/a	n/a	
31	Australia	0.31	19.08	0.64		n/a	Ghana	n/a	n/a	n/a	
32	Finland (2013)	0.31	18.95	0.63		n/a	Iceland	n/a	n/a	n/a	
33	Burundi (2013)	0.30	18.14	0.62	●	n/a	Indonesia	n/a	n/a	n/a	
34	Korea, Rep.	0.28	17.20	0.61		n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
35	Italy (2013)	0.28	16.98	0.60		n/a	Jamaica	n/a	n/a	n/a	
36	Armenia	0.27	16.65	0.58		n/a	Jordan	n/a	n/a	n/a	
37	Senegal (2013)	0.24	14.34	0.57		n/a	Kuwait	n/a	n/a	n/a	
38	Ireland (2013)	0.21	12.61	0.56	○	n/a	Kyrgyzstan	n/a	n/a	n/a	
39	Croatia	0.20	12.03	0.55		n/a	Malaysia	n/a	n/a	n/a	
40	Ukraine	0.19	11.59	0.54		n/a	Malta	n/a	n/a	n/a	
41	Hong Kong (China) (2013)	0.17	10.18	0.52		n/a	Mongolia	n/a	n/a	n/a	
42	Serbia	0.15	9.35	0.51		n/a	Namibia	n/a	n/a	n/a	
43	TFYR of Macedonia	0.15	9.15	0.50		n/a	Nepal	n/a	n/a	n/a	
44	Panama	0.14	8.60	0.49		n/a	Netherlands	n/a	n/a	n/a	
45	India	0.12	7.58	0.48		n/a	New Zealand	n/a	n/a	n/a	
46	Brazil	0.12	7.04	0.46		n/a	Nicaragua	n/a	n/a	n/a	
47	South Africa	0.11	6.96	0.45		n/a	Niger	n/a	n/a	n/a	
48	Morocco	0.11	6.71	0.44		n/a	Nigeria	n/a	n/a	n/a	
49	Montenegro	0.10	5.80	0.43		n/a	Oman	n/a	n/a	n/a	
50	Georgia	0.08	5.16	0.42		n/a	Qatar	n/a	n/a	n/a	
51	Peru	0.08	4.71	0.40		n/a	Saudi Arabia	n/a	n/a	n/a	
52	Philippines	0.07	4.34	0.39		n/a	Singapore	n/a	n/a	n/a	
53	Colombia	0.07	3.96	0.38		n/a	Spain	n/a	n/a	n/a	
54	Albania	0.07	3.96	0.37		n/a	Sri Lanka	n/a	n/a	n/a	
55	Cameroon (2013)	0.06	3.51	0.36		n/a	Switzerland	n/a	n/a	n/a	
56	Norway	0.05	3.29	0.35	○	n/a	Tajikistan	n/a	n/a	n/a	
57	Belarus	0.05	3.04	0.33		n/a	Tanzania, United Rep.	n/a	n/a	n/a	
58	Mauritius	0.05	3.01	0.32		n/a	Thailand	n/a	n/a	n/a	
59	Bolivia, Plurinational St.	0.05	2.85	0.31		n/a	Tunisia	n/a	n/a	n/a	
60	Japan	0.04	2.72	0.30	○	n/a	United Arab Emirates	n/a	n/a	n/a	
61	Madagascar (2013)	0.04	2.39	0.29		n/a	Uruguay	n/a	n/a	n/a	
62	Azerbaijan	0.04	2.24	0.27		n/a	Viet Nam	n/a	n/a	n/a	
63	Malawi	0.03	2.06	0.26		n/a	Yemen	n/a	n/a	n/a	
64	Mozambique	0.03	1.87	0.25		n/a	Zambia	n/a	n/a	n/a	

SOURCE: World Trade Organization, *Trade in Commercial Services* database, based on the International Monetary Fund *Balance of Payments* database

NOTE: ● indicates a strength; ○ a weakness

7.2.2 National feature films produced

Number of national feature films produced (per million population 15–69 years old) | 2013

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Bhutan (2011)	58.58	100.00	0.97	●
1	Estonia	19.21	100.00	0.97	●
1	Iceland	30.46	100.00	0.97	●
1	Luxembourg (2011)	42.41	100.00	0.97	●
5	Switzerland	17.40	90.62	0.96	
6	Denmark	17.29	90.03	0.95	
7	Armenia	12.82	66.75	0.94	●
8	Finland	12.63	65.78	0.93	
9	Nigeria (2011)	11.16	58.11	0.92	●
10	Israel	10.83	56.38	0.91	
11	Mongolia	10.50	54.69	0.90	●
12	Ireland	10.33	53.79	0.89	
13	Azerbaijan	9.88	51.42	0.88	●
14	Sweden	9.03	47.01	0.87	
15	Belgium	8.91	46.41	0.86	
16	Greece	8.86	46.15	0.85	●
17	Slovenia	8.62	44.89	0.84	
18	Croatia	8.48	44.14	0.83	●
19	Norway	8.00	41.64	0.82	
20	New Zealand	7.97	41.49	0.81	
21	Hong Kong (China)	7.48	38.96	0.80	
22	Austria	7.48	38.93	0.79	
23	Lithuania	7.04	36.67	0.78	
24	Latvia	6.94	36.16	0.77	
25	Spain	6.91	35.99	0.76	
26	Japan	6.73	35.03	0.75	
27	Montenegro	6.70	34.89	0.74	
28	Malta	6.54	34.08	0.73	
29	France	6.17	32.12	0.72	
30	Argentina	5.88	30.60	0.71	
31	Czech Republic	5.74	29.87	0.70	
32	Netherlands	5.64	29.34	0.69	
33	Korea, Rep.	5.39	28.09	0.68	
34	United Kingdom	5.34	27.82	0.67	
35	Slovakia	5.32	27.72	0.66	
36	Hungary	5.22	27.15	0.65	
37	Uruguay	4.75	24.74	0.64	
38	Bolivia, Plurinational St. (2009)	4.19	21.84	0.63	●
39	Lebanon	4.01	20.90	0.62	
40	Italy	3.97	20.69	0.61	
41	Germany	3.89	20.26	0.60	
42	Bosnia and Herzegovina	3.78	19.67	0.59	
43	Canada	3.59	18.68	0.58	
44	Malaysia	3.38	17.59	0.57	
45	United States of America	3.26	16.97	0.56	
46	Singapore	3.11	16.21	0.55	○
47	Georgia	3.05	15.90	0.54	
48	Kazakhstan	2.93	15.28	0.53	
49	Bulgaria	2.83	14.74	0.52	
50	Serbia	2.78	14.45	0.51	
51	Romania	2.58	13.41	0.50	
52	Chile	2.44	12.72	0.50	
53	Cyprus	2.34	12.19	0.49	
54	India	2.01	10.46	0.48	
55	TFYR of Macedonia	1.93	10.07	0.47	
56	Cameroon (2009)	1.83	9.53	0.46	●
57	Burkina Faso	1.78	9.26	0.45	
58	Tajikistan	1.77	9.20	0.44	
59	Portugal	1.75	9.09	0.43	○
60	Turkey	1.62	8.41	0.42	
61	Australia	1.56	8.14	0.41	○
62	Iran, Islamic Rep.	1.54	8.01	0.40	
63	Mexico	1.51	7.87	0.39	
64	Cambodia (2011)	1.37	7.15	0.38	
65	Russian Federation	1.30	6.78	0.37	
66	Paraguay (2009)	1.29	6.70	0.36	
67	Guatemala (2010)	1.17	6.10	0.35	
68	Viet Nam (2011)	1.17	6.09	0.34	
69	Mauritius (2011)	1.08	5.64	0.33	
70	Poland	1.07	5.56	0.32	○
71	Sri Lanka	1.04	5.43	0.31	
72	Venezuela, Bolivarian Rep.	1.03	5.35	0.30	
73	Tunisia	1.01	5.28	0.29	
74	Thailand (2010)	0.98	5.11	0.28	
75	Morocco	0.96	5.00	0.27	
76	Dominican Republic (2009)	0.96	4.98	0.26	
77	Moldova, Rep.	0.96	4.98	0.25	
78	Brazil	0.89	4.61	0.24	
79	Philippines	0.84	4.36	0.23	
80	Guinea (2010)	0.83	4.30	0.22	
81	Colombia	0.78	4.04	0.21	
82	Niger (2011)	0.73	3.80	0.20	
83	South Africa	0.70	3.65	0.19	○
84	Bangladesh (2009)	0.66	3.44	0.18	
85	China	0.61	3.16	0.17	○
86	Costa Rica	0.59	3.09	0.16	○
87	Egypt	0.59	3.05	0.15	
88	Peru	0.58	3.04	0.14	○
89	Kyrgyzstan	0.53	2.73	0.13	
90	Indonesia (2012)	0.51	2.63	0.12	
91	Panama (2010)	0.41	2.15	0.11	○
92	Honduras (2012)	0.41	2.14	0.10	○
93	Senegal	0.39	2.02	0.09	
94	Ukraine	0.36	1.87	0.08	○
95	Nicaragua (2009)	0.28	1.45	0.07	
96	Pakistan (2009)	0.27	1.39	0.06	○
97	El Salvador (2008)	0.26	1.36	0.05	○
98	Belarus (2011)	0.14	0.74	0.04	○
99	Mali (2011)	0.12	0.65	0.03	○
100	Mozambique (2006)	0.09	0.46	0.02	○
101	Bahrain	0.00	0.00	0.00	○
101	Oman (2009)	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Algeria	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Jordan	n/a	n/a	n/a	
n/a	Kenya	n/a	n/a	n/a	
n/a	Kuwait	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Qatar	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Saudi Arabia	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: UNESCO Institute for Statistics, *UIS online database*; United Nations, *World Population Prospects: The 2015 Revision* (population)
NOTE: ● indicates a strength; ○ a weakness

7.2.3 Global entertainment and media market

Global entertainment and media market (per thousand population 15–69 years old) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Norway	3.40	100.00	1.00	●
2	Switzerland	2.92	85.94	0.98	●
3	United States of America	2.64	77.71	0.97	●
4	Denmark	2.41	70.61	0.95	
5	Sweden	2.40	70.47	0.93	
6	United Kingdom	2.20	64.40	0.92	
7	Austria	2.15	63.00	0.90	
8	Australia	2.10	61.69	0.88	
9	Finland	1.98	57.92	0.86	
10	Germany	1.95	56.97	0.85	
11	Japan	1.87	54.70	0.83	
12	New Zealand	1.82	53.37	0.81	
13	France	1.81	53.02	0.80	
14	Netherlands	1.78	52.07	0.78	
15	Belgium	1.75	51.09	0.76	
16	Canada	1.74	50.86	0.75	
17	Hong Kong (China)	1.60	46.62	0.73	
18	Ireland	1.58	46.03	0.71	
19	Korea, Rep.	1.38	40.32	0.69	
20	Singapore	1.27	36.81	0.68	
21	Qatar	1.20	34.80	0.66	
22	Israel	1.11	32.30	0.64	
23	Portugal	1.01	29.15	0.63	
24	Italy	0.96	27.81	0.61	
25	Spain	0.87	25.02	0.59	
26	Czech Republic	0.67	19.14	0.58	
27	Kuwait	0.63	17.82	0.56	
28	Greece	0.58	16.60	0.54	
29	United Arab Emirates	0.43	12.14	0.53	
30	Hungary	0.43	12.11	0.51	
31	Poland	0.39	10.96	0.49	
32	Argentina	0.38	10.55	0.47	
33	Malaysia	0.37	10.37	0.46	
34	Bahrain	0.33	9.18	0.44	
35	Chile	0.33	9.02	0.42	
36	Saudi Arabia	0.33	8.94	0.41	
37	Mexico	0.30	8.24	0.39	
38	South Africa	0.30	8.07	0.37	
39	Brazil	0.30	8.07	0.36	
40	Oman	0.25	6.60	0.34	
41	Russian Federation	0.24	6.38	0.32	
42	Turkey	0.21	5.50	0.31	
43	Romania	0.19	4.81	0.29	
44	Venezuela, Bolivarian Rep.	0.19	4.78	0.27	
45	Peru	0.19	4.76	0.25	
46	Thailand	0.18	4.72	0.24	
47	Colombia	0.17	4.32	0.22	
48	China	0.14	3.41	0.20	
49	Lebanon	0.13	3.17	0.19	
50	Algeria	0.08	1.76	0.17	
51	Philippines	0.08	1.76	0.15	
52	Jordan	0.08	1.69	0.14	○
53	Kenya	0.07	1.38	0.12	
54	Indonesia	0.06	1.09	0.10	
55	Egypt	0.05	0.75	0.08	
56	Morocco	0.05	0.73	0.07	○
57	Nigeria	0.04	0.52	0.05	
58	Viet Nam	0.04	0.46	0.03	○
59	India	0.03	0.12	0.02	○
60	Pakistan	0.02	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Bosnia and Herzegovina	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Bulgaria	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Cyprus	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Estonia	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kazakhstan	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Latvia	n/a	n/a	n/a	
n/a	Lithuania	n/a	n/a	n/a	
n/a	Luxembourg	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Senegal	n/a	n/a	n/a	
n/a	Serbia	n/a	n/a	n/a	
n/a	Slovakia	n/a	n/a	n/a	
n/a	Slovenia	n/a	n/a	n/a	
n/a	Sri Lanka	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	TFYR of Macedonia	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Tunisia	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	Ukraine	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Yemen	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: PwC's *Global entertainment and media outlook, 2015–2019*; United Nations, *World Population Prospects: The 2015 Revision* (population)
NOTE: ● indicates a strength; ○ a weakness

7.2.4 Printing and publishing output

Printing and publishing manufactures output (% of manufactures total output) | 2012

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Iceland (2006)	6.36	100.00	0.98	●
1	Lebanon (2007)	4.18	100.00	0.98	●
1	Malta (2009)	36.18	100.00	0.98	●
4	Georgia	3.51	83.15	0.97	●
5	Mauritius	3.24	76.40	0.96	●
6	Mongolia (2011)	2.94	68.79	0.95	●
7	Cyprus	2.90	67.69	0.94	●
8	Tanzania, United Rep. (2010)	2.84	66.26	0.92	●
9	Costa Rica	2.74	63.75	0.91	●
10	Ethiopia (2009)	2.72	63.32	0.90	●
11	Peru (2011)	2.66	61.71	0.89	●
12	TFYR of Macedonia (2011)	2.62	60.66	0.88	●
13	Kenya	2.59	59.90	0.87	●
14	Latvia	2.46	56.74	0.86	●
15	South Africa (2010)	2.44	56.11	0.85	●
16	Tajikistan	2.41	55.49	0.84	●
17	Saudi Arabia (2009)	2.31	53.05	0.83	●
18	Australia	2.25	51.39	0.82	
19	Colombia	2.23	51.02	0.81	●
20	Estonia	2.22	50.67	0.80	
21	United Kingdom	2.21	50.51	0.78	
22	Japan	2.09	47.35	0.77	
23	Madagascar (2006)	2.08	47.15	0.76	●
24	New Zealand (2010)	1.98	44.74	0.75	
25	Moldova, Rep.	1.94	43.71	0.74	
26	United States of America (2008)	1.88	42.25	0.73	
27	Sri Lanka (2011)	1.88	42.13	0.72	●
28	Slovenia	1.82	40.72	0.71	
29	Malawi (2010)	1.74	38.56	0.70	●
30	Serbia	1.65	36.38	0.69	
31	Norway	1.61	35.48	0.68	
32	Ecuador (2008)	1.55	33.92	0.67	●
33	Armenia	1.54	33.67	0.66	
34	Belgium	1.52	33.02	0.65	
35	Netherlands	1.47	31.89	0.63	○
36	Austria	1.44	31.18	0.62	
37	Luxembourg	1.42	30.66	0.61	
38	Sweden	1.41	30.38	0.60	○
39	Uruguay (2010)	1.38	29.55	0.59	
40	Jordan	1.38	29.48	0.58	
41	Spain	1.37	29.40	0.57	
42	Finland	1.37	29.22	0.56	○
43	Paraguay (2010)	1.33	28.32	0.55	●
44	Italy	1.31	27.94	0.54	
45	Switzerland	1.30	27.67	0.53	○
46	Cameroon (2008)	1.28	27.19	0.52	●
47	Portugal	1.26	26.69	0.51	
48	Israel (2011)	1.25	26.44	0.49	
49	Viet Nam (2008)	1.25	26.41	0.48	
50	Greece	1.25	26.34	0.47	
51	Algeria (2008)	1.21	25.23	0.46	
52	Germany	1.20	25.01	0.45	○
53	Russian Federation	1.19	24.88	0.44	
54	Denmark	1.18	24.63	0.43	○
55	Bulgaria	1.18	24.55	0.42	
56	Qatar (2010)	1.18	24.50	0.41	
57	Turkey (2009)	1.14	23.58	0.40	
58	France	1.09	22.27	0.38	○
58	Romania	1.09	22.27	0.38	
60	Bosnia and Herzegovina (2011)	1.06	21.54	0.37	
61	Czech Republic	1.05	21.32	0.34	○
61	Poland	1.05	21.32	0.34	○
63	Bahrain (2010)	1.04	20.99	0.33	
64	Lithuania	1.02	20.64	0.32	
65	Kyrgyzstan (2010)	1.02	20.59	0.31	
66	Ireland (2011)	0.95	18.75	0.30	○
67	Kazakhstan	0.93	18.28	0.29	
68	Indonesia (2011)	0.92	18.03	0.28	
69	Malaysia	0.86	16.55	0.27	○
70	Hungary	0.83	15.79	0.26	○
71	Senegal	0.83	15.67	0.25	
72	Singapore	0.82	15.49	0.24	○
73	Morocco	0.81	15.21	0.23	
74	Brazil	0.79	14.81	0.22	○
75	Burundi (2010)	0.78	14.59	0.20	
76	Thailand (2011)	0.77	14.16	0.19	○
77	Oman	0.73	13.36	0.18	
78	Tunisia (2007)	0.72	12.93	0.17	
79	Ukraine	0.70	12.55	0.16	
80	Egypt (2010)	0.64	11.12	0.15	
81	Slovakia	0.62	10.47	0.14	○
82	Azerbaijan	0.61	10.29	0.13	
83	Kuwait	0.59	9.77	0.12	○
84	India (2011)	0.57	9.29	0.11	○
85	Mexico (2011)	0.57	9.26	0.10	○
86	Philippines (2010)	0.54	8.61	0.09	○
87	China (2011)	0.52	7.98	0.08	○
88	Nepal (2011)	0.44	5.87	0.06	○
89	Canada	0.38	4.59	0.05	○
90	Yemen (2009)	0.37	4.34	0.04	
91	Pakistan (2006)	0.33	3.26	0.03	○
92	Korea, Rep.	0.28	2.01	0.02	○
93	Iran, Islamic Rep. (2011)	0.22	0.48	0.01	○
94	Bangladesh (2011)	0.20	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Argentina	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Chile	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Croatia	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Ghana	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Hong Kong (China)	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Montenegro	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Nigeria	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uganda	n/a	n/a	n/a	
n/a	United Arab Emirates	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: United Nations Industrial Development Organization, *Industrial Statistics Database*, ISIC Revision 3 (INDSTAT2 2012)

NOTE: ● indicates a strength; ○ a weakness

7.2.5 Creative goods exports

Creative goods exports (% of total trade) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	China	14.75	100.00	1.00	●
2	Slovakia	10.34	87.87	0.99	●
3	Mexico	10.32	87.81	0.98	●
4	Czech Republic	10.05	86.91	0.98	●
5	Thailand	9.63	85.50	0.97	●
6	Malaysia	9.19	83.94	0.96	●
7	Hungary	5.93	69.70	0.95	●
8	Netherlands	5.26	66.00	0.94	
9	Viet Nam	5.08	64.90	0.93	●
10	Singapore	4.83	63.37	0.93	
11	Poland	4.26	59.63	0.92	●
12	Switzerland	3.70	55.45	0.91	
13	Latvia	3.41	53.13	0.90	●
14	Turkey	3.03	49.86	0.89	●
15	United Kingdom	2.94	49.00	0.89	
16	India	2.89	48.55	0.88	●
17	Indonesia	2.85	48.15	0.87	●
18	Korea, Rep.	2.68	46.51	0.86	
19	Tunisia (2013)	2.57	45.47	0.85	●
20	Bahrain	2.29	42.43	0.85	●
21	Italy	2.28	42.34	0.84	
22	Ireland	2.11	40.40	0.83	
23	Japan	2.10	40.34	0.82	
24	Germany	2.01	39.19	0.81	
25	Israel	1.71	35.48	0.80	
26	Sweden	1.71	35.45	0.80	
27	United States of America	1.65	34.67	0.79	
28	Denmark	1.63	34.40	0.78	
29	France	1.62	34.24	0.77	
30	Lithuania	1.61	34.13	0.76	
31	Egypt	1.59	33.85	0.76	●
32	Belgium	1.57	33.47	0.75	
33	Dominican Republic	1.49	32.37	0.74	●
34	Austria	1.45	31.82	0.73	
35	Romania	1.36	30.41	0.72	
36	Portugal	1.30	29.54	0.72	
37	Estonia	1.19	27.78	0.71	
38	Greece	1.00	24.42	0.70	
39	Jordan	0.94	23.31	0.69	●
40	Canada	0.93	23.28	0.68	
41	Lebanon	0.82	21.16	0.67	
42	South Africa	0.82	21.06	0.67	
43	Serbia	0.82	21.02	0.66	
44	Spain	0.81	20.91	0.65	
45	Croatia	0.81	20.87	0.64	
46	Slovenia	0.80	20.63	0.63	
47	Russian Federation	0.79	20.49	0.63	
48	Bulgaria	0.78	20.39	0.62	
49	Bolivia, Plurinational St.	0.73	19.33	0.61	●
50	Finland	0.72	19.02	0.60	
51	El Salvador	0.71	18.85	0.59	
52	Mauritius	0.70	18.56	0.59	
53	Australia	0.69	18.51	0.58	
54	Costa Rica (2013)	0.68	18.28	0.57	
55	Namibia	0.67	18.08	0.56	
56	Ukraine	0.63	17.27	0.55	
57	Kazakhstan	0.60	16.53	0.54	
58	Iran, Islamic Rep. (2011)	0.54	15.04	0.54	
59	Malta	0.50	14.11	0.53	
60	Armenia	0.49	14.03	0.52	
61	Norway	0.48	13.63	0.51	○
62	Cambodia (2013)	0.44	12.77	0.50	●
63	Peru	0.36	10.68	0.50	
64	Guatemala	0.33	9.92	0.49	
65	Pakistan	0.32	9.62	0.48	
66	Nepal	0.30	9.04	0.47	●
67	Belarus	0.29	8.92	0.46	
68	Bosnia and Herzegovina	0.28	8.75	0.46	
69	New Zealand	0.28	8.55	0.45	
70	Kenya (2013)	0.28	8.50	0.44	
71	Sri Lanka	0.26	8.14	0.43	
72	Hong Kong (China) (2013)	0.23	7.29	0.42	○
73	Kuwait	0.23	7.26	0.41	
74	Argentina	0.23	7.17	0.41	
75	Colombia	0.23	7.11	0.40	
76	Chile	0.20	6.37	0.39	
77	TFYR of Macedonia	0.20	6.37	0.38	
78	Brazil	0.20	6.23	0.37	
79	Côte d'Ivoire	0.19	6.14	0.37	
80	Botswana	0.19	6.08	0.36	
81	Luxembourg	0.17	5.34	0.35	
82	Montenegro	0.16	5.10	0.34	
83	Senegal	0.15	4.75	0.33	
84	Madagascar	0.13	4.38	0.33	
85	Saudi Arabia (2013)	0.12	3.85	0.32	
86	Honduras	0.10	3.20	0.31	
87	Iceland	0.08	2.81	0.30	○
88	Ghana (2013)	0.07	2.41	0.29	
89	Paraguay	0.07	2.29	0.28	
90	Malawi	0.07	2.19	0.28	
91	Tanzania, United Rep.	0.06	2.05	0.27	
92	Uruguay	0.06	2.03	0.26	
93	Bangladesh (2011)	0.06	1.99	0.25	
94	Nicaragua	0.06	1.95	0.24	
95	Kyrgyzstan (2013)	0.06	1.95	0.24	
96	Jamaica	0.05	1.64	0.23	
97	Ecuador	0.05	1.59	0.22	
98	Moldova, Rep.	0.04	1.43	0.21	
99	Uganda	0.04	1.37	0.20	
100	Rwanda	0.04	1.33	0.20	
101	Albania	0.03	1.16	0.19	
102	Zambia	0.03	1.08	0.18	
103	Georgia	0.03	0.95	0.17	
104	Ethiopia	0.03	0.94	0.16	
105	Togo (2013)	0.02	0.81	0.15	
106	Burkina Faso	0.02	0.68	0.15	
107	Oman	0.02	0.66	0.14	
108	Niger	0.02	0.55	0.13	
109	Cyprus	0.02	0.53	0.12	○
110	Panama	0.02	0.52	0.11	
111	Burundi	0.01	0.49	0.11	
112	Guinea	0.01	0.46	0.10	
113	Azerbaijan	0.01	0.43	0.09	○
114	Cameroon	0.01	0.42	0.08	
115	Nigeria	0.01	0.40	0.07	
116	Bhutan (2012)	0.01	0.35	0.07	
117	Mozambique	0.01	0.35	0.06	
118	Benin	0.01	0.33	0.05	
119	Mongolia	0.01	0.23	0.04	○
120	Mali (2012)	0.00	0.15	0.03	
121	United Arab Emirates	0.00	0.08	0.02	○
122	Yemen	0.00	0.05	0.02	
123	Algeria	0.00	0.03	0.01	○
124	Qatar	0.00	0.00	0.00	○
n/a	Morocco	n/a	n/a	n/a	
n/a	Philippines	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	

SOURCE: United Nations, *COMTRADE* database; 2009 UNESCO Framework for Cultural Statistics; World Trade Organization, *Trade in Commercial Services* database

NOTE: ● indicates a strength; ○ a weakness

7.3.1 Generic top-level domains (gTLDs)

Generic top-level domains (gTLDs) (per thousand population 15–69 years old) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Iceland	100.00	100.00	0.98	●
1	Luxembourg	100.00	100.00	0.98	●
1	United States of America	100.00	100.00	0.98	●
4	Malta	99.12	99.12	0.98	●
5	Netherlands	82.49	82.49	0.97	●
6	Canada	81.56	81.56	0.96	●
7	Hong Kong (China)	74.07	74.07	0.95	
8	Cyprus	73.10	73.10	0.94	●
9	Australia	68.72	68.72	0.94	
10	Ireland	65.81	65.81	0.93	
11	United Kingdom	65.75	65.75	0.92	
12	Switzerland	64.94	64.94	0.91	
13	Germany	59.13	59.13	0.91	
14	Norway	55.38	55.38	0.90	
15	Denmark	51.17	51.17	0.89	
16	Panama	49.03	49.03	0.88	●
17	Sweden	45.70	45.70	0.87	
18	France	43.88	43.88	0.87	
19	Austria	39.32	39.32	0.86	
20	New Zealand	37.12	37.12	0.85	
21	Finland	31.10	31.10	0.84	
22	Spain	29.71	29.71	0.83	
23	Singapore	27.91	27.91	0.83	
24	Israel	24.67	24.67	0.82	
25	Italy	24.39	24.39	0.81	
26	Belgium	23.69	23.69	0.80	
27	Bulgaria	23.61	23.61	0.80	●
28	Slovenia	22.66	22.66	0.79	
29	Portugal	19.71	19.71	0.78	
30	Czech Republic	17.95	17.95	0.77	
31	Japan	16.39	16.39	0.76	
32	Croatia	14.89	14.89	0.76	
33	Lithuania	14.14	14.14	0.75	
34	Mauritius	13.52	13.52	0.74	
35	Turkey	13.16	13.16	0.73	
36	Greece	13.10	13.10	0.72	
37	Costa Rica	12.30	12.30	0.72	
38	United Arab Emirates	11.91	11.91	0.71	
39	Hungary	11.01	11.01	0.70	
40	Estonia	9.91	9.91	0.69	
41	Latvia	9.89	9.89	0.69	
42	Namibia	9.31	9.31	0.68	●
43	Kuwait	8.84	8.84	0.67	
44	Korea, Rep.	8.70	8.70	0.66	
45	Poland	7.54	7.54	0.65	
46	Lebanon	7.38	7.38	0.65	
47	Jordan	7.15	7.15	0.64	
48	Albania	7.13	7.13	0.63	
49	Uruguay	6.98	6.98	0.62	
50	TFYR of Macedonia	6.95	6.95	0.61	
51	Malaysia	6.79	6.79	0.61	
52	Bahrain	5.99	5.99	0.60	
53	Thailand	5.68	5.68	0.59	
54	Peru	5.63	5.63	0.58	
55	Romania	5.00	5.00	0.57	
56	Qatar	4.73	4.73	0.57	
57	Ukraine	4.64	4.64	0.56	
58	Guatemala	4.61	4.61	0.55	
59	Russian Federation	3.49	3.49	0.54	
60	South Africa	3.49	3.49	0.54	
61	Slovakia	3.39	3.39	0.53	
62	Saudi Arabia	3.35	3.35	0.52	
63	Argentina	3.27	3.27	0.51	
64	Colombia	3.06	3.06	0.50	

Rank	Country/Economy	Score (0–100)	Score (0–100)	Percent rank	
65	Nicaragua	3.04	3.04	0.50	
66	Armenia	2.97	2.97	0.49	
67	Tunisia	2.87	2.87	0.48	
68	Dominican Republic	2.84	2.84	0.47	
69	Mexico	2.73	2.73	0.46	
70	Viet Nam	2.69	2.69	0.46	
71	El Salvador	2.67	2.67	0.45	
72	Bosnia and Herzegovina	2.53	2.53	0.44	
73	Bhutan	2.37	2.37	0.43	
74	China	2.32	2.32	0.43	
75	Ecuador	2.29	2.29	0.42	
76	Chile	2.29	2.29	0.41	
77	Moldova, Rep.	2.23	2.23	0.40	
78	Venezuela, Bolivarian Rep.	2.15	2.15	0.39	
79	Jamaica	2.07	2.07	0.39	
80	Oman	1.99	1.99	0.38	
81	Bolivia, Plurinational St.	1.95	1.95	0.37	
82	Iran, Islamic Rep.	1.95	1.95	0.36	
83	Georgia	1.89	1.89	0.35	
84	Belarus	1.84	1.84	0.35	
85	Paraguay	1.83	1.83	0.34	
86	Montenegro	1.76	1.76	0.33	
87	Morocco	1.72	1.72	0.32	
88	Indonesia	1.71	1.71	0.31	
89	Brazil	1.69	1.69	0.31	
90	Serbia	1.56	1.56	0.30	
91	Egypt	1.33	1.33	0.29	
92	Philippines	1.24	1.24	0.28	
93	Botswana	1.20	1.20	0.28	
94	Azerbaijan	1.15	1.15	0.27	
95	Kenya	1.15	1.15	0.26	
96	Senegal	1.12	1.12	0.25	
97	Niger	1.11	1.11	0.24	
98	India	1.02	1.02	0.24	
99	Cambodia	0.85	0.85	0.23	
100	Sri Lanka	0.83	0.83	0.22	
101	Ghana	0.69	0.69	0.21	
102	Togo	0.69	0.69	0.20	
103	Mongolia	0.67	0.67	0.20	
104	Honduras	0.67	0.67	0.19	
105	Benin	0.66	0.66	0.18	
106	Pakistan	0.65	0.65	0.17	
107	Nigeria	0.57	0.57	0.17	
108	Côte d'Ivoire	0.55	0.55	0.16	
109	Algeria	0.52	0.52	0.15	
110	Nepal	0.50	0.50	0.14	
111	Yemen	0.40	0.40	0.13	
112	Bangladesh	0.39	0.39	0.13	
113	Kazakhstan	0.39	0.39	0.12	○
114	Uganda	0.26	0.26	0.11	
115	Kyrgyzstan	0.22	0.22	0.10	
116	Malawi	0.21	0.21	0.09	
117	Cameroon	0.19	0.19	0.09	
118	Tanzania, United Rep.	0.18	0.18	0.08	
119	Rwanda	0.16	0.16	0.07	
120	Mali	0.16	0.16	0.06	
121	Madagascar	0.14	0.14	0.06	
122	Zambia	0.12	0.12	0.05	○
123	Burkina Faso	0.08	0.08	0.04	○
124	Guinea	0.06	0.06	0.03	
125	Tajikistan	0.06	0.06	0.02	○
126	Burundi	0.05	0.05	0.02	
127	Mozambique	0.04	0.04	0.01	○
128	Ethiopia	0.00	0.00	0.00	○

SOURCE: ZookNIC Inc; United Nations, *World Population Prospects: The 2015 Revision* (population)
NOTE: ● indicates a strength; ○ a weakness

7.3.2 Country-code top-level domains (ccTLDs)

Country-code top-level domains (ccTLDs) (per thousand population 15–69 years old) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Denmark	100.00	100.00	0.97	●
1	Germany	100.00	100.00	0.97	●
1	Montenegro	100.00	100.00	0.97	●
1	Netherlands	100.00	100.00	0.97	●
1	Switzerland	100.00	100.00	0.97	●
6	Iceland	86.05	86.05	0.96	●
7	United Kingdom	83.85	83.85	0.95	
8	Luxembourg	74.53	74.53	0.94	
9	Sweden	73.82	73.82	0.94	
10	New Zealand	73.74	73.74	0.93	
11	Austria	73.62	73.62	0.92	●
12	Belgium	69.07	69.07	0.91	
13	Norway	65.33	65.33	0.91	
14	Australia	62.88	62.88	0.90	
15	Czech Republic	56.99	56.99	0.89	●
16	Estonia	39.08	39.08	0.88	
17	Portugal	37.91	37.91	0.87	
18	Canada	35.56	35.56	0.87	
19	Finland	34.91	34.91	0.86	
20	Hungary	33.60	33.60	0.85	●
21	Poland	33.14	33.14	0.84	●
22	Latvia	30.65	30.65	0.83	
23	Lithuania	30.36	30.36	0.83	
24	Slovakia	29.03	29.03	0.82	●
25	Slovenia	28.32	28.32	0.81	
26	Italy	24.52	24.52	0.80	
27	France	23.90	23.90	0.80	
28	Ireland	23.17	23.17	0.79	
29	Colombia	20.97	20.97	0.78	
30	Romania	20.59	20.59	0.77	●
31	Spain	19.49	19.49	0.76	
32	Greece	19.48	19.48	0.76	
33	Russian Federation	16.99	16.99	0.75	
34	Israel	16.01	16.01	0.74	
35	Singapore	14.70	14.70	0.73	
36	Mali	13.73	13.73	0.72	●
37	Chile	13.58	13.58	0.72	
38	Uruguay	11.36	11.36	0.71	●
39	Croatia	10.71	10.71	0.70	
40	South Africa	10.16	10.16	0.69	
41	Korea, Rep.	9.34	9.34	0.69	
42	Hong Kong (China)	8.95	8.95	0.68	
43	Brazil	8.93	8.93	0.67	
44	Malta	8.75	8.75	0.66	
45	United Arab Emirates	6.83	6.83	0.65	
46	Argentina	6.82	6.82	0.65	
47	Belarus	6.27	6.27	0.64	
48	Ukraine	5.98	5.98	0.63	
49	Japan	5.84	5.84	0.62	
50	China	5.53	5.53	0.61	
51	Cyprus	5.46	5.46	0.61	
52	Malaysia	5.26	5.26	0.60	
53	Venezuela, Bolivarian Rep.	5.16	5.16	0.59	●
54	Serbia	4.93	4.93	0.58	
55	Iran, Islamic Rep.	4.53	4.53	0.57	
56	Armenia	4.52	4.52	0.57	
57	Qatar	4.03	4.03	0.56	
58	Kazakhstan	3.60	3.60	0.55	
59	Mexico	3.22	3.22	0.54	
60	Viet Nam	3.15	3.15	0.54	
61	Moldova, Rep.	2.81	2.81	0.53	
62	Mauritius	2.79	2.79	0.52	
63	United States of America	2.62	2.62	0.51	
64	Georgia	2.55	2.55	0.50	

Rank	Country/Economy	Score (0–100)	Score (0–100)	Percent rank	
65	Turkey	2.46	2.46	0.50	
66	Bulgaria	2.41	2.41	0.49	
67	Bosnia and Herzegovina	2.14	2.14	0.48	
68	Costa Rica	1.88	1.88	0.47	
69	Mongolia	1.75	1.75	0.46	
70	Botswana	1.66	1.66	0.46	
71	TFYR of Macedonia	1.64	1.64	0.45	
72	Albania	1.61	1.61	0.44	
73	Paraguay	1.54	1.54	0.43	
74	Bahrain	1.51	1.51	0.43	
75	Peru	1.51	1.51	0.42	
76	Panama	1.45	1.45	0.41	
77	Ecuador	1.40	1.40	0.40	
78	Dominican Republic	1.30	1.30	0.39	
79	Azerbaijan	1.21	1.21	0.39	
80	Jamaica	1.16	1.16	0.38	
81	Nepal	0.90	0.90	0.37	
82	Morocco	0.89	0.89	0.36	
83	Bhutan	0.72	0.72	0.35	
84	India	0.70	0.70	0.35	
85	Kenya	0.69	0.69	0.34	
86	Saudi Arabia	0.69	0.69	0.33	
87	El Salvador	0.68	0.68	0.32	
88	Nicaragua	0.65	0.65	0.31	
89	Bolivia, Plurinational St.	0.60	0.60	0.31	
90	Guatemala	0.60	0.60	0.30	
91	Honduras	0.54	0.54	0.29	
92	Kyrgyzstan	0.49	0.49	0.28	
93	Kuwait	0.48	0.48	0.28	
94	Thailand	0.45	0.45	0.27	
95	Tajikistan	0.43	0.43	0.26	
96	Philippines	0.38	0.38	0.25	
97	Jordan	0.35	0.35	0.24	
98	Lebanon	0.33	0.33	0.24	
99	Cameroon	0.33	0.33	0.23	
100	Indonesia	0.31	0.31	0.22	
101	Tunisia	0.25	0.25	0.21	
102	Sri Lanka	0.21	0.21	0.20	
103	Côte d'Ivoire	0.17	0.17	0.20	
104	Oman	0.16	0.16	0.19	
105	Senegal	0.15	0.15	0.18	
106	Pakistan	0.13	0.13	0.17	
107	Tanzania, United Rep.	0.13	0.13	0.17	
108	Nigeria	0.12	0.12	0.16	
109	Burundi	0.11	0.11	0.15	
110	Malawi	0.10	0.10	0.14	
111	Mozambique	0.10	0.10	0.13	
112	Algeria	0.10	0.10	0.13	
113	Cambodia	0.09	0.09	0.12	
114	Rwanda	0.08	0.08	0.11	
115	Guinea	0.06	0.06	0.10	
116	Uganda	0.06	0.06	0.09	
117	Madagascar	0.05	0.05	0.09	
118	Namibia	0.05	0.05	0.08	○
119	Egypt	0.04	0.04	0.07	○
120	Burkina Faso	0.04	0.04	0.06	
121	Yemen	0.02	0.02	0.06	
122	Benin	0.02	0.02	0.05	○
123	Togo	0.02	0.02	0.04	○
124	Bangladesh	0.02	0.02	0.03	○
125	Ethiopia	0.01	0.01	0.02	○
126	Niger	0.00	0.00	0.02	○
127	Zambia	0.00	0.00	0.01	○
128	Ghana	0.00	0.00	0.00	○

SOURCE: ZookNIC Inc; United Nations, *World Population Prospects: The 2015 Revision* (population)
NOTE: ● indicates a strength; ○ a weakness

7.3.3 Wikipedia monthly edits

Wikipedia monthly page edits (per million population 15–69 years old) | 2014

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	Iceland	13,529.16	100.00	1.00	●
2	Hong Kong (China)	11,073.54	81.84	0.99	●
3	Ireland	9,744.51	72.01	0.98	●
4	United Kingdom	9,652.35	71.33	0.98	●
5	Malta	9,424.37	69.65	0.97	●
6	Netherlands	9,406.73	69.52	0.96	●
7	Finland	8,836.02	65.30	0.95	
8	Israel	7,906.33	58.42	0.94	
9	Australia	7,868.46	58.14	0.94	
10	New Zealand	7,816.31	57.76	0.93	
11	Estonia	7,671.34	56.69	0.92	●
12	Sweden	7,625.05	56.34	0.91	
13	Italy	7,569.56	55.93	0.91	●
14	Luxembourg	7,322.33	54.10	0.90	
15	Norway	7,232.92	53.44	0.89	
16	Canada	7,167.23	52.96	0.88	
17	Belgium	6,650.74	49.14	0.87	
18	Uruguay	6,005.16	44.36	0.87	●
19	Germany	5,952.06	43.97	0.86	
20	Spain	5,678.19	41.95	0.85	
21	Chile	5,520.35	40.78	0.84	●
22	Cyprus	5,408.77	39.95	0.83	
23	Denmark	5,288.93	39.07	0.83	
24	Montenegro	5,218.33	38.55	0.82	●
25	United States of America	5,148.43	38.03	0.81	
26	Austria	4,879.46	36.04	0.80	
27	France	4,814.47	35.56	0.80	
28	Bulgaria	4,772.61	35.25	0.79	
29	Serbia	4,693.03	34.66	0.78	●
30	Armenia	4,651.34	34.35	0.77	●
31	Greece	4,568.81	33.74	0.76	
32	Switzerland	4,555.61	33.65	0.76	
33	Korea, Rep.	4,407.70	32.55	0.75	
34	Bosnia and Herzegovina	3,913.21	28.90	0.74	●
35	Argentina	3,777.59	27.89	0.73	●
36	Lithuania	3,619.07	26.72	0.72	
37	Croatia	3,562.67	26.30	0.72	
38	Slovakia	3,369.56	24.88	0.71	
39	Slovenia	3,298.34	24.35	0.70	
40	Japan	3,292.10	24.30	0.69	
41	Czech Republic	3,275.29	24.18	0.69	
42	Portugal	3,156.39	23.30	0.68	
43	TFYR of Macedonia	3,131.69	23.12	0.67	
44	Latvia	3,087.05	22.79	0.66	
45	Hungary	2,890.88	21.34	0.65	
46	Poland	2,614.24	19.29	0.65	
47	Albania	2,576.69	19.01	0.64	
48	Singapore	2,562.14	18.91	0.63	
49	Colombia	2,259.65	16.67	0.62	
50	Costa Rica	2,245.22	16.56	0.61	
51	Iran, Islamic Rep.	2,091.36	15.42	0.61	●
52	Qatar	2,058.25	15.18	0.60	
53	Peru	1,929.56	14.23	0.59	
54	United Arab Emirates	1,889.24	13.93	0.58	
55	Belarus	1,864.61	13.75	0.57	
56	Ecuador	1,804.13	13.30	0.57	
57	Azerbaijan	1,709.38	12.60	0.56	
58	Malaysia	1,677.11	12.36	0.55	
59	Venezuela, Bolivarian Rep.	1,623.93	11.97	0.54	
60	Georgia	1,586.93	11.69	0.54	
61	Russian Federation	1,568.96	11.56	0.53	
62	Bahrain	1,547.68	11.40	0.52	
63	Mexico	1,479.01	10.90	0.51	
64	Ukraine	1,472.06	10.85	0.50	
65	Saudi Arabia	1,469.75	10.83	0.50	
66	Kuwait	1,452.23	10.70	0.49	
67	Panama	1,416.52	10.43	0.48	
68	Philippines	1,298.29	9.56	0.47	
69	Dominican Republic	1,155.11	8.50	0.46	
70	Jordan	1,037.91	7.64	0.46	
71	Mauritius	998.83	7.35	0.45	
72	Mongolia	984.67	7.24	0.44	
73	Brazil	971.19	7.14	0.43	
74	Thailand	944.02	6.94	0.43	
75	Romania	934.51	6.87	0.42	
76	El Salvador	921.31	6.77	0.41	
77	Kazakhstan	919.66	6.76	0.40	
78	Lebanon	876.27	6.44	0.39	
79	Paraguay	872.44	6.41	0.39	
80	Moldova, Rep.	812.65	5.97	0.38	
81	Turkey	793.91	5.83	0.37	
82	Jamaica	779.80	5.73	0.36	
83	Honduras	777.82	5.71	0.35	
84	Guatemala	774.87	5.69	0.35	
85	Nicaragua	691.17	5.07	0.34	
86	Oman	637.37	4.67	0.33	
87	Bolivia, Plurinational St.	590.48	4.33	0.32	
88	Sri Lanka	536.61	3.93	0.31	
89	Tunisia	499.87	3.66	0.31	
90	Egypt	439.07	3.21	0.30	
91	Algeria	399.68	2.92	0.29	
92	Morocco	390.44	2.85	0.28	
93	South Africa	363.80	2.65	0.28	○
94	Kyrgyzstan	332.09	2.42	0.27	
95	Viet Nam	267.66	1.94	0.26	
96	India	264.59	1.92	0.25	
97	Indonesia	260.62	1.89	0.24	
98	Pakistan	244.77	1.77	0.24	
99	Botswana	240.54	1.74	0.23	
100	Namibia	224.05	1.62	0.22	
101	Nepal	218.24	1.57	0.21	
102	Cambodia	202.64	1.46	0.20	
103	Bhutan	178.93	1.28	0.20	
104	China	149.78	1.07	0.19	○
105	Bangladesh	121.58	0.86	0.18	
106	Yemen	117.46	0.83	0.17	
107	Kenya	107.00	0.75	0.17	
108	Ghana	101.69	0.71	0.16	
109	Tajikistan	97.53	0.68	0.15	
110	Senegal	51.45	0.34	0.14	
111	Uganda	46.51	0.30	0.13	
112	Zambia	44.34	0.29	0.13	
113	Tanzania, United Rep.	38.61	0.25	0.12	
114	Rwanda	38.57	0.25	0.11	
115	Nigeria	36.19	0.23	0.10	
116	Mozambique	27.50	0.16	0.09	
117	Cameroon	27.50	0.16	0.09	
118	Ethiopia	23.93	0.14	0.08	
119	Côte d'Ivoire	23.74	0.14	0.07	○
120	Benin	19.59	0.11	0.06	
121	Madagascar	16.14	0.08	0.06	
122	Malawi	14.19	0.07	0.05	
123	Togo	13.60	0.06	0.04	○
124	Mali	12.71	0.05	0.03	○
125	Burkina Faso	8.72	0.02	0.02	○
126	Burundi	7.62	0.02	0.02	
127	Guinea	5.62	0.00	0.01	○
128	Niger	5.34	0.00	0.00	○

SOURCE: Wikimedia Foundation; United Nations, *World Population Prospects: The 2012 Revision* (population)

NOTE: ● indicates a strength; ○ a weakness

7.3.4 Video uploads on YouTube

Number of video uploads on YouTube (scaled by population 15–69 years old) | 2015

Rank	Country/Economy	Value	Score (0–100)	Percent rank	
1	United States of America	100.00	100.00	1.00	●
2	Netherlands	85.85	85.85	0.99	●
3	Hong Kong (China)	84.50	84.50	0.97	●
4	United Kingdom	82.42	82.42	0.96	
5	Latvia	79.32	79.32	0.95	●
6	Estonia	79.23	79.23	0.93	●
7	Israel	76.69	76.69	0.92	
8	Canada	74.83	74.83	0.90	
9	Finland	71.07	71.07	0.89	
10	Singapore	69.06	69.06	0.88	
11	Denmark	67.38	67.38	0.86	
12	Switzerland	66.16	66.16	0.85	
13	Ireland	65.33	65.33	0.84	
14	Sweden	64.76	64.76	0.82	
15	New Zealand	63.24	63.24	0.81	
16	Australia	54.63	54.63	0.79	
17	Korea, Rep.	53.97	53.97	0.78	
18	Spain	52.09	52.09	0.77	
19	Norway	51.95	51.95	0.75	
20	Czech Republic	51.41	51.41	0.74	
21	Hungary	49.60	49.60	0.73	
22	France	46.90	46.90	0.71	
23	Lithuania	45.18	45.18	0.70	
24	Portugal	44.86	44.86	0.68	
25	Belgium	44.63	44.63	0.67	
26	Greece	44.07	44.07	0.66	
27	Japan	39.82	39.82	0.64	
28	Germany	38.83	38.83	0.63	
29	Austria	37.26	37.26	0.62	
30	Russian Federation	36.52	36.52	0.60	
31	Romania	35.58	35.58	0.59	
32	Poland	35.34	35.34	0.58	
33	Saudi Arabia	34.39	34.39	0.56	
34	Ukraine	33.70	33.70	0.55	
35	Argentina	32.96	32.96	0.53	
36	Slovenia	32.87	32.87	0.52	
37	Chile	32.54	32.54	0.51	
38	Italy	32.12	32.12	0.49	
39	Kuwait	30.36	30.36	0.48	
40	Bulgaria	29.55	29.55	0.47	
41	Slovakia	29.52	29.52	0.45	
42	Brazil	28.84	28.84	0.44	
43	Bahrain	28.15	28.15	0.42	
44	Serbia	28.11	28.11	0.41	
45	Croatia	27.92	27.92	0.40	
46	Qatar	26.64	26.64	0.38	
47	United Arab Emirates	26.60	26.60	0.37	
48	Thailand	21.55	21.55	0.36	
49	TFYR of Macedonia	21.29	21.29	0.34	
50	Mexico	20.85	20.85	0.33	
51	Colombia	20.01	20.01	0.32	
52	Bosnia and Herzegovina	19.63	19.63	0.30	
53	Montenegro	19.32	19.32	0.29	○
54	Peru	19.31	19.31	0.27	
55	Viet Nam	17.92	17.92	0.26	
56	Turkey	17.89	17.89	0.25	
57	Malaysia	16.22	16.22	0.23	○
58	Lebanon	12.67	12.67	0.22	
59	Jordan	12.40	12.40	0.21	○
60	Morocco	12.35	12.35	0.19	
61	Philippines	8.84	8.84	0.18	
62	Tunisia	7.79	7.79	0.16	
63	Oman	7.71	7.71	0.15	
64	Egypt	7.67	7.67	0.14	
65	Indonesia	7.38	7.38	0.12	
66	Algeria	4.49	4.49	0.11	
67	South Africa	2.95	2.95	0.10	○
68	India	1.53	1.53	0.08	○
69	Senegal	1.43	1.43	0.07	○
70	Kenya	0.89	0.89	0.05	○
71	Yemen	0.67	0.67	0.04	
72	Ghana	0.60	0.60	0.03	○
73	Uganda	0.19	0.19	0.01	○
74	Nigeria	0.00	0.00	0.00	○
n/a	Albania	n/a	n/a	n/a	
n/a	Armenia	n/a	n/a	n/a	
n/a	Azerbaijan	n/a	n/a	n/a	
n/a	Bangladesh	n/a	n/a	n/a	
n/a	Belarus	n/a	n/a	n/a	
n/a	Benin	n/a	n/a	n/a	
n/a	Bhutan	n/a	n/a	n/a	
n/a	Bolivia, Plurinational St.	n/a	n/a	n/a	
n/a	Botswana	n/a	n/a	n/a	
n/a	Burkina Faso	n/a	n/a	n/a	
n/a	Burundi	n/a	n/a	n/a	
n/a	Cambodia	n/a	n/a	n/a	
n/a	Cameroon	n/a	n/a	n/a	
n/a	China	n/a	n/a	n/a	
n/a	Costa Rica	n/a	n/a	n/a	
n/a	Côte d'Ivoire	n/a	n/a	n/a	
n/a	Cyprus	n/a	n/a	n/a	
n/a	Dominican Republic	n/a	n/a	n/a	
n/a	Ecuador	n/a	n/a	n/a	
n/a	El Salvador	n/a	n/a	n/a	
n/a	Ethiopia	n/a	n/a	n/a	
n/a	Georgia	n/a	n/a	n/a	
n/a	Guatemala	n/a	n/a	n/a	
n/a	Guinea	n/a	n/a	n/a	
n/a	Honduras	n/a	n/a	n/a	
n/a	Iceland	n/a	n/a	n/a	
n/a	Iran, Islamic Rep.	n/a	n/a	n/a	
n/a	Jamaica	n/a	n/a	n/a	
n/a	Kazakhstan	n/a	n/a	n/a	
n/a	Kyrgyzstan	n/a	n/a	n/a	
n/a	Luxembourg	n/a	n/a	n/a	
n/a	Madagascar	n/a	n/a	n/a	
n/a	Malawi	n/a	n/a	n/a	
n/a	Mali	n/a	n/a	n/a	
n/a	Malta	n/a	n/a	n/a	
n/a	Mauritius	n/a	n/a	n/a	
n/a	Moldova, Rep.	n/a	n/a	n/a	
n/a	Mongolia	n/a	n/a	n/a	
n/a	Mozambique	n/a	n/a	n/a	
n/a	Namibia	n/a	n/a	n/a	
n/a	Nepal	n/a	n/a	n/a	
n/a	Nicaragua	n/a	n/a	n/a	
n/a	Niger	n/a	n/a	n/a	
n/a	Pakistan	n/a	n/a	n/a	
n/a	Panama	n/a	n/a	n/a	
n/a	Paraguay	n/a	n/a	n/a	
n/a	Rwanda	n/a	n/a	n/a	
n/a	Sri Lanka	n/a	n/a	n/a	
n/a	Tajikistan	n/a	n/a	n/a	
n/a	Tanzania, United Rep.	n/a	n/a	n/a	
n/a	Togo	n/a	n/a	n/a	
n/a	Uruguay	n/a	n/a	n/a	
n/a	Venezuela, Bolivarian Rep.	n/a	n/a	n/a	
n/a	Zambia	n/a	n/a	n/a	

SOURCE: Google, parent company of YouTube; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision* (population)

NOTE: ● indicates a strength; ○ a weakness

Appendix III

Sources and Definitions

Sources and Definitions

This appendix complements the data tables by providing, for each of the 82 indicators included in the Global Innovation Index (GII) this year, its title, its description, its definition, and its source. For each indicator for each country/economy, the most recent value within the 10-year period 2006–15 was used. The single year given next to the description corresponds to the most frequent year for which data were available; when more than one year is considered, the period is indicated at the end of the indicator's source in parentheses.

Some indicators received special treatment in the computation. A few variables required scaling by some other indicator to be comparable across countries, or through division by gross domestic product (GDP) in current US dollars, purchasing power parity GDP in international dollars (PPP$ GDP), population, total exports, total trade, and so on. Details are provided in this appendix. The scaling factor was in each case the value corresponding to the same year of the particular indicator. In addition, 36 indicators that were assigned half weight are singled out with an 'a'. Finally, indicators for which higher scores indicate worse outcomes, commonly known as 'bads', are differentiated with a 'b' (details on the computation can be found in Appendix IV Technical Notes).

A total of 58 variables are hard data; 19 are composite indicators from international agencies, distinguished with an asterisk (*); and 5 are survey questions from the World Economic Forum's Executive Opinion Survey (EOS), singled out with a dagger (†).

1 Institutions

1.1 Political environment

1.1.1 Political stability and absence of violence/terrorism

Political stability and absence of violence/terrorism index* | 2014

Index that captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Scores are standardized.

Source: World Bank, World Governance Indicators 2015. (http://info.worldbank.org/governance/wgi/index.aspx#home)

1.1.2 Government effectiveness

Government effectiveness index* | 2014

Index that captures perceptions of the quality of public and civil services and the degree of their independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Scores are standardized.

Source: World Bank, World Governance Indicators 2015. (http://info.worldbank.org/governance/wgi/index.aspx#home)

1.2 Regulatory environment

1.2.1 Regulatory quality

Regulatory quality index*[a] | 2014

Index that captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development. Scores are standardized.

Source: World Bank, World Governance Indicators 2015. (http://info.worldbank.org/governance/wgi/index.aspx#home)

1.2.2 Rule of law

Rule of law index*[a] | 2014

Index that captures perceptions of the extent to which agents have confidence in and abide by the rules of society, in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Scores are standardized.

Source: World Bank, World Governance Indicators 2015. (http://info.worldbank.org/governance/wgi/index.aspx#home)

1.2.3 Cost of redundancy dismissal

Sum of notice period and severance pay for redundancy dismissal (in salary weeks, averages for workers with 1, 5, and 10 years of tenure, with a minimum threshold of 8 weeks)[b] | 2015

Doing Business has historically studied the flexibility of regulation of employment specifically as it relates to the areas of hiring, working hours, and redundancy. Over the period from 2007 to 2011 improvements were made to align the methodology for the labour market regulation indicators (formerly the employing workers indicators) with the letter and spirit of the International Labour Organization (ILO) conventions. Redundancy cost measures the cost of advance notice requirements and severance payments due when terminating a redundant worker, expressed in weeks of salary. The average value of notice requirements and severance payments applicable to a worker with 1 year of tenure: a worker with 5 years and a worker with 10 years is also considered. One month is recorded as 4 and 1/3 weeks. If the redundancy cost adds up to 8 or fewer weeks of salary, a value of 8 is assigned but the actual number of weeks is published. If the cost adds up to more than 8 weeks of salary, the score is the number of weeks. Assumptions about the worker: the worker is a cashier in a supermarket or grocery store, age 19, with one year of work experience; is a full-time employee; is not a member of the labour union, unless membership is mandatory. Assumptions about the business: the business is a limited liability company (or the equivalent in the economy); operates a supermarket or grocery store in the economy's largest business city (for 11 economies the data are also collected for the second largest business city); has 60 employees; is subject to collective bargaining agreements if such agreements cover more than 50% of the food retail sector and they apply even to firms that are not party to them; abides by every law and regulation but does not grant workers more benefits than those mandated by law, regulation or (if applicable) collective bargaining agreements.

Source: World Bank, Ease of Doing Business Index 2016: Measuring Regulatory Quality and Efficiency (2014–15). (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

1.3 Business environment

1.3.1 Ease of starting a business

Ease of starting a business (distance to frontier)* | 2015

The ranking of economies on the ease of starting a business is determined by sorting their distance to frontier scores for starting a business. These scores are the simple average of the distance to frontier scores for each of the component indicators. *Doing Business* records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete these procedures and the paid-in minimum capital requirement. These procedures include obtaining all necessary licenses and permits and completing any required notifications, verifications, or inscriptions for the company and employees with relevant authorities. To make the data comparable across economies, several assumptions about the business and the procedures are used. The business: is a limited liability company (or its legal equivalent). If there is more than one type of limited liability company in the economy, the limited liability form most common among domestic firms is chosen. Information on the most common form is obtained from incorporation lawyers or the statistical office; operates in the economy's largest business city. For 11 economies the data are also collected for the second largest business city; the business is 100% domestically owned and has five owners, none of whom is a legal entity; has start-up capital of 10 times income per capita; performs general industrial or commercial activities, such as the production or sale to the public of products or services. The business does not perform foreign trade activities and does not handle products subject to a special tax regime, for example, liquor or tobacco. It is not using heavily polluting production processes; leases the commercial plant or offices and is not a proprietor of real estate; does not qualify for investment incentives or any special benefits; has at least 10 and up to 50 employees one month after the commencement of operations, all of them domestic nationals; has a turnover of at least 100 times income per capita; has a company deed 10 pages long. The distance to frontier score shows the distance of an economy to the 'frontier', which is derived from the most efficient practice or highest score achieved on each indicator.

Source: World Bank, Doing Business 2016: Measuring Regulatory Quality and Efficiency. (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

1.3.2 Ease of resolving insolvency

Ease of resolving insolvency (distance to frontier)* | 2015

The ranking of economies on the ease of resolving insolvency is determined by

sorting their distance to frontier scores for resolving insolvency. These scores are the simple average of the distance to frontier scores for the recovery rate and the strength of insolvency framework index. The recovery rate is recorded as cents on the dollar recovered by secured creditors through reorganization, liquidation, or debt enforcement (foreclosure or receivership) proceedings. The calculation takes into account the outcome: whether the business emerges from the proceedings as a going concern or the assets are sold piecemeal. Then the costs of the proceedings are deducted (1 cent for each percentage point of the value of the debtor's estate). Finally, the value lost as a result of the time the money remains tied up in insolvency proceedings is taken into account, including the loss of value due to depreciation of the hotel furniture. Consistent with international accounting practice, the annual depreciation rate for furniture is taken to be 20%. The furniture is assumed to account for a quarter of the total value of assets. The recovery rate is the present value of the remaining proceeds, based on end-2014 lending rates from the International Monetary Fund's *International Financial Statistics*, supplemented with data from central banks and the Economist Intelligence Unit. If an economy had zero cases a year over the past five years involving a judicial reorganization, judicial liquidation, or debt enforcement procedure (foreclosure or receivership), the economy receives a 'no practice' mark on the time, cost, and outcome indicators. This means that creditors are unlikely to recover their money through a formal legal process. The recovery rate for 'no practice' economies is zero. In addition, a 'no practice' economy receives a score of 0 on the strength of insolvency framework index even if its legal framework includes provisions related to insolvency proceedings (liquidation or reorganization). The strength of insolvency framework index is based on four other indices: commencement of proceedings index, management of debtor's assets index, reorganization proceedings index and creditor participation index. To make the data on the time, cost, and outcome of insolvency proceedings comparable across economies, several assumptions about the business and the case are used: the business is a limited liability company; operates in the economy's largest business city. For 11 economies the data are also collected for the second largest business city; is 100% domestically owned, with the founder, who is also chairman of the supervisory board, owning 51% (no other shareholder holds more than 5% of shares); has downtown real estate, where it runs a hotel, as its major asset; has a professional general manager; has 201 employees and 50 suppliers, each of which is owed money for the last delivery; has a 10-year loan agreement with a domestic bank secured by a mortgage over the hotel's real estate property. A universal business charge (an enterprise charge) is also assumed in economies where such collateral is recognized. If the laws of the economy do not specifically provide for an enterprise charge but contracts commonly use some other provision to that effect, this provision is specified in the loan agreement; has observed the payment schedule and all other conditions of the loan up to now; has a market value, operating as a going concern, of 100 times income per capita or $200,000, whichever is greater. The market value of the company's assets, if sold piecemeal, is 70% of the market value of the business. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, Doing Business 2016: Measuring Regulatory Quality and Efficiency. (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

1.3.3 Ease of paying taxes

Ease of paying taxes (distance to frontier)* | 2015

The ranking of economies on the ease of paying taxes is determined by sorting their distance to frontier scores for paying taxes. These scores are the simple average of the distance to frontier scores for each of the component indicators, with a threshold and a nonlinear transformation applied to one of the component indicators, the total tax rate. The 'threshold' is defined as the total tax rate at the 15th percentile of the overall distribution of the total tax rate indicator for all years included in the analysis up to and including *Doing Business 2015*. The threshold is set at 26.1%. All economies with a total tax rate below this threshold receive the same score as the economy at the threshold. The threshold is not based on any economic theory of an 'optimal tax rate' that minimizes distortions or maximizes efficiency in an economy's overall tax system. Instead, it is mainly empirical in nature, set at the lower end of the distribution of tax rates levied on medium-size enterprises in the manufacturing sector as observed through the paying taxes indicators. To make the data comparable across economies, several assumptions about the business and the taxes and contributions are used. The business: is a limited liability, taxable company. If there is more than one type of limited liability company in the economy, the limited liability form most common among domestic firms is chosen. The most common form is reported by incorporation lawyers or the statistical office; started operations on January 1, 2013. At that time the company purchased all the assets shown in its balance sheet and hired all its workers; operates in the economy's largest business city. For 11 economies the data are also collected for the second largest business city; the business is 100% domestically owned and has five owners, all of whom are natural persons; at the end of 2013, has a start-up capital of 102 times income per capita; performs general industrial or commercial activities. Specifically, it produces ceramic flowerpots and sells them at retail. It does not participate in foreign trade (no import or export) and does not handle products subject to a special tax regime, for example, liquor or tobacco; at the beginning of 2014, owns two plots of land, one building, machinery, office equipment, computers and one truck and leases one truck; does not qualify for investment incentives or any benefits apart from those related to the age or size of the company; has 60 employees—4 managers, 8 assistants, and 48 workers. All are nationals, and one manager is also an owner. The company pays for additional medical insurance for employees (not mandated by any law) as an additional benefit. In addition, in some economies reimbursable business travel and client entertainment expenses are considered fringe benefits. When applicable, it is assumed that the company pays the fringe benefit tax on this expense or that the benefit becomes taxable income for the employee. The case study assumes no additional salary for meals, transportation, education or others. Therefore, even when such benefits are frequent, they are not added to or removed from the taxable gross salaries to arrive at the labor tax or contribution calculation; has a turnover of 1,050 times income per capita; makes a loss in the first year of operation; has a gross margin (pretax) of 20% (that is, sales are 120% of the cost of goods sold); distributes 50% of its net profits as dividends to the owners at the end of the second year; sells one of its plots of land at a profit at the beginning of the second year; is subject to a series of detailed assumptions on expenses and transactions to further standardize the case. For example, the owner who is also a manager spends 10% of income per capita on traveling for the company (20% of this owner's expenses are purely private, 20% are for entertaining customers, and 60% are for business travel). All financial statement variables are proportional to 2012 income per capita as of and including *Doing Business 2014* (this is an update

from *Doing Business 2013* and previous years' reports, where the variables were proportional to 2005 income per capita). For some economies a multiple of two or three times the income per capita has been used to estimate the financial statement variables. The 2012 income per capita was not sufficient to bring the salaries of all the case study employees up to the minimum wage thresholds that exist in these economies. Assumptions about the taxes and contributions: all the taxes and contributions recorded are those paid in the second year of operation (calendar year 2014). A tax or contribution is considered distinct if it has a different name or is collected by a different agency. Taxes and contributions with the same name and agency, but charged at different rates depending on the business, are counted as the same tax or contribution; the number of times the company pays taxes and contributions in a year is the number of different taxes or contributions multiplied by the frequency of payment (or withholding) for each tax. The frequency of payment includes advance payments (or withholding) as well as regular payments (or withholding). Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, Doing Business 2016: Measuring Regulatory Quality and Efficiency. (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

2 Human capital and research

2.1 Education

2.1.1 Expenditure on education

Government expenditure on education (% of GDP) | 2012

Government operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment, as a percentage of gross domestic product (GDP).

Source: UNESCO Institute for Statistics, UIS online database (2006–14). (http://stats.uis.unesco.org)

2.1.2 Government expenditure on education per pupil, secondary

Government expenditure per pupil, secondary (% of GDP per capita) | 2012

Government spending on education divided by the total number of secondary students, as a percentage of GDP per capita. Government expenditure (current and capital) includes government spending on educational institutions (both public and private), education administration, and subsidies for private entities (students/households and other private entities).

Source: UNESCO Institute for Statistics, UIS online database (2006–14). (http://stats.uis.unesco.org)

2.1.3 School life expectancy

School life expectancy, primary to tertiary education (years) | 2013

Total number of years of schooling that a child of a certain age can expect to receive in the future, assuming that the probability of his or her being enrolled in school at any particular age is equal to the current enrolment ratio for that age.

Source: UNESCO Institute for Statistics, UIS online database (2006–14). (http://stats.uis.unesco.org)

2.1.4 Assessment in reading, mathematics, and science

PISA average scales in reading, mathematics, and science[a] | 2012

The Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) develops three-yearly surveys that examine 15-year-old students' performance in reading, mathematics, and science. The scores are calculated in each year so that the mean is 500 and the standard deviation 100. The scores for China come from Shanghai; those for India from Himachal Pradesh and Tamil Nadu (average); those for the United Arab Emirates from Dubai; and those for the Bolivarian Republic of Venezuela from Miranda. These scores are those from the GII 2015 report.

Source: OECD Programme for International Student Assessment (PISA) (2010–12). (www.pisa.oecd.org/)

2.1.5 Pupil-teacher ratio, secondary

Pupil-teacher ratio, secondary[a,b] | 2014

The number of pupils enrolled in secondary school divided by the number of secondary school teachers (regardless of their teaching assignment). Where the data are missing for some countries, the ratios for upper-secondary are reported; if these are also missing, the ratios for lower-secondary are reported instead.

Source: UNESCO Institute for Statistics, UIS online database (2007–14). (http://stats.uis.unesco.org)

2.2 Tertiary education

2.2.1 Tertiary enrolment

School enrolment, tertiary (% gross)[a] | 2013

The ratio of total tertiary enrolment, regardless of age, to the population of the age group that officially corresponds to the tertiary level of education. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

Source: UNESCO Institute for Statistics, UIS online database (2007–14). (http://stats.uis.unesco.org)

2.2.2 Graduates in science and engineering

Tertiary graduates in science, engineering, manufacturing, and construction (% of total tertiary graduates) | 2013

The share of all tertiary graduates in science, manufacturing, engineering, and construction over all tertiary graduates.

Source: UNESCO Institute for Statistics, UIS online database (2006–14). (http://stats.uis.unesco.org)

2.2.3 Tertiary inbound mobility

Tertiary inbound mobility ratio (%)[a] | 2013

The number of students from abroad studying in a given country, as a percentage of the total tertiary enrolment in that country.

Source: UNESCO Institute for Statistics, UIS online database (2006–14). (http://stats.uis.unesco.org)

2.3 Research and development (R&D)

2.3.1 Researchers

Researchers, full-time equivalence (FTE) (per million population) | 2014

Researchers per million population, full-time equivalence. Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the management of the projects concerned. Postgraduate PhD students (ISCED97 level 6) engaged in R&D are included.

Source: UNESCO Institute for Statistics, UIS online database (2007–14). (http://stats.uis.unesco.org)

2.3.2 Gross expenditure on R&D (GERD)

GERD: Gross expenditure on R&D (% of GDP) | 2014

Total domestic intramural expenditure on R&D during a given period as a percent-

age of GDP. Intramural R&D expenditure is all expenditure for R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds.

Source: UNESCO Institute for Statistics, UIS online database (2007–15). (http://stats.uis.unesco.org)

2.3.3 Global R&D companies, average expenditure top 3

Average expenditure of the top 3 global companies by R&D, mn $US* | 2013

Average expenditure on R&D of the top three global companies. If a country has fewer than three global companies listed, the figure is either the average of the sum of the two companies listed or the total for a single listed company. A score of zero is given to countries with no listed companies.

Source: EU JRC Industrial R&D Investment Scoreboard 2014. (http://iri.jrc.ec.europa.eu/scoreboard14.html)

2.3.4 QS university ranking average score of top 3 universities.

Average score of the top 3 universities at the QS world university ranking* | 2015

Average score of the top three universities per country. If fewer than three universities are listed in the QS ranking of the global top 700 universities, the sum of the scores of the listed universities is divided by three, thus implying a score of zero for the non-listed universities.

Source: QS Quacquarelli Symonds Ltd, QS World University Ranking 2015/2016, Top Universities. (http://www.topuniversities.com/university-rankings/world-university-rankings/2015)

3 Infrastructure

3.1 Information and communication technologies (ICTs)

3.1.1 ICT access

ICT access index* | 2015

The ICT access index is a composite index that weights five ICT indicators (20% each): (1) Fixed telephone subscriptions per 100 inhabitants; (2) Mobile cellular telephone subscriptions per 100 inhabitants; (3) International Internet bandwidth (bit/s) per Internet user; (4) Percentage of households with a computer; and (5) Percentage of households with Internet access. It is the first sub-index in ITU's ICT Development Index (IDI).

Source: International Telecommunication Union, Measuring the Information Society 2015, ICT Development Index 2015. (http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf)

3.1.2 ICT use

ICT use index* | 2015

The ICT use index is a composite index that weights three ICT indicators (33% each): (1) Percentage of individuals using the Internet; (2) Fixed (wired)-broadband Internet subscriptions per 100 inhabitants; (3) Active mobile-broadband subscriptions per 100 inhabitants. It is the second sub-index in ITU's ICT Development Index (IDI).

Source: International Telecommunication Union, Measuring the Information Society 2015, ICT Development Index 2015. (http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf)

3.1.3 Government's online service

Government's online service index* | 2014

To arrive at a set of Online Service Index values, research teams assessed each country's national website, including the national central portal, e-services portal, and e-participation portal as well as the websites of the related ministries of education, labour, social services, health, finance, and environment, as applicable. In addition to being assessed for content and features, the national sites were tested for a minimal level of web content accessibility as described in the *Web Content Accessibility Guidelines* of the World Wide Web Consortium. The survey covers four stages of government's online service development, with points assigned for (1) an emerging presence, providing limited and basic information; (2) an enhanced presence, providing greater public policy and governance sources of information, such as policies, laws and regulation, downloadable databases, etc.; (3) a transactional presence, allowing two-way interactions between government and citizens (G2C and C2G), including paying taxes and applying for ID cards, birth certificates, passports, license renewals, etc.; and (4) a connected presence, characterized by G2G, G2C, and C2G interactions; participatory deliberative policy- and decision-making. A citizen-centric approach was followed. It is the first of three components of the E-Government Development Index (EGDI) of the United Nations Public Administration Network (UNPAN), together with components on telecommunication infrastructure and human capital.

Note: The precise meaning of these values varies from one edition of the Survey to the next as understanding of the potential of e-government changes and the underlying technology evolves. Read about the methodology at http://unpan3.un.org/egovkb/en-us/About/Methodology

Source: United Nations Public Administration Network, e-Government Survey 2014. (http://unpan3.un.org/egovkb/Reports/UN-E-Government-Survey-2014)

3.1.4 Online e-participation

E-Participation Index* | 2014

The United Nations E-Participation Index is based on the survey used for the UN Online Service Index. The survey was expanded with questions emphasizing quality in the connected presence stage of e-government. These questions focus on the use of the Internet to facilitate the provision of information by governments to citizens ('e-information sharing'), interaction with stakeholders ('e-consultation'), and engagement in decision-making processes ('e-decision making'). A country's E-Participation Index value reflects how useful these features are and the extent to which they have been deployed by the government compared with all other countries. The purpose of this measure is to offer insight into how different countries are using online tools to promote interaction between citizens and government, as well as among citizens, for the benefit of all. The index ranges from 0 to 1, with 1 showing greater e-participation.

Note: The precise meaning of these values varies from one edition of the Survey to the next as understanding of the potential of e-government changes and the underlying technology evolves. Read about the methodology at http://unpan3.un.org/egovkb/en-us/About/Methodology

Source: United Nations Public Administration Network, e-Government Survey 2014. (http://unpan3.un.org/egovkb/Reports/UN-E-Government-Survey-2014)

3.2 General infrastructure

3.2.1 Electricity output

Electricity output (kWh per capita)[a] | 2013

Electricity production, measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, this indicator covers generation by geothermal,

solar, wind, and tide and wave energy, as well as that from combustible renewables and waste. Production includes the output of electricity plants that are designed to produce electricity only as well as that of combined heat and power plants. Electricity output in KWh is scaled by population.

Source: International Energy Agency (IEA) World Energy Balances on-line data service, 2015 edition (2013–14). (http://www.iea.org/statistics/)

3.2.2 Logistics performance

Logistics Performance Index*[a] | 2014

A multidimensional assessment of logistics performance, the Logistics Performance Index (LPI) compares the trade logistics profiles of 160 countries and rates them on a scale of 1 (worst) to 5 (best). The ratings are based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, who rated the eight foreign countries their company serves most frequently. The LPI's six components include: (1) the efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs; (2) the quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology); (3) the ease of arranging competitively priced shipments; (4) the competence and quality of logistics services (transport operators, customs brokers); (5) the ability to track and trace consignments; and (6) the frequency with which shipments reach the consignee within the scheduled or expected delivery time. Details of the survey methodology are in Arvis et al.'s *Connecting to Compete 2014: Trade Logistics in the Global Economy* (2014). Scores are averaged across all respondents.

Source: World Bank and Turku School of Economics, Logistics Performance Index 2014; Arvis et al., 2014, Connecting to Compete 2014: Trade Logistics in the Global Economy. (http://lpi.worldbank.org/)

3.2.3 Gross capital formation

Gross capital formation (% of GDP) | 2015

Ratio of total gross capital formation in current local currency to GDP in current local currency. Gross capital formation or investment is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector, on the basis of the System of National Accounts (SNA) of 1993. Gross fixed capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales and 'work in progress'. Net acquisitions of valuables are also considered capital formation.

Source: International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP). (http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

3.3 Ecological sustainability

3.3.1 GDP per unit of energy use

GDP per unit of energy use (2005 PPP$ per kg of oil equivalent) | 2013

Purchasing power parity gross domestic product (PPP$ GDP) per kilogram of oil equivalent of energy use. Energy use or total primary energy supply (TPES) is calculated as the production of fuels + inputs from other sources + imports – exports – international marine bunkers +/– stock changes. It includes coal, crude oil, natural gas liquids, refinery feedstocks, additives, petroleum products, gases, combustible renewables and waste, electricity, and heat. Domestic supply (also called 'energy apparent consumption') differs from final consumption in that it does not take account of distribution losses. The supply (or use) of energy commodities is converted to kilograms or tons of oil equivalent (koe, toe) using standard coefficients for each energy source.

Source: International Energy Agency (IEA) World Energy Balances on-line data service, 2015 edition (2013–14). (http://www.iea.org/statistics/)

3.3.2 Environmental performance

Environmental Performance Index* | 2015

This index ranks countries on 20 performance indicators tracked across policy categories that cover both environmental public health and ecosystem vitality. These indicators gauge how close countries are to established environmental policy goals. The index ranges from 0 to 100, with 100 indicating best performance.

Source: Yale University and Columbia University Environmental Performance Index 2016. (http://epi.yale.edu/)

3.3.3 ISO 14001 environmental certificates

ISO 14001 Environmental management systems—Requirements with guidance for use: Number of certificates issued (per billion PPP$ GDP)[a] | 2014

ISO 14001:2015 sets out the criteria for an environmental management system and can be certified to. It maps out a framework that a company or organization can follow to set up an effective environmental management system. It can be used by any organization regardless of its activity or sector. Using ISO 14001:2015 can provide assurance to company management and employees as well as external stakeholders that environmental impact is being measured and improved. The ISO survey is published on an annual basis by the International Organization for Standardization (ISO). Only certification bodies accredited by national members of the International Accreditation Forum (http://www.iaf.nu) were used as sources. Certification of conformity with standards is not a requirement and the standards can be implemented without certification, but certification is perceived as adding value and trust. ISO is a network of the national standards institutes of 161 countries, and it is the world's largest developer of voluntary International Standards for business, government, and society, with a portfolio of more than 19,500 standards in almost every sector of economic activity and technology. ISO itself does not perform certification to its standards, does not issue certificates, and does not control certification performed independently of ISO by other organizations. The data are reported per billion PPP$ GDP.

Note: ISO 14001 Environmental Management Systems has recently been revised. Information about the key changes is available at http://www.iso.org/iso/home/standards/management-standards/iso14000/iso14001_revision.htm.

Source: International Organization for Standardization, The ISO Survey of Management System Standard Certifications 2014; International Monetary Fund, World Economic Outlook 2015 database, October 2015 (PPP$ GDP) (2013–14). (http://www.iso.org; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

4 Market sophistication

4.1 Credit

4.1.1 Ease of getting credit

Ease of getting credit (distance to frontier)* | 2015

The ranking of economies on the ease of getting credit is determined by sorting their distance to frontier scores for getting credit. These scores are the distance to frontier score for the sum of the strength of legal rights index (range 0–10); and the depth of credit information index (range 0–8). *Doing Business* measures the legal rights of borrowers and lenders with respect to secured transactions through one set of indicators and the reporting of credit information through another. The first set of indicators measures whether certain features that facilitate lending exist within the applicable collateral and bankruptcy laws. The second set measures the coverage, scope and accessibility of credit information available through credit reporting service providers such as credit bureaus or credit registries. Although *Doing Business* compiles data on getting credit for public registry coverage (% of adults) and for private bureau coverage (% of adults), these indicators are not included in the ranking. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, Doing Business 2016: Measuring Regulatory Quality and Efficiency. (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

4.1.2 Domestic credit to private sector

Domestic credit to private sector (% of GDP) | 2014

Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other financial corporations are finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.

Source: International Monetary Fund, International Financial Statistics and data files; and World Bank and OECD GDP estimates; extracted from the World Bank's World Development Indicators database (2006–14). (http://data.worldbank.org/)

4.1.3 Microfinance institutions' gross loan portfolio

Microfinance institutions: Gross loan portfolio (% of GDP) | 2014

Combined gross loan balances per microfinance institution (current US$), divided by GDP (current US$) and multiplied by 100.

Source: Microfinance Information Exchange, Mix Market database; International Monetary Fund, World Economic Outlook database, October 2015 (current US$ GDP) (2007–14). (https://reports.mixmarket.org/crossmarket; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

4.2 Investment

4.2.1 Ease of protecting minority investors

Ease of protecting minority investors (distance to frontier)* | 2015

The ranking is the simple average of the distance to frontier scores for the extent of conflict of interest regulation index and the extent of shareholder governance index. The extent of conflict of interest regulation index measures the protection of shareholders against directors' misuse of corporate assets for personal gain by distinguishing three dimensions of regulation that address conflicts of interest: transparency of related-party transactions (extent of disclosure index), shareholders' ability to sue and hold directors liable for self-dealing (extent of director liability index), and access to evidence and allocation of legal expenses in shareholder litigation. The extent of shareholder governance index measures shareholders' rights in corporate governance by distinguishing three dimensions of good governance: shareholders' rights and role in major corporate decisions (extent of shareholder rights index); governance safeguards protecting shareholders from undue board control and entrenchment (extent of ownership and control index); and corporate transparency on ownership stakes, compensation, audits, and financial prospects (extent of corporate transparency index). The index also measures whether a subset of relevant rights and safeguards are available in limited companies. The data come from a questionnaire administered to corporate and securities lawyers and are based on securities regulations, company laws, civil procedure codes, and court rules of evidence. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, Doing Business 2016: Measuring Regulatory Quality and Efficiency. (http://www.doingbusiness.org/reports/global-reports/doing-business-2016)

4.2.2 Market capitalization

Market capitalization of listed companies (% of GDP)[a] | 2014

Market capitalization (also known as 'market value') is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles.

Note: The methodology was changed for the total value of stocks traded because Standard & Poor's discontinued its *Global Stock Markets Factbook*. The current source of the data, the World Federation of Exchanges (WFE), uses a different methodology. The WFE provides data according to its membership list, available at http://www.world-exchanges.org/home/index.php/members/wfe-members.

Source: World Federation of Exchanges database; extracted from the World Bank's World Development Indicators database (2006–14). (http://data.worldbank.org/)

4.2.3 Total value of stocks traded

Stocks traded, total value (% of GDP)[a] | 2014

The value of shares traded is the total number of shares traded, both domestic and foreign, multiplied by their respective matching prices. Figures are single counted (only one side of the transaction is considered). Companies admitted to listing and admitted to trading are included in the data. Data are end-of-year values.

Note: The methodology was changed for the total value of stocks traded because Standard & Poor's discontinued its *Global Stock Markets Factbook*. The current source of the data, the World Federation of Exchanges (WFE), uses a different methodology. The WFE provides data according to its membership list, available at http://www.world-exchanges.org/home/index.php/members/wfe-members.

Source: World Federation of Exchanges database; extracted from the World Bank's World Development Indicators database (2008–14). (http://data.worldbank.org/)

4.2.4 Venture capital deals

Venture capital per investment location: Number of deals (per billion PPP$ GDP)[a] | 2015

Thomson Reuters data on private equity deals, per deal, with information on the location of investment, investment company, investor firms, and funds, among other details. The series corresponds to a query on venture capital deals from 1 January 2015 to 31 December 2015, with the data collected by investment location, for a total of 13,703 deals in 95 countries in 2015. The data are reported per billion PPP$ GDP.

Source: Thomson Reuters, Thomson One Banker Private Equity database; International Monetary Fund, World Economic Outlook database, October 2015 (PPP$ GDP). (http://banker.thomsonib.com; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

4.3 Trade, competition, and market scale

4.3.1 Applied tariff rate, weighted mean

Tariff rate, applied, weighted mean, all products (%) [a,b] | 2013

Weighted mean applied tariff is the average of effectively applied rates weighted by the product import shares corresponding to each partner country. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups and import weights. Effectively applied tariff rates at the six- and eight-digit product level are averaged for products in each commodity group. When the effectively applied rate is unavailable, the most-favoured-nation rate is used instead. To the extent possible, specific rates have been converted to their ad valorem equivalent rates and have been included in the calculation of weighted mean tariffs. World Bank staff estimates use the World Integrated Trade Solution system, based on data from United Nations Conference on Trade and Development's Trade Analysis and Information System (TRAINS) database and the World Trade Organization's (WTO) Integrated Data Base (IDB) and Consolidated Tariff Schedules (CTS) database.

Source: World Bank, based on UNCTAD TRAINS, WTO, IDB, and UN COMTRADE databases; extracted from World Bank World Development Indicators database (2007–13). (http://data.worldbank.org/)

4.3.2 Intensity of local competition

Average answer to the survey question: In your country, how intense is competition in the local markets? [1 = not intense at all; 7 = extremely intense]†a | 2015

Source: World Economic Forum, Executive Opinion Survey 2014–2015. (http://reports.weforum.org/global-competitiveness-report-2015-2016/)

4.3.3 Domestic market scale

Domestic market size as measured by GDP, bn PPP$ | 2014

The domestic market size is measured by gross domestic product (GDP) based on the purchasing-power-parity (PPP) valuation of country GDP, in current international dollar (billions).

Source: World Bank, International Monetary Fund, World Economic Outlook Database, 2015 (PPP$ GDP). (http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

5 Business sophistication

5.1 Knowledge workers

5.1.1 Employment in knowledge-intensive services

Employment in knowledge-intensive services (% of workforce) | 2014

Sum of people in categories 1 to 3 as a percentage of total people employed, according to the International Standard Classification of Occupations (ISCO). Categories included: ISCO-08: 1 Managers, 2 Professionals, and 3 Technicians and associate professionals (years 2006–14); ISCO-88: 1 Legislators, senior officials and managers, 2 Professionals, 3 Technicians and associate professionals (2006–14); ISCO-68: 1 Professional, technical and related workers (category 0 Armed forces is excluded), 2 Administrative and managerial workers, 3 Clerical and related workers (years 2006–08).

Source: International Labour Organization ILOSTAT Database of Labour Statistics (2006–14). (http://www.ilo.org/ilostat/)

5.1.2 Firms offering formal training

Firms offering formal training (% of firms) | 2013

The percentage of firms offering formal training programs for their permanent, full-time employees.

Source: World Bank, Enterprise Surveys (2006–15). (http://www.enterprisesurveys.org/).

5.1.3 GERD performed by business enterprise

GERD: Performed by business enterprise (% of GDP)[a] | 2014

Gross expenditure on R&D performed by business enterprise as a percentage of GDP.

Source: UNESCO Institute for Statistics, UIS online database (2007–14). (http://stats.uis.unesco.org)

5.1.4 GERD financed by business enterprise

GERD: Financed by business enterprise (% of total GERD)[a] | 2014

Gross expenditure on R&D financed by business enterprise as a percentage of total gross expenditure on R&D.

Source: UNESCO Institute for Statistics, UIS online database (2007–15). (http://stats.uis.unesco.org)

5.1.5 Females employed with advanced degrees

Females employed with advanced degrees, % total employed (25+ years old)[a] | 2014

The percentage of females employed with advanced degrees out of total employed. The employed comprise all persons of working age who, during a specified brief period, were in one of the following categories: (1) paid employment (whether at work or with a job but not at work); or (2) self-employment (whether at work or with an enterprise but not at work). Data are disaggregated by level of education, which refers to the highest level of education completed, classified according to the International Standard Classification of Education (ISCE).

Source: International Labour Organization, ILOSTAT Annual Indicators (2009–14); and Statistics Canada, Table 282-0004; Labour Force Survey estimates (LFS) by educational attainment, sex and age group, annual, CANSIM, accessed 11 February 2016. (http://www.ilo.org/ilostat/; http://laborsta.ilo.org/; http://www5.statcan.gc.ca/)

5.2 Innovation linkages

5.2.1 University/industry research collaboration

Average answer to the survey question: In your country, to what extent do people collaborate and share ideas in between companies and universities/research institutions? [1 = not at all; 7 = to a great extent]†a | 2015

Source: World Economic Forum, Executive Opinion Survey 2014–2015. (http://reports.weforum.org/global-competitiveness-report-2015-2016/)

5.2.2 State of cluster development

Average answer to the survey question on the role of clusters in the economy: In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? [1 = nonexistent; 7 = widespread in many fields]† | 2015

Source: World Economic Forum, Executive Opinion Survey 2014–2015. (http://reports.weforum.org/global-competitiveness-report-2015-2016/)

5.2.3 GERD financed by abroad

GERD: Financed by abroad (% of total GERD) | 2014

Percentage of gross expenditure on R&D financed by abroad—i.e., with foreign financing.

Source: UNESCO Institute for Statistics, UIS online database (2007–15). (http://stats.uis.unesco.org)

5.2.4 Joint venture/strategic alliance deals

Joint ventures/strategic alliances: Number of deals, fractional counting (per billion PPP$ GDP)[a] | 2015

Thomson Reuters data on joint ventures/strategic alliances deals, per deal, with details on the country of origin of partner firms, among others. The series corresponds to a query on joint venture/strategic alliance deals from 1 January 2015 to 31 December 2015, for a total of 1,512 deals announced in 2015, with firms headquartered in 92 participating economies. Each participating nation of each company in a deal (*n* countries per deal) gets, per deal, a score equivalent to 1/*n* (with the effect that all country scores add up to 1,512). The data are reported per billion PPP$ GDP.

Source: Thomson Reuters, Thomson One Banker Private Equity, SDC Platinum database; International Monetary Fund World Economic Outlook Database, October 2015 (PPP$ GDP). (http://banker.thomsonib.com; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

5.2.5 Patent families filed in two offices

Number of patent families filed by residents in at least two offices (per billion PPP$ GDP)[a] | 2012

A 'patent family' is a set of interrelated patent applications filed in one or more countries or jurisdictions to protect the same invention. Patent families containing applications filed in at least two different offices is a subset of patent families where protection of the same invention is sought in at least two different countries. In this report, 'patent families data' refers to patent applications filed by residents in at least two IP offices; the data are scaled by PPP$ GDP (billions). A 'patent' is a set of exclusive rights granted by law to applicants for inventions that are new, non-obvious, and commercially applicable. A patent is valid for a limited period of time (generally 20 years), during which patent holders can commercially exploit their inventions on an exclusive basis. In return, applicants are obliged to disclose their inventions to the public in a manner that enables others, skilled in the art, to replicate the invention. The patent system is designed to encourage innovation by providing innovators with time-limited exclusive legal rights, thus enabling them to appropriate the returns from their innovative activity.

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2007–12). (http://www.wipo.int//ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

5.3 Knowledge absorption

5.3.1 Intellectual property payments

Charges for use of intellectual property n.i.e., payments (%, total trade)[a] | 2014

Charges for the use of intellectual property not included elsewhere payments (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, code SH Charges for the use of intellectual property not included elsewhere as a percentage of total trade. 'Total trade' is defined as the sum of total imports code G goods and code SOX commercial services (excluding government goods and services not included elsewhere) plus total exports of code G goods and code SOX commercial services (excluding government goods and services not included elsewhere), divided by 2. According to the sixth edition of the International Monetary Fund's *Balance of Payments Manual,* the item 'Goods' covers general merchandise, net exports of goods under merchanting and nonmonetary gold. The 'commercial services' category is defined as being equal to 'services' minus 'government goods and services not included elsewhere'. Receipts are between residents and nonresidents for the use of proprietary rights (such as patents, trademarks, copyrights, industrial processes and designs including trade secrets, franchises), and for licenses to reproduce or distribute (or both) intellectual property embodied in produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable, or satellite broadcast).

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2009–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

5.3.2 High-tech imports

High-tech net imports (% of total trade) | 2014

High-technology imports minus re-imports (% of total trade). The list of commodities contains technical products with a high intensity of R&D, based on the Eurostat classification, itself based on SITC Rev.4 and the Organisation for Economic Co-operation and Development (OECD) definition. Commodities belong to the following sectors: aerospace; computers & office machines; electronics, telecommunications; pharmacy; scientific instruments; electrical machinery; chemistry; non-electrical machinery; and armament.

Source: United Nations, COMTRADE database; Eurostat, 'High-technology' aggregations based on SITC Rev. 4, April 2009 (2008–14). (http://comtrade.un.org/; http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an5.pdf)

5.3.3 ICT services imports

Telecommunications, computers, and information services imports (% of total trade) | 2014

Telecommunications, computer and information services (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010, coded SI: Telecommunications, computer and information services.

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2009–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

5.3.4 Foreign direct investment net inflows

Foreign direct investment (FDI), net inflows (% of GDP) | 2014

'Foreign direct investment' refers to the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This data series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.

Source: International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates; extracted from the World Bank's World Development Indicators database (2011–14). (http://data.worldbank.org/)

5.3.5 Research talent in business enterprise

Researchers in business enterprise, per thousand population (%) | 2014

Full-time equivalence (FTE) researchers in the business enterprise sector refers to 'researchers' as: professionals engaged in the conception or creation of new knowledge, products, processes, methods, and systems, as well as in the management of these projects, broken down by the sectors in which they are employed (business enterprise, government, higher education, and private non-profit organizations). In the context of R&D statistics, the business enterprise sector includes all firms, organizations, and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price, and the private non-profit institutions mainly serving them; the core of this sector is made up of private enterprises. This also includes public enterprises.

Source: UNESCO Institute for Statistics, UIS online database (2007–14); World Population Prospects: The 2015 Revision (population). (http://stats.uis.unesco.org)

6 Knowledge and technology outputs

6.1 Knowledge creation

6.1.1 Patent applications by origin

Number of resident patent applications filed at a given national or regional patent office (per billion PPP$ GDP)[a] | 2014

'Patent' is defined in the description of indicator 5.2.5. A 'resident patent application' refers to an application filed with an IP office or an office acting on behalf of the state or jurisdiction in which the first-named applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with the European Patent Office (EPO) by an applicant who resides in any of the EPO member states, for example, Germany, is considered a resident application for that member state (Germany).

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2010–14). (http://www.wipo.int//ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.1.2 PCT international applications by origin

Number of international patent applications filed by residents at the Patent Cooperation Treaty (per billion PPP$ GDP)[a] | 2015

These are the number of Patent Cooperation Treaty (PCT) international patent applications filed through the WIPO-administered Patent Cooperation Treaty in 2015. A 'PCT international application' refers to a patent application filed through the WIPO-administered Patent Cooperation Treaty (PCT) during the international phase outlined by the PCT System. The origin of PCT applications are defined by the residence of the first-named applicant. The PCT System facilitates the filing of patent applications worldwide, making it possible to seek patent protection for an invention simultaneously in each of a large number of countries by first filing a single international patent application.

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2014–15). (http://www.wipo.int//ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.1.3 Utility model applications by origin

Number of utility model applications filed by residents at the national patent office (per billion PPP$ GDP) | 2014

These are the number of resident utility model applications filed at a given national or regional patent office in 2014. A 'resident UM application' refers to an application filed with an IP office of or an office acting on behalf of the state or jurisdiction in which the first-named applicant has residence. For example, an application filed with the IP office of Germany by a resident of Germany is considered a resident application for Germany. A utility model grant is a special form of patent right issued by a state or jurisdiction to an inventor or the inventor's assignee for a fixed period of time. The terms and conditions for granting a utility model are slightly different from those for normal patents and include a shorter term of protection and less stringent patentability requirements. A utility model is sometimes referred to in certain countries as 'petty patents', 'short-term patents', or 'innovation patents'.

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2010–14). (http://www.wipo.int//ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.1.4 Scientific and technical publications

Number of scientific and technical journal articles (per billion PPP$ GDP)[a] | 2015

The number of scientific and engineering articles published in those fields, including: physics, chemistry, engineering, science technology, environmental sciences ecology, biochemistry molecular biology, mathematics, computer science, cell biology, biotechnology applied microbiology, metallurgy metallurgical engineering, veterinary sciences, meteorology atmospheric sciences, marine freshwater biology, life sciences biomedicine, dentistry oral surgery medicine, construction building technology, mathematical computational biology, evolutionary biology, general internal medicine, research experimental medicine, food science technology, plant sciences, radiology nuclear medicine medical imaging, microbiology, life sciences biomedicine, nuclear science technology, evolutionary biology, reproductive biology, and imaging science photographic technology. Article counts are from a set of journals covered by the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI). Articles are classified by year

of publication and assigned to each country/economy on basis of the institutional address(es) listed in the article. Articles are counted on a count basis (rather than a fractional basis)—that is, for articles with collaborating institutions from multiple countries/economies, each country/economy receives credit on the basis of its participating institutions. The data are reported per billion PPP$ GDP.

Source: Special tabulations from Thomson Reuters, Web of Science, Science Citation Index (SCI) and Social Sciences Citation Index (SSCI); International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP). (http://thomsonreuters.com/en/products-services/scholarly-scientific-research.html; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.1.5 Citable documents H index

The H index is the economy's number of published articles (H) that have received at least H citations in the period 1996–2014*[a] | 2015

The H index is an economy's number of published articles (H) that have received at least H citations in the period 1996–2014. It quantifies both country scientific productivity and scientific impact and is also applicable to scientists, journals, etc. The SCImago Journal & Country Rank is a portal that includes journal and economy scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). This platform takes its name from the SCImago Journal Rank (SJR), developed by SCImago from the algorithm Google PageRank™. The H index is tabulated from the number of citations received in subsequent years by articles published in a given year, divided by the number of articles published that year.

Source: SCImago (2016) SJR—SCImago Journal & Country Rank. Retrieved February 2016. (http://www.scimagojr.com)

6.2 Knowledge impact

6.2.1 Growth rate of GDP per person engaged

Growth rate of GDP per person engaged (constant 1990 PPP$) | 2014

Growth of gross domestic product (GDP) per person engaged provides a measure of labor productivity (defined as output per unit of labor input). GDP per person employed is GDP divided by total employment in the economy. PPP$ GDP is converted to 1990 US$, converted at Geary Khamis PPPs.

Source: The Conference Board Total Economy Database™ Output, Labor and Labor Productivity, 1950–2015, September 2015. (https://www.conference-board.org/data/economydatabase/)

6.2.2 New business density

New business density (new registrations per thousand population 15–64 years old)[a] | 2014

Number of new firms, defined as firms registered in the current year of reporting, per thousand population aged 15–64 years old.

Source: World Bank, Doing Business 2016, Entrepreneurship (2009–14). (http://www.doingbusiness.org/data/exploretopics/entrepreneurship)

6.2.3 Total computer software spending

Total computer software spending (% of GDP)[a] | 2015

Computer software spending includes the total value of purchased or leased packaged software such as operating systems, database systems, programming tools, utilities, and applications. It excludes expenditures for internal software development and outsourced custom software development. The data are a combination of actual figures and estimates. Data are reported as a percentage of GDP.

Source: IHS Global Insight, Information and Communication Technology Database; International Monetary Fund, World Economic Outlook 2015 Database, October 2015 (current US$ GDP). (https://www.ihs.com/industry/economics-country-risk.html; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.2.4 ISO 9001 quality certificates

ISO 9001 Quality management systems—Requirements: Number of certificates issued (per billion PPP$ GDP)[a] | 2014

ISO 9001:2015 sets out the criteria for a quality management system and is the only standard in the family that can be certified to (although this is not a requirement). It can be used by any organization, large or small, regardless of its field of activity. In fact, there are over 1 million companies and organizations in over 170 countries certified to ISO 9001. This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach, and continual improvement. These principles are explained in more detail in the ISO 9001 Quality Management Principles. Using ISO 9001:2015 helps ensure that customers get consistent, good quality products and services, which in turn brings many business benefits. Single-site and multiple-site certificates are not distinguished. The data are reported per billion PPP$ GDP. Refer to indicator 3.3.3 for more details.

Note: ISO 9001 Quality Management Systems has recently been revised. Information about the revision is available at http://www.iso.org/iso/home/standards/management-standards/iso_9000/iso9001_revision.htm.

Source: International Organization for Standardization (ISO), The ISO Survey of Management System Standard Certifications, 1993–2014; International Monetary Fund, World Economic Outlook database, October 2015 (PPP$ GDP) (2014). (http://www.iso.org; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

6.2.5 High-tech and medium-high-tech output

High-tech and medium-high-tech output (% of total manufactures output)[a] | 2012

High-tech and medium-high-tech output as a percentage of total manufactures output, on the basis of the Organisation for Economic Co-operation and Development (OECD) classification of Technology Intensity Definition, itself based on International Standard Industrial Classification ISIC Revision 3.

Source: United Nations Industrial Development Organization (UNIDO), Industrial Statistics Database, 3- and 4-digit level of International Standard Industrial Classification ISIC Revision 3 (INDSTAT4 2012); OECD, Directorate for Science, Technology and Industry, Economic Analysis and Statistics Division, 'ISIC REV. 3 Technology Intensity Definition: Classification of Manufacturing Industries into Categories Based on R&D Intensities', 7 July 2011 (2006–12). (http://www.unido.org/statistics.html; http://unstats.un.org/unsd/cr/registry/regcst.asp?cl=27; http://www.oecd.org/sti/ind/48350231.pdf)

6.3 Knowledge diffusion

6.3.1 Intellectual property receipts

Charges for use of intellectual property n.i.e., receipts (%, total trade)[a] | 2014

Charges for the use of intellectual property not included elsewhere receipts (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, code SH Charges for the use of intellectual property not included elsewhere as a percentage of total trade. 'Total trade' is defined as the sum of total imports code G goods and code SOX commercial services (excluding government goods

and services not included elsewhere) plus total exports of code G goods and code SOX commercial services (excluding government goods and services not included elsewhere), divided by 2. According to the sixth edition of the International Monetary Fund's *Balance of Payments Manual,* the item 'Goods' covers general merchandise, net exports of goods under merchanting and nonmonetary gold. The 'commercial services' category is defined as being equal to 'services' minus 'government goods and services not included elsewhere'. Receipts are between residents and nonresidents for the use of proprietary rights (such as patents, trademarks, copyrights, industrial processes, and designs including trade secrets, franchises), and for licenses to reproduce or distribute (or both) intellectual property embodied in produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable, or satellite broadcast).

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2007–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

6.3.2 High-tech exports

High-tech net exports (% of total trade)[a] | 2014

High-technology exports minus re-exports (% of total trade). See indicator 5.3.2 for details.

Source: United Nations, COMTRADE database; Eurostat, 'High-technology' aggregations based on SITC Rev. 4, April 2009 (2008–14). (http://comtrade.un.org/; http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an5.pdf)

6.3.3 ICT services exports

Telecommunications, computers, and information services exports (% of total trade)[a] | 2014

Telecommunications, computer and information services (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010, coded SI: Telecommunications, computer and information services.

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2009–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

6.3.4 Foreign direct investment net outflows

Foreign direct investment (FDI), net outflows (% of GDP) | 2014

This refers to net outflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This data series shows net outflows of investment from the reporting economy to the rest of the world and is divided by GDP.

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2010–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

7 Creative outputs

7.1 Intangible assets

7.1.1 Trademark application class count by origin

Number of trademark applications issued to residents at a given national or regional office (per billion PPP$ GDP) | 2014

The count of trademark applications is based on the total number of goods and services classes specified in resident trademark applications filed at a given national or regional office in 2015. Data refer to trademark application class counts—the number of classes specified in resident trademark applications—and include those filed at both the national office and the regional office, where applicable. Data are scaled by PPP$ GDP (billions). A 'trademark' is a sign used by the owner of certain products or provider of certain services to distinguish them from the products or services of other companies. A trademark can consist of words and/or combinations of words, such as slogans, names, logos, figures and images, letters, numbers, sounds and moving images, or a combination thereof. The procedures for registering trademarks are governed by the legislation and procedures of national and regional IP offices. Trademark rights are limited to the jurisdiction of the IP office that registers the trademark. Trademarks can be registered by filing an application at the relevant national or regional office(s) or by filing an international application through the Madrid System. A resident trademark application is one that is filed with an IP office or an office acting on behalf of the state or jurisdiction in which the applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with the Office for Harmonization in the Internal Market (OHIM) by an applicant who resides in any of the EU member states, such as France, is considered a resident application for that member state (France).

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2010–14). (http://www.wipo.int/ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

7.1.2 Industrial designs by origin

Number of designs contained in industrial design applications filed at a given national or regional office (per billion PPP$ GDP)[a] | 2014

This indicator refers to the number of designs contained in industrial design applications filed at a given national or regional office in 2014. Data refer to industrial design application design counts—the number of designs contained in applications—and include designs contained in resident industrial design applications filed at both the national office and at the regional office, where applicable. 'Resident design counts' refers to the number of designs contained in applications filed with the IP office of or at an office acting on behalf of the state or jurisdiction in which the applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with OHIM by an applicant who resides in any of the OHIM member state, such as Italy, is considered as a resident application for that member state (Italy).

Source: World Intellectual Property Organization, WIPO Statistics Database; International Monetary Fund, World Economic Outlook Database, October 2015 (PPP$ GDP) (2010–14). (http://www.wipo.int//ipstats/; http://www.imf.org/external/pubs/ft/weo/2015/02/weodata/weoselgr.aspx)

7.1.3 ICTs and business model creation

Average answer to the question: In your country, to what extent do ICTs enable new business models? [1 = not at all; 7 = to a great extent]† | 2015

Source: World Economic Forum, Executive Opinion Survey 2014–2015. (http://reports.weforum.org/global-competitiveness-report-2015-2016/)

7.1.4 ICTs and organizational model creation

Average answer to the question: In your country, to what extent do ICTs enable new organizational models (e.g., virtual teams, remote working, telecommuting) within companies? [1 = not at all; 7 = to a great extent]† | 2015

Source: World Economic Forum, Executive Opinion Survey 2014–2015. (http://reports.weforum.org/global-competitiveness-report-2015-2016/)

7.2 Creative goods and services

7.2.1 Cultural and creative services exports

Cultural and creative services exports (% of total trade)[a] | 2014

Creative services exports (% of total exports) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, EBOPS code SI3 Information services; code SJ22 Advertising, market research, and public opinion polling services; code SK1 Audiovisual and related services; and code SK24 Other personal cultural and recreational services as a percentage of total trade. The score for the United States of America (USA) includes the category Movies & TV programming in the absence of available data for code SK1 Audiovisual and related services. The category Movies & TV programming is specific to the USA in BPM6 statistics and does not have a code.

Source: World Trade Organization, Trade in Commercial Services database, based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2011–14). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf)

7.2.2 National feature films produced

Number of national feature films produced (per million population 15–69 years old)[a] | 2013

A film with a running time of 60 minutes or longer. It includes works of fiction, animation, and documentaries. It is intended for commercial exhibition in cinemas. Feature films produced exclusively for television broadcasting, as well as newsreels and advertising films, are excluded. Data are reported per million population 15–69 years old. For Cambodia and Cameroon, this indicator covers only feature films in video format; for Slovenia, feature films with a running time of 75 minutes or longer.

Source: UNESCO Institute for Statistics, UIS online database; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision (population) (2006–13). (http://stats.uis.unesco.org; http://esa.un.org/unpd/wpp/)

7.2.3 Global entertainment and media market

Global entertainment and media market (per thousand population 15–69 years old)*[a] | 2014

The Global entertainment and media outlook (the Outlook) provides a single comparable source of five-year forecast and five-year historic consumer and advertiser spending data and commentary, for 13 entertainment and media segments, across 61 countries. The data and intuitive online functionality allows one to easily browse, compare and contrast spending, and create charts and graphs. The segments covered by the Outlook are book publishing, business-to-business, filmed entertainment, Internet access, Internet advertising, magazine publishing, music, newspaper publishing, out-of-home advertising, radio, TV advertising, TV subscriptions and license fees, and video games. The score and rankings for the Global Media Expenditures for the 60 countries considered in the Outlook report are based on advertising and consumer digital and non-digital data in US$ millions at average 2014 exchange rates for the year 2014. These results are reported normalized per thousand population, 15–69 years old, for the year 2014. The figures for Algeria, Bahrain, Jordan, Kuwait, Lebanon, Morocco, Oman, and Qatar were estimated from a total corresponding to Middle East and North Africa (MENA) countries using a breakdown of total GDP (current US$) for the above-mentioned countries to define referential percentages.

Source: The source of the data for the base of these calculations was derived from PwC's Global entertainment and media outlook, 2015–2019; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision (population). (http://www.pwc.com/outlook; http://stats.uis.unesco.org; http://esa.un.org/unpd/wpp/)

7.2.4 Printing and publishing output

Printing and publishing manufactures output (% of manufactures total output) | 2012

Publishing, printing, and reproduction of recorded media output (ISIC Rev. 3 code 22) as a percentage of total manufacturing output (ISIC rev.3 code D).

Source: United Nations Industrial Development Organization, Industrial Statistics Database; 2-digit level of International Standard Industrial Classification ISIC Revision 3 (INDSTAT2 2015) (2006–12). (http://www.unido.org/statistics.html; http://unstats.un.org/unsd/cr/registry/regcst.asp?cl=2)

7.2.5 Creative goods exports

Creative goods exports (% of total trade) | 2014

Total value of creative goods exports, net of re-exports (current US$) over total trade. 'Total trade' is defined as the sum of total imports code G goods and code SOX commercial services (excluding government goods and services not included elsewhere) plus total exports of code G goods and code SOX commercial services (excluding government goods and services not included elsewhere), divided by 2. According to the sixth edition of the International Monetary Fund's *Balance of Payments Manual,* the item 'Goods' covers general merchandise, net exports of goods under merchanting and non-monetary gold. The 'commercial services' category is defined as being equal to 'services' minus 'government goods and services not included elsewhere'.

Source: United Nations, COMTRADE database; 2009 UNESCO Framework for Cultural Statistics, Table 3, International trade of cultural goods and services based on the 2007 Harmonised System (HS 2007); World Trade Organization, Trade in Commercial Services database, itself based on the sixth (2009) edition of the International Monetary Fund's Balance of Payments Manual and Balance of Payments database (2011–14). (http://unctadstat.unctad.org/; http://www.uis.unesco.org/culture/Documents/framework-cultural-statistics-culture-2009-en.pdf; http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx)

7.3 Online creativity

7.3.1 Generic top-level domains (gTLDs)

Generic top-level domains (gTLDs) (per thousand population 15–69 years old) | 2015

A generic top-level domain (gTLD) is one of the categories of top-level domains (TLDs) maintained by the Internet Assigned Numbers Authority (IANA) for use in the Internet. Generic TLDs can be unrestricted (com, info, net, and org) or restricted—that is, used on the basis of fulfilling eligibility criteria (biz, name, and pro). Of these, the statistic covers the five generic domains biz, info, org, net, and com. Generic domains .name and .pro, and sponsored domains (arpa, aero, asia, cat, coop, edu, gov, int, jobs, mil, museum, tel, travel, and xxx) are not included. Neither are country-code top-level domains (refer to indicator 7.3.2). The statistic represents the total number of registered domains (i.e., net totals by December 2015, existing domains + new registrations – expired domains). Data are collected on the basis of a 4% random sample of the total population of domains drawn from the root zone files (a complete listing of active domains) for each TLD. The geographic location of a domain is determined by the registration address for the domain name registrant that is returned from a whois query. These registration data are parsed by country and postal code and then aggregated to any number of geographic levels such as county, city, or country/economy. The original hard data were scaled by thousand population 15–69 years old. For confidentiality reasons, only normalized values are reported; while relative positions are preserved, magnitudes are not.

Source: ZookNIC Inc; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision (population). (http://www.zooknic.com; http://esa.un.org/unpd/wpp/Excel-Data/population.htm)

7.3.2 Country-code top-level domains (ccTLDs)

Country-code top-level domains (ccTLDs) (per thousand population 15–69 years old) | 2015

A country-code top-level domain (ccTLD) is one of the categories of top-level domains (TLDs) maintained by the Internet Assigned Numbers Authority (IANA) for use in the Internet. Country-code TLDs are two-letter domains especially designated for a particular economy, country, or autonomous territory (there are 324 ccTLDs, in various alphabets/characters). The statistic represents the total number of registered domains (i.e., net totals by December 2015, existing domains + new registrations – expired domains). Data are collected from the registry responsible for each ccTLD and represent the total number of domain registrations in the ccTLD. Each ccTLD is assigned to the country with which it is associated rather than based on the registration address of the registrant. ZookNIC reports that, for the ccTLDs it covers, 85–100% of domains are registered in the same country; the only exceptions are the ccTLDs that have been licensed for commercial worldwide use. Of this year's GII sample of countries, this is the case for the ccTLDs of the following economies: Armenia am, Austria at, Belarus by, Belgium be, Canada ca, Colombia co, Finland fi, Iceland is, India in, Iran ir, Italy it, Latvia lv, Mauritius mu, Moldova md, Mongolia mn, Montenegro me, Nicaragua ni, Serbia rs, Slovenia si, Spain es, and Switzerland ch (this list is based on www.wikipedia.org). Data are reported per thousand population 15–69 years old. For confidentiality reasons, only normalized values are reported; while relative positions are preserved, magnitudes are not.

Source: ZookNIC Inc; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision (population). (http://www.zooknic.com; http://esa.un.org/unpd/wpp/Excel-Data/population.htm)

7.3.3 Wikipedia monthly edits

Wikipedia monthly page edits (per million population 15–69 years old) | 2014

Data extracted from Wikimedia Traffic Analysis Report, Wikipedia Page Edits per Country, Overview on the portal http://www.wikipedia.org. The count of monthly page edits data is based on a 1:1,000 sampled server log (squids), averages of quarterly reports. Countries are included only if the number of page edits in the period exceeds 100,000 (100 matching records in 1:1,000 sampled log). Page edits by bots are not included. Also all IP addresses that occur more than once on a given day are discarded for that day. A few false negatives are taken for granted. Data are reported per million population 15–69 years old.

Source: Wikimedia Foundation; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2012 Revision (population). (http://stats.wikimedia.org/wikimedia/squids/SquidReportsCountriesLanguagesVisitsEdits.htm; http://esa.un.org/unpd/wpp/Excel-Data/population.htm)

7.3.4 Video uploads on YouTube

Number of video uploads on YouTube (scaled by population 15–69 years old) | 2015

Total number of video uploads on YouTube, per country, scaled by population 15–69 years old. The raw data are survey based: the country of affiliation is chosen by each user on the basis of a multi-choice selection. This metric counts all video upload events by users. For confidentiality reasons, only normalized values are reported; while relative positions are preserved, magnitudes are not.

Source: Google, parent company of YouTube; United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision (population). (http://www.youtube.com; http://esa.un.org/unpd/wpp/Excel-Data/population.htm; http://www.comscore.com/Industries/Media)

Appendix IV

Technical Notes

Technical Notes

Audit by the Joint Research Centre of the European Commission

The Joint Research Centre (JRC) of the European Commission has researched extensively on the complexity of composite indicators ranking economies' performances along policy lines. For the sixth consecutive year, the JRC has agreed to perform a thorough robustness and sensitivity analysis of the Global Innovation Index (GII) to look at some structural changes made to the list of indicators by the GII developing team (see Table 1 of Annex 2 to Chapter 1 for more details).

The recommendations from the JRC audit of the 2015 GII model were reviewed and incorporated into the 2016 GII model. Following these recommendations, to be included in the GII this year, an economy must have a minimum symmetric data coverage of 33 indicators in the Innovation Input Sub-Index (60%) and 16 indicators in the Innovation Output Sub-Index (60%), and it must have scores for at least two sub-pillars per pillar.

A final audit was performed in April–May 2016 on the 2016 GII model, the results of which are included in Annex 3 to Chapter 1.

Composite indicators

The GII relies on seven pillars. Each pillar is divided into three sub-pillars, and each sub-pillar is composed of two to five individual indicators. Each sub-pillar score is calculated as the weighted average of its individual indicators. Each pillar score is calculated as the weighted average of its sub-pillar scores.

The notion of weights as importance coefficients was, as in the previous two years, discarded to ensure a greater statistical coherence of the model, following the recommendations of the JRC.[1]

The GII includes three indices and one ratio:

1. The Innovation Input Sub-Index is the simple average of the first five pillar scores.
2. The Innovation Output Sub-Index is the simple average of the last two pillar scores.
3. The Global Innovation Index is the simple average of the Input and Output Sub-Indices.
4. The Innovation Efficiency Ratio is the ratio of the Output Sub-Index over the Input Sub-Index.

Country/economy rankings are provided for indicator, sub-pillar, pillar, and index scores.

The Innovation Efficiency Ratio serves to highlight those economies that have achieved more with less as well as those that lag behind in terms of achieving their innovation potential. In theory, assuming that innovation results go hand in hand with innovation enablers, efficiency ratios should evolve around the number one. This measure thus allows us to complement the GII by providing an insight that should be neutral to the development stages of economies.[2]

Individual indicators

The model includes 82 indicators, which fall within the following three categories:

1. quantitative/objective/hard data (58 indicators),
2. composite indicators/index data (19 indicators), and
3. survey/qualitative/subjective/soft data (5 indicators).

Hard data

Hard data series (58 indicators) are drawn from a variety of public and private sources such as United Nations agencies, including the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Industrial Development Organization (UNIDO), the World Intellectual Property Organization (WIPO), the World Bank, the Joint Research Centre of the European Commission (JRC), PwC, Bureau van Dijk (BvD), Thomson Reuters, IHS Global Insight, and Google.

Indicators are often correlated with population, gross domestic product (GDP), or some other size-related factor; they require scaling by some relevant size indicator for economy comparisons to be valid.

Most indicators are either scaled at the source or do not need to be scaled; for the rest, the scaling factor was chosen to represent a fair picture of economy differences. This affected 40 indicators, which can be broadly divided into four groups:

1. Indicators 2.1.1, 2.3.2, 3.2.3, 4.1.2, 4.1.3, 4.2.2, 4.2.3, 5.1.3, 5.3.4, 6.2.3, and 6.3.4 were scaled by GDP in current US dollars.[3]
2. The count variables 3.3.3, 4.2.4, 5.2.4, 5.2.5, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.2.4, 7.1.1, and 7.1.2 were scaled by GDP in purchasing power parity current international dollars (PPP$ GDP). This choice of denominator was dictated by a willingness to appropriately account for differences in development stages; in addition, scaling these variables by population would improperly bias results to the detriment of economies with large young or large ageing populations.[4]
3. Variables 5.1.5, 6.2.2, 7.2.2, 7.2.3, 7.3.1, 7.3.2, 7.3.3, and 7.3.4 were scaled by population (population 25+ years old for 5.1.5, population 15–64 years old for 6.2.2, and population 15–69 years old for the rest).[5]
4. Sectoral indicators 5.3.1, 5.3.2, 5.3.3, 6.3.1, 6.3.2, 6.3.3, 7.2.1, and 7.2.5 were scaled by total trade; indicators 6.2.5 and 7.2.4 were scaled by the total unit corresponding to the particular statistic.[6]

Indices

Composite indicators come from a series of specialized agencies and academic institutions such as the World Bank, the International Telecommunication Union (ITU), the UN Public Administration Network (UNPAN), and Yale and Columbia Universities. Statisticians discourage the use of an 'index within an index' on two main grounds: the distorting effect of the use of different computing methodologies and the risk of duplicating variables. The normalization procedure partially solves for the former (more on this below). To avoid incurring the mistake of including a particular indicator more than once (directly and indirectly through a composite indicator), only indices with a narrow focus (19 in total) were selected.

Any remaining downside is outweighed by the gains in terms of model parsimony, acknowledgement of expert opinion, and focus on multi-dimensional phenomena that can hardly be captured by a single indicator.[7]

Survey data

Survey data are drawn from the World Economic Forum's Executive Opinion Survey (EOS). Survey questions are drafted to capture subjective perceptions on specific topics; five EOS questions were retained to capture phenomena strongly linked to innovative activities for which hard data either do not exist or have low economy coverage.

Country/economy coverage and missing data

This year's GII covers 128 economies, which were selected on the basis of the availability of data. Economies with a minimum indicator coverage of 33 indicators in the Innovation Input Sub-Index (60%) and 16 indicators in the Innovation Output Sub-Index (60%), and with scores for at least two sub-pillars per pillar were retained. This minimum data coverage threshold rule was adjusted—on the recommendation of the JRC—to maintain the significance of both the GII results and the country sample. The last record available for each economy was considered, with a cut-off at year 2006. For the sake of transparency and replicability of results, no additional effort was made to fill missing values. Missing values are indicated with 'n/a' and are not considered in the sub-pillar score. However, the JRC audit assessed the robustness of the GII modelling choices (i.e., no imputation of missing data, fixed predefined weights, and arithmetic averages) by imputing missing data, applying random weights, and using geometric averages. Since 2012, on the basis of this assessment, a confidence interval is provided for each ranking in the GII as well as the Input and Output Sub-Indices (see Annex 3 to Chapter 1).

Treatment of series with outliers

Potentially problematic indicators with outliers that could polarize results and unduly bias the rankings were treated according to the rules listed below, following the recommendations of the JRC. This affected 36 out of the 58 hard data indicators.

First rule: Selection

The identification of indicators as problematic used skewness or kurtosis. The problematic indicators had either:

- an absolute value of skewness greater than 2, *or*
- a kurtosis greater than 3.5.[8]

Second rule: Treatment

Series with one to five outliers (32 cases) were winsorized: The values distorting the indicator distribution were assigned the next highest value, up to the level where skewness and/

or kurtosis entered within the ranges specified above.[9]

With one exception (see note 9), for series with six or more outliers (4 cases), skewness and/or kurtosis entered within the ranges specified above after multiplication by a given factor *f* and transformation by natural logs.[10] Since only 'goods' were affected (i.e., indicators for which higher values indicate better outcomes, as opposed to 'bads'), the formula used was:

$$\ln\left[\frac{(\max \times f - 1)\ (\text{economy value} - \min)}{\max - \min} + 1\right]^{11}$$

where 'min' and 'max' are the minimum and maximum indicator sample values.

Normalization

The 82 indicators were then normalized into the [0, 100] range, with higher scores representing better outcomes. Normalization was made according to the min-max method, where the min and max values were given by the minimum and maximum indicator sample values respectively, except for particular index and survey data, for which the original series' range of values was kept as min and max values (for example, [1, 7] for the World Economic Forum Executive Opinion Survey questions; [0, 100] for World Bank's World Governance Indicators; [0, 10] for ITU indices, etc.). The following formula was applied:

- **Goods:**

$$\frac{\text{economy value} - \min}{\max - \min} \times 100$$

- **Bads:**

$$\frac{\max - \text{economy value}}{\max - \min} \times 100$$

Notes

1 Paruolo et al. (2013) show that a theoretical inconsistency exists between the real theoretical meaning of weights and the meaning generally attributed to them by the standard practice in constructing composite indicators that use them as importance coefficients in combination with linear aggregation rules. The approach followed in the GII this year, as last year, is to assign weights of 0.5 or 1.0 to each component in a composite to ensure the highest correlations between them (i.e., indicator/sub-pillar, sub-pillar/pillar, etc.). Two sub-pillars (7.2 Creative goods and services, and 7.3 Online creativity) and 36 indicators (1.2.1, 1.2.2, 2.1.4, 2.1.5, 2.2.1, 2.2.3, 3.2.1, 3.2.2, 3.3.3, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 5.1.3, 5.1.4, 5.1.5, 5.2.1, 5.2.4, 5.2.5, 5.3.1, 6.1.1, 6.1.2, 6.1.4, 6.1.5, 6.2.2, 6.2.3, 6.2.4, 6.2.5, 6.3.1, 6.3.2, 6.3.3, 7.1.2, 7.2.1, 7.2.2, and 7.2.3) are weighted 0.5; the rest have a weight of 1.

Seven indicators with Pearson correlation coefficients with their respective sub-pillar scores below 0.3 were kept in the model to ensure a conceptual coherence (as opposed to a statistical coherence) in the belief that some cyclical (as opposed to structural) dimension might be at the source of their behaviour as 'noise' (see also Annex 3 to Chapter 1): graduates in science and engineering (2.2.2); gross capital formation (3.2.3); GDP per unit of energy use (3.3.1); microfinance institutions' gross loan portfolio (4.1.3); GERD financed by abroad (5.2.3); foreign direct investment net inflows (5.3.4); and growth rate of GDP per person engaged (6.2.1).

2 To account for differences in development, other composite indicators use weighting schemes differentiated by income level.

3 These indicators are expenditure on education (2.1.1); gross expenditure on R&D (GERD) (2.3.2); gross capital formation (3.2.3); domestic credit to private sector (4.1.2); microfinance institutions' gross loan portfolio (4.1.3); market capitalization (4.2.2); total value of stocks traded (4.2.3); GERD performed by business enterprise (5.1.3); foreign direct investment net inflows (5.3.4); total computer software spending (6.2.3); and foreign direct investment net outflows (6.3.4).

4 These count variables are mainly indicators that increase disproportionately with economic growth. They include: ISO 14001 environmental certificates (3.3.3); venture capital deals; (5.2.4) joint venture/strategic alliance deals; (5.2.5) patent families filed in two or more offices (4.2.4); patent applications by origin (6.1.1); PCT international applications by origin (6.1.2); utility model applications by origin (6.1.3); scientific and technical publications (6.1.4); ISO 9001 quality certificates (6.2.4); trademark application class count by origin (7.1.1); and industrial designs by origin (7.1.2).

5 These variables are females employed with advanced degrees (5.1.5); new business density (6.2.2); national feature films produced (7.2.2); global entertainment and media market (7.2.3); generic (7.3.1) and country-code (7.3.2) top-level Internet domains; Wikipedia monthly edits (7.3.3); and video uploads on YouTube (7.3.4).

6 Intellectual property payments (5.3.1); high-tech imports less re-imports (5.3.2); ICT services imports (5.3.3); intellectual property receipts (6.3.1); high-tech exports less re-exports (6.3.2); ICT services exports (6.3.3); cultural and creative services exports (7.2.1); and creative goods exports (7.2.5) were scaled by total trade; high-tech and medium-high-tech output (6.2.5) and printing and publishing output (7.2.4) were scaled by total manufactures output.

7 For example, GII sub-pillar 3.1, Information and communication technologies (ICTs), is composed of four indices: ITU's ICT Access and Use sub-indices and UNPAN's Government Online Service and E-Participation indices. The first two are components of ITU's ICT Development Index together with an ICT skills sub-index that was not considered, as it duplicates GII pillar 2. Similarly, the Online Service Index is a component of UNPAN's E-Government Development Index together with two indices on Telecommunication Infrastructure and Human Capital that were not considered, as they duplicate GII pillars 3 and 2, respectively. The e-Participation Index was developed separately by UNPAN in 2010.

8 Based on Groeneveld and Meeden (1984), which sets the criteria of absolute skewness above 1 and kurtosis above 3.5. The skewness criterion was relaxed to account for the small sample at hand (128 economies).

9 This distributional issue affects the following variables: 2.1.1, 2.1.5, 5.2.4, 5.3.2, 5.3.3, 6.1.5, 6.2.2, 6.2.4, and 7.1.1 (1 outlier); 1.2.3, 3.2.1, 3.3.3, 4.2.3, 5.3.1, 6.3.2, 7.2.1, 7.2.2, 7.2.4, and 7.3.1 (2 outliers); 2.2.3, 4.1.3, 4.2.2, 6.1.3, 6.3.3, and 7.1.2 (3 outliers); 4.2.4, 5.3.4, 6.1.1, 6.1.2, and 7.3.2 (4 outliers); and 6.3.1 (5 outliers). The treatment criterion was relaxed this year to allow a single series (6.3.4) with 6 outliers—5 outliers given the next highest value and 1 given the next lowest value—to be winsorized instead of subjected to natural log transformation. This because applying a log transformation at 1, 10, and 100 had the reverse effect, and instead of reducing skewness and kurtosis, it increased them.

10 This distributional issue affects variables 2.3.3, 4.3.3, 5.2.5, and 7.2.5 (factor *f* of 1).

11 The corresponding formula for bads is:

$$\ln\left[\frac{(\max \times f - 1) \times (\max - \text{economy value})}{\max - \min} + 1\right]$$

These formulas achieve two things: converting all series into 'goods' and scaling the series to the range [1, max] so that natural logs are positive starting at 0.

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Appendix V

About the Authors

About the Authors

Nigel Andrade is the Global Lead Partner for A.T. Kearney's Customer Value Service Line and the leader of its multi-disciplinary proposition innovation capability platform Pivotal Customer Event Labs. He has over 17 years of experience working with governments and major corporations, designing and executing innovation-led transformation programmes. In particular, he has a passion for designing and building 'attacker' business models—for incumbents and market entrants alike—which challenge the status quo and create value for the customer, the company, and the economy. Mr Andrade has worked and lived in over two dozen global cities across Asia, Europe, and North America prior to moving to Sydney, Australia, in 2010. He is passionate about innovation at the national level and is a published author of *Australia 2034: Luckier by Design,* which looks out at the capabilities Australian and global companies need to build to survive and thrive over the next two decades. He has leveraged these insights in helping shape some of Australia's leading companies' innovation agendas. Apart from his client-facing roles, he is also the lead Asia Pacific Partner for A.T. Kearney's Diversity & Inclusion Agenda and works closely with his global colleagues on firm-wide initiatives to ensure we attract, nurture, and retain the best talent available. Prior to joining A.T. Kearney, Mr Andrade was a Partner with McKinsey & Company and led their FI practice for SE Asia (2008–10) and FI practice for Australia (2010–13). He has an MBA from the Indian Institute of Management, Ahmedabad (Industry Scholar), and a BSc (Hons) in Mathematics from Mumbai University (University Gold Medal).

Suma Athreye is Professor of International Strategy at Brunel Business School and a member of the Strategy, Entrepreneurship and International Business Group. She is a visiting researcher at UNU-MERIT (Maastricht) and Birkbeck College, London, and has been a visiting researcher at The Earth Institute at Columbia University and the East-West Center in Hawaii. Her main research interests lie in the fields of International Economics and the Economics of Innovation; she has published over 50 papers on these subjects and won several research grants for work in these areas. She serves on the editorial boards of *Research Policy, Journal of International Business Studies,* and *Industrial and Corporate Change.* She has consulted with the World Intellectual Property Organization and the UK Intellectual Property Office, and was also Rapporteur of the European Research Area (2008) report *Opening to the World: International Cooperation in Science and Technology.*

John Bell is a Senior Associate with ACIL Allen Consulting and Senior Policy Adviser to the Australian Academy of Technology and Engineering (ATSE). He is also a Director of the Australian Genome Research Facility Ltd. Dr Bell has been Chief Science Adviser and a Deputy Secretary in the (now) Australian Department of Industry, Innovation and Science. His other appointments included Acting Director of the Australian Institute of Marine Science and Chairman of the Commonwealth Coordinating Committee on Science & Technology and of the Cooperative Research Centres Committee. He has been a member of the Prime Minister's Science Prizes Committee, the Australian Space Council, the Industry R&D Board, the Australian Research Council, and the Defence Industry Committee. Dr Bell's experience includes more than seven years working with the OECD in Paris. In the 1980s he spent four years as Head of the OECD's division responsible for work on innovation. In 2012–14 he chaired an Expert Working Group for the Australian Council of Learned Academies (ACOLA) that reported to the government on the contribution of science, research, and technology in lifting Australian productivity. He has subsequently chaired another ACOLA Expert Working Group that examined the translation of public sector research for economic and social benefit. Dr Bell holds a BSc and an MSc (Auckland), and a PhD (Sydney). He had postdoctoral experience at UCLA and at the Australian National University. In 2003 he was awarded a Centenary of Federation medal for his strategic contribution to research in Australia.

Aravind S. Bharadwaj is currently Senior Vice President of Advanced Technology and Services, Automotive & Farm Equipment Sectors, Mahindra & Mahindra Ltd. Prior to this assignment he was CEO of Automotive Infotronics Limited (a joint venture between Ashok Leyland and Continental AG) after serving as Executive Director of Advanced Engineering & Mission Summit at Ashok Leyland since April 2008. He has worked at TVS Motor Company, India; Delphi Technical Center, Singapore; GM Powertrain, Michigan, USA; and GM R&D Center, Michigan, USA. In these assignments, he has worked on technology development projects in various domains such as electric and hybrid electric vehicles, transmission and engine control systems, two-wheeler electronics, and commercial vehicle mechatronics and infotronics. He has published several papers in international journals and conferences and has three patents. He is a certified six sigma black belt and a senior member of IEEE. He is currently the President of SAEINDIA and was a Director in the Board of SAE International from 2008 to 2010. He is Co-Chairman of the CII National Council on Technology and, until recently, was a member of the Board of Governors, AC College of Engineering & Technology, Karaikudi. He was a founding member of the Core Group on Automotive R&D and played a leadership role in the Koyambedu Telematics Project for Chennai/Tamil Nadu Bus applications. Dr Bharadwaj received a BE (Hons) from the Madurai Kamaraj University, an MS and a PhD from Virginia Polytechnic Institute and State University, USA, and an MBA (with Distinction) from the University of Michigan, Ann Arbor, USA.

Kirsten Bound is Director of International Innovation at Nesta, an innovation charity based in the UK. Her research explores new trends in innovation around the world with an emphasis on emerging economies such as China, India, and Brazil. She works with the UK and global governments to design and build capacity for more effective and impactful innovation policy interventions. She has overseen the creation of a new Compendium of Evidence on the Effectiveness of Innovation Policy, and published reports on issues ranging from Chinese and Indian innovation systems to start-up accelerators and innovation procurement. Prior to Nesta, she worked for Tony Blair's Africa Governance Initiative in Rwanda, capacity building in central government and advising the Rwandan Prime Minister on a new Policy Delivery Unit. She also worked as a consultant on Investment Climate Reform for the World Bank's International Finance Corporation, focusing on inward investment promotion and private-sector development. Before that, she spent five years as a researcher, then senior researcher, at Demos, a leading public policy think tank, where she specialized in innovation in emerging economies. Her publications at Demos include *Brazil: The Natural Knowledge Economy,* republished in Portuguese as *Brasil: A Economia Natural do Conhecimento,* and *India: The Uneven Innovator.*

John Cantwell is Distinguished Professor of International Business at Rutgers University in New Jersey, USA. He was Professor of International Economics at the University of Reading in the UK, and he has also been a Visiting Professor at the University of Rome 'La Sapienza'; the University of the Social Sciences, Toulouse; and the University of Economics and Business Administration, Vienna. He is the author of *Technological Innovation and Multinational Corporations* (Basil Blackwell, 1989). This book helped to launch a new literature on multinational companies and international networks for technology creation, beyond merely international technology transfer. Altogether, Professor Cantwell has published 14 books, over 70 articles in refereed academic journals, and over 80 chapters in edited collections. His published research spans the fields of International Business and Management, Economics, Economic History and Philosophy, Economic Geography, and Innovation Studies. Professor Cantwell is currently serving as the Editor-in-Chief of the *Journal of International Business Studies* from 2011 to 2016, which is the leading journal in the field of International Business scholarship. He was the President of the European International Business Academy (EIBA) in 1992, and in 2001 he was elected as one of four EIBA Founding Fellows. He is serving as the elected Dean of the EIBA Fellows from December 2015 to December 2018. In 2005 he was elected as a Fellow of the Academy of International Business (AIB).

Cristina Chaminade is Full Professor in Innovation Studies at the Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE) at Lund University (Sweden). Her area of expertise lies in the globalization of innovation, particularly global innovation networks and innovation in emerging economies. She has actively worked on innovation in developing countries such as China, India, South Africa, Thailand, and Brazil for over 15 years. Professor Chaminade's research focuses mainly on understanding how firms, regions, and nations create and use knowledge for innovation when knowledge is globally distributed, and how policies can be designed to support innovation in a global context. She has been an advisor to international organizations such as the European Commission, UNCTAD, the OECD, and UN-ECLAC. Professor Chaminade has published in international journals, refereed books, and handbooks in the fields of Innovation, Development Studies, and Knowledge Management. Currently she is coordinating two research projects dealing with globalization of innovation: one on technology-driven investments by emerging multinationals in Europe and another on regional variety and global innovation networks, funded by Riksbanken and the Wallenberg Foundation, respectively.

Marcos Domínguez-Torreiro is a Research Fellow at the Competence Centre on Composite Indicators and Scoreboards (COIN) of the Joint Research Centre of the European Commission (Italy), where he conducts research and policy support tasks in the field of Econometrics and Applied Statistics. After his undergraduate studies in Economics and Business Administration, he completed his doctoral thesis in Applied Economics at the University of Vigo, Spain. His past work experience includes the private sector, universities, and public administration. He has co-authored books and research articles dealing with finance, consumer behaviour, environmental and natural resource economics, rural development, and institutional economics.

Soumitra Dutta is the Founding Dean of the College of Business at Cornell University. Previously he was the Anne and Elmer Lindseth Dean at the Samuel Curtis Johnson Graduate School of Management at Cornell University, New York. Prior to July 2012, he was the Roland Berger Chaired Professor of Business and Technology at INSEAD and the founding director of eLab, a centre of excellence in the digital economy. His current research is on technology strategy and innovation policies at both corporate and national levels. He has won several awards for research and pedagogy and is actively involved in strategy and policy consulting. His research has been showcased in the global media and he has received a number of awards, including the Light of India Award '12 (from the Times of India media group) and the Global Innovation Award '13 (from INNOVEX in Israel). Professor Dutta obtained his PhD in Computer Science and his MSc in Business Administration from the University of California at Berkeley.

Jakob Edler is Professor of Innovation Policy and Strategy, and Executive Director of the Manchester Institute of Innovation Research, Alliance Business School, University of Manchester. His research interests lie in the analysis and conceptualization of governance and policy in science and innovation, with a focus on demand-side innovation policy and public procurement of innovation, and more recently on the governance of responsible research and innovation. He also works on the impact of science and innovation policy, the internationalization of research and innovation activities, and related policies. Professor Edler's research has been funded by the UK Research Council, international organizations (such as the EU, the OECD, and WIPO), and numerous national and regional bodies in many European countries. He has been appointed to numerous national and international advisory committees, and is a member of the German National Academy for Science and Engineering (Acatech) and the Austrian Council for Research and Technological Development. He is President Elect of the association of institute in STI policy Eu-SPRI. He holds a PhD in Political Science from the University of Mannheim, a Master in Political Science/Economic History, and a Master in Business Administration. He has been a Fulbright Scholar at Dartmouth College, Hanover, New Hampshire, USA.

Kai Engel, Partner and Managing Director for Germany, A.T. Kearney, is the Global Lead Partner for A.T. Kearney's Innovation Services Practice. He led numerous consulting projects to improve operations excellence in large corporations along the value chain. The projects focused on increasing clients' capabilities in the areas of innovation and product creation management, manufacturing efficiency as well as its manufacturing network set up, supply chain management, and supply management. He has served large global corporate clients as well as mid-sized companies and governmental organizations representing industries such as automotive, aerospace and defence, consumer goods, engineering, high tech, machinery, process, chemicals, and private equity funds. He co-founded the European Innovation Management Academy, and, in coordination with the EU Commission, the IMP^{3}rove platform that provides knowledge-intensive services to small- and medium-sized businesses around the globe. Dr Engel regularly chairs top executive roundtables and is a frequent speaker for business and industry conferences—for example, @ Harvard's European Conference on Competitiveness. He has authored several books including *Masters of Innovation* (LID Publishing, 2015). Dr Engel serves on the supervisory board of the European Innovation Management Academy (www.improve-innovation.eu) and advised on the World Economic Forum's Fostering Innovation-Driven Entrepreneurship in Europe and Collaborative Innovation initiatives. Dr Engel studied Mechanical Engineering, focusing on production and material technologies. He earned his PhD in Laser Technology and holds a degree in Business Administration.

Rafael Escalona Reynoso has been Lead Researcher at the Global Innovation Index since October 2013. His previous professional experience includes working as Economic and Science and Technology Policy Advisor to the Senate of Mexico and as a member of the Trade and Foreign Investment Advisory Board at the office of the President of Mexico. His research experience at Cornell University includes comparative studies between Mexico and Spain on the regulatory aspects of modern biotechnology and the biosafety of genetically modified organisms (GMOs), and on the reach of intellectual property rights (IPRs) in the information technologies era. He holds a PhD in Regional Planning and a Master of Public Administration from Cornell University as well as a BA in Economics from Universidad Panamericana in Mexico.

Alan Finkel commenced as Australia's Chief Scientist on 25 January 2016. He is Australia's eighth Chief Scientist. He has an extensive science background as an entrepreneur, engineer, neuroscientist, and educator. Prior to becoming Chief Scientist, he was the Chancellor of Monash University and President of the Australian Academy of Technology and Engineering (ATSE). Dr Finkel was awarded his PhD in Electrical Engineering from Monash University and worked as a postdoctoral research fellow in Neuroscience at the Australian National University. In 1983 he founded Axon Instruments, a California-based, Australian-listed company that made precision scientific instruments used in pharmaceutical companies and universities. After Axon was sold in 2004, Dr Finkel became a director of the acquiring company, NASDAQ-listed Molecular Devices. In 2006, he returned to Australia. He led the amalgamation that formed the Florey Neuroscience Institutes; he became Chair of the Australian Centre of Excellence for All-Sky Astrophysics and was a director of the diagnostics company Cogstate Limited. He was Executive Chair of the educational software company Stile Education, Chair of Manhattan Investment Group, Chief Technology Officer of Better Place Australia, and Chair of Speedpanel Australia. Committed to science education, Dr Finkel co-founded Cosmos Magazine, which, in addition to magazine publishing, operates a secondary schools science education programme. At ATSE, he led the development and implementation of the STELR programme for secondary school science, which has been adopted in nearly 500 Australian schools. Dr Finkel also established the Australian Course in Advanced Neuroscience to train early career neuroscientists and is patron of the Australian Science Media Centre.

Oliver Gassmann is Professor of Technology and Innovation Management at the University of St. Gallen and Managing Director of the Institute of Technology Management. Until 2002, he worked for Schindler and led its Corporate Research as VP Technology Management. He is co-founder of the BMI-Lab, GLORAD, BGW, and Avatarion. He has authored over 350 publications and several books on the management of innovation. His book *The Business Model Navigator* by Financial Times and Pearson has rapidly become a bestseller. He is one of the most-cited innovation researchers as well as the most-published author in *R&D Management.* In 2014, he was nominated for the Scholarly Impact Award as a leading researcher by the prestigious *Journal of Management*. He serves as a member on several academic, economic, and political boards and has coached several Fortune 500 companies in innovation and growth strategies.

Leonid Gokhberg is First Vice-Rector of the Higher School of Economics (HSE)—one of the most prominent research universities in Russia. He is also Director of the HSE Institute for Statistical Studies and Economics of Knowledge (ISSEK). Professor Gokhberg's area of expertise is statistics and indicators on science, technology and innovation as well as foresight and policy studies in this area. He has authored over 400 publications in Russian and international peer-reviewed journals, monographs, and university textbooks. Professor Gokhberg has coordinated dozens of national and international projects, including some aimed at establishing statistical frameworks for measuring innovation in industry; services and agriculture; and engineering and industrial design, emerging technologies and nanotechnology in particular; national S&T Foresight-2025 and 2030, sectorial and regional foresight and roadmapping exercises; understanding innovation behaviour of companies; surveying public awareness of S&T and innovation; developing methodologies for evaluation of public research institutions, measuring efficiency of S&T policies, and so on, funded by public agencies, businesses, and international organizations. Professor Gokhberg has served as a consultant of the OECD, Eurostat, UNESCO, and other international and national agencies. He is also a member of the GII Advisory Board, the OECD Government Foresight Network, and OECD and Eurostat working groups and task forces on indicators for S&T and innovation and information society and education, as well as steering committees of various prestigious international and national initiatives. Professor Gokhberg is Editor-in-Chief of the Scopus-indexed scientific journal *Foresight and STI Governance* (http://foresight-journal.hse.ru/en), editor of the Springer academic book series *Science, Technology, and Innovation Studies,* and participates on the editorial boards of several other influential journals. He holds PhD and Dr. of Sc. degrees in Economics.

Lucía Gómez is a PhD candidate in Economic Geography at Turku School of Economics, with Master's degrees in Urban Management and Development (Erasmus University Rotterdam) and History, Art, Architecture, and Cities (Polytechnic University of Catalonia). Her professional experience spans more than 25 years in architectural design and development cooperation in developing countries and conflict areas in Europe, Africa, and South America. Currently she is carrying out research on trends in foreign direct investments, the emergence of investment growth hubs in the global South, and the impact of different types of multinational enterprises on urban economic development, with a focus on Latin America. In particular, she analyses the potential contributions by MNEs to innovation systems, in host urban economies.

Gopichand Katragadda is the Group Chief Technology Officer for Tata Sons. In this role, he drives technology and innovation for the Tata conglomerate, leveraging cross-company synergies. He is a director on the boards of select Tata companies. Previously, as the Chairman and Managing Director of GE India Technology Centre, he facilitated funding of cross-business innovation, championed the commissioning of new research labs, developed research teams, and helped build GE's largest R&D Centre—the John F. Welch Technology Centre (JFWTC). Under his leadership, the JFWTC team was contributing to over 300 US patents a year. Dr Katragadda also served as the Chairman for GE-BEL. Before joining GE, he worked with Karta Technologies, San Antonio, Texas, as Vice President of Research and Development. At Karta, he led the development of advanced sensor technology for US government agencies and research consortiums. He also was an Adjunct Professor at the University of Texas and served on the Board of Directors for Texas Public Radio. Dr Katragadda provides the voice of technology for various Industry bodies in India, including CII and NASSCOM. He is the India Chair for the Technology track of the Indo-UK Joint Economic and Trade Committee, which facilitates the government-to-government negotiations on market liberalization. He chairs the India Development Panel and is a Fellow of the Institute of Engineering and Technology. He is also on the India Council for the Anita Borg Institute. He is a GE Certified Six Sigma Master Black Belt. Dr Katragadda has over 30 publications and five patents. He has authored a book on innovation, *SMASH,* published by Wiley. He holds MS and PhD degrees in Electrical Engineering from Iowa State University, Ames, Iowa.

Hyunjee Hannah Kim is a PhD student at the Organizational Behavior and Human Resource Management Division at Seoul National University; advisor: Professor Jin Nam Cho. Her research studies how team members with different cultural backgrounds affect team creativity and innovations by examining team dynamics, such as members' knowledge management behaviours and team mood contagion. She is ultimately interested in understanding ways to make global teams work effectively to achieve creative performance and innovations despite the challenges they face. She was also a member of the Work, Technology, and Organization lab at Management of Science & Engineering department at Stanford University; advisor: Professor Pamela Hinds. At Stanford, through a series of experiments, she studied how teams with different cultural backgrounds exhibit different levels of engagement, learning, and creative efficacy in iterative prototyping work practices, which played a critical role in achieving the team's creative performance. Previous to her academic career, she was a Management Consultant for Boston Consulting Group for about six years, in both the Seoul and San Francisco offices. She earned an MBA degree from Harvard Business School in 2007 and a BBA from Yonsei University in the Republic of Korea in 2002.

Bruno Lanvin is INSEAD's Executive Director for Global Indices. From 2007 to 2015 he was the Executive Director of INSEAD's eLab, managing INSEAD's teams in Paris, Singapore, and Abu Dhabi and then Executive Director for INSEAD's European Competitiveness Initiative (IECI). From 2000 to 2007 Dr Lanvin worked for the World Bank, where he was inter alia Senior Advisor for E-strategies and Regional Coordinator (Europe and Central Asia) for ICT and e-government issues. He also headed the Capacity Building Practice of the World Bank's Global ICT Department and was Chairman of the Bank's e-Thematic Group. From June 2001 to December 2003, he was the Manager of the Information for Development Program (infoDev) at the World Bank. In 2000 Dr Lanvin was appointed Executive Secretary of the G8-DOT Force. Until then, he was Head of Electronic Commerce in the United Nations Conference on Trade and Development (UNCTAD) in Geneva, and occupied various senior positions including Chief of the Cabinet of the Director General of the United Nations in New York, Head of Strategic Planning, and later Chief of the SME Trade Competitiveness Unit of UNCTAD/SITE. He was the main drafter, team leader, and editor of *Building Confidence: Electronic Commerce and Development,* published in January 2000. Since 2002, he has been co-authoring *The Global Information Technology Report* (INSEAD-World Economic Forum-Cornell University); he is currently the co-editor of the *Global Innovation Index* report (INSEAD-WIPO-Cornell University). In 2013, he created and launched the first edition of the *Global Talent Competitiveness Index* (GTCI), and still is the co-editor of this annual report. He holds a BA in Mathematics and Physics from the University of Valenciennes (France), an MBA from Ecole des Hautes Etudes Commerciales (HEC) in Paris, and a PhD in Economics from the University of Paris I (La Sorbonne) in France. A frequent speaker at high-level meetings, he advises a number of global companies and governments and is a member of numerous boards, including those of ICANN and IDA-Infocomm in Singapore.

Seonjoo Lee is the Head of Investor Relations at AmorePacific Group. She has been leading Investor Relations for more than 10 years, having successfully gone through significant changes in the company, including its transition into a holding company structure, its stock split procedure, and so on. Before joining the company in 2006, she worked at Edelman, a global communications marketing firm, as a Communications Specialist providing public relations consulting services to various multinational companies.

Lim Chuan Poh was appointed Chairman A*STAR on 1 April 2007 to lead A*STAR in advancing science and developing innovative technology to further economic growth and improve lives. Appointed as Deputy Chairman of A*STAR in November 2006, Mr Lim has been a Board Member of the Nanyang Technological University (NTU) since 2003 and the National Research Foundation since January 2006. He is currently the Chairman of the Governing Board of the Lee Kong Chian School of Medicine, a joint medical school of NTU and Imperial College. He co-chairs the Health and Biomedical Sciences and the National Cybersecurity R&D Executive Committee, and is a member of the Advanced Manufacturing and Engineering Executive Committee. He is also a member of the Singtel Technology Advisory Panel (TAP). Mr Lim has been an Adjunct Professor of the Lee Kuan Yew School of Public Policy (LKY SPP) at the National University of Singapore (NUS) since July 2013. Internationally, Mr Lim is a board and council member of the Science and Technology in Society (STS) forum; a member of Japan's World Premier International (WPI) Initiative Programme Assessment and Review Committee since 2007; and a special committee member of the Japan Science and Technology Agency (JST) Advisory Committee since 2014. He became a founding member of the Frost and Sullivan Board of Governors of the Economic Development Innovation Council in 2014. Prior to A*STAR, Mr Lim was Permanent Secretary at the Ministry of Education (MOE). Before joining the MOE, he spent 23 years with the Singapore Armed Forces and last held the office of Chief of Defence Force. Mr Lim graduated with a BA (Hons) from Cambridge University in 1983, and received an MA from Cambridge University in 1988, as well as an MBA from Cornell University in 1993. He attended the Advanced Management Program at Harvard Business School in 2003. He has also been conferred honorary doctorates from Loughborough (2008), Monash (2009), and Arizona State University (2012), as well as a Fellowship of Imperial College (2010).

Jordan Litner joined Cornell University in July 2015. He is the Project Manager of the Global Innovation Index 2016. His previous professional experience includes working as an Account Supervisor of E-commerce and Digital Marketing with Fortune 500 companies at iProspect in Boston, Massachusetts, USA. Prior to that, he was a coordinator for study abroad programming with the Institute for Study Abroad (IFSA), Butler University, which involved student recruitment, marketing and social media development, and university outreach. He obtained his Bachelor of Arts from the Johns Hopkins University in Baltimore, Maryland, where he studied Economics and Applied Mathematics & Statistics. He is currently continuing his education at the College of Business at Cornell University.

Garry Lyons is Chief Innovation Officer for MasterCard. In this role, he leads both the digital payments and MasterCard Labs businesses, consolidating the development and delivery of emerging digital payments solutions to ensure a simple, safe, and high-quality consumer and merchant experience. He sits on the company's Management Committee. In 2010, Mr Lyons led the launch of MasterCard Labs, the company's global research and development arm concentrating on payments innovation, delivering additional consumer shopping convenience with greater speed than ever before. MasterCard Labs is focused on looking at how advances in technology and consumer trends can help create new products and solutions. As part of its remit, the team also works with the global start-up community. Mr Lyons has more than 20 years of experience in the software and financial services industries, primarily focused on innovation and on the technology and business development aspects of deploying complex, large-scale payment systems. He was Chief Executive Officer of Orbiscom, a leading provider of innovative payment solutions to the global financial services industry, prior to its acquisition by MasterCard in 2008. He was with Orbiscom since its incorporation in early 1999, when he was recruited by its founders to take responsibility for all aspects of technology, innovation, delivery, and support. Prior to joining Orbiscom, Mr Lyons held various senior technology positions in Cognotec, Credo, and ICL. He was recognized as one of Forbes' Next Gen Innovators in 2014. Mr Lyons is a technologist by training, with a Bachelor of Science in Computer Applications from Dublin City University. He is a member of the board of directors of Datalex plc as a non-executive director.

Erik Peterson is a Partner at A.T. Kearney and Managing Director of the firm's Global Business Policy Council (GBPC), a strategic advisory service designed to provide insight and analysis to the world's foremost CEOs. Under his leadership, the GBPC was recognized early this year (for the fourth consecutive time) as one of the leading for-profit think tanks in the world. Mr Peterson is also a Senior Advisor at the Center for Strategic and International Studies (CSIS), the Washington, DC–based bipartisan and nonprofit think tank on foreign policy and national security issues. Formerly he was Senior Vice President at CSIS. He also held the CSIS William A. Schreyer Endowed Chair in Global Analysis. Before joining CSIS, Mr Peterson was Director of Research at Kissinger Associates, the international consulting firm chaired by former Secretary of State Henry A. Kissinger. Mr Peterson has lectured in 42 countries and 48 US states. He has addressed numerous groups (including the Word Economic Forum and TED) on foresight, global trends, scenario planning, strategic planning, technology innovation, and supply-chain management. Mr Peterson received an MBA from the Wharton School, an MA from The Johns Hopkins University School of Advanced International Studies (SAIS), and a BA from Colby College. He holds a Certificate of Eastern European Studies from the University of Fribourg and a Certificate in International Legal Studies from the Hague Academy of International Law. In 2011, he completed the certificate programme on scenario studies at the Oxford University Saïd School of Business.

Jeehye (Jennifer) Rho is Senior Vice President in charge of Group Strategy at AmorePacific Group. She focuses on mid- to long-term strategy development, covering global expansion strategy, organic and inorganic new business development, and corporate-wide digital and retail transformation. Prior to joining AmorePacific Group, she worked at LG Electronics, Boston Consulting Group, and Accenture developing strategies related to technology, innovation, and globalization. She holds an MBA from Harvard Business School and an MA and a BA in International Relations from Seoul National University.

Vitaliy Roud is Researcher and Scientific Coordinator at the Laboratory for Economics of Innovation of the National Research University Higher School of Economics and at the HSE Institute for Statistical Studies and Economics of Knowledge. He has participated in a number of research and policy advice projects initiated by the Russian state bodies and enterprises, including several national-level foresight initiatives. His academic interests include empirical studies of innovation; evidence-based innovation policy; the methodology of innovation surveys; science, technology, and innovation (STI) statistical indicators; and STI policy design and evaluation. He holds a Lecturer position in the Master's programme Governance of Science, Technology and Innovation in the NRU HSE and delivers courses in various areas of the economics of innovation and methods for empirical studies of STI.

Martin Ruppert is Managing Director of IMP^{3}rove – European Innovation Management Academy (www.improve-innovation.eu) and a core team member of the Innovation and R&D Management practice at A.T. Kearney. Building on numerous consulting projects, he has comprehensive experience in innovation management, ranging from innovation strategy development and innovation project portfolio analysis to the development of innovative business models. He has been seconded to the World Economic Forum to manage the initiative Fostering Innovation-Driven Entrepreneurship in Europe. Moreover, he was adviser for the World Economic Forum's follow-on initiative Collaborative Innovation. Dr Ruppert holds a PhD from the Graduate School of Risk Management at the University of Cologne and a Diploma in the combined studies of Mathematics and Business Administration from TU Darmstadt.

Michaela Saisana leads the European Commission's Competence Centre on Composite Indicators and Scoreboards (COIN) at the Joint Research Centre in Italy. She conducts and coordinates research on the monitoring of multi-dimensional phenomena that feed into EU policy formulation and legislation. She collaborates, by auditing performance indices, with over 100 international organizations and world-class universities, including the United Nations, UNICEF, Transparency International, the World Economic Forum, INSEAD, the World Intellectual Property Organization, Yale University, Columbia University, and Harvard University. Her publications deal with composite indicators, multi-criteria analysis, multi-objective optimization, data envelopment analysis, and sensitivity analysis (20 peer-reviewed articles, 2 books, 60 working papers). She provides regular trainings/seminars on composite indicators (over 30 trainings and 60 invited lectures). In 2004 she was awarded the European Commission's JRC Young Scientist Prize in Statistics and Econometrics in recognition of her research on composite indicators. She has a PhD and an MSc in Chemical Engineering.

Kritika Saxena is an Economist Intern at the World Intellectual Property Organization (WIPO). Her research interests cover the broad areas of innovation, development, and the environment, with a particular focus on the role of public policies and finance in innovation and green growth. Before joining WIPO, she was Research Analyst at the World Bank in New Delhi, where she contributed to policy-oriented research and flagship reports. She has worked in various capacities on research projects with the Jameel Poverty Action Lab (India), the National Council of Applied Economic Research (India), and the Overseas Development Institute (United Kingdom). She is currently pursuing a Master's degree in International Economics from the Graduate Institute (IHEID) in Geneva. She also holds a Master of Development Economics from the University of East Anglia, United Kingdom.

Jaeyong Song is the AmorePacific Chaired Professor of Strategy and International Management at Seoul National University (SNU). He received his PhD from the University of Pennsylvania. Before joining SNU, he was Professor of Strategy at Columbia Business School and Yonsei University. He is an editor of the *Journal of International Business Studies* (JIBS) and the Korea Chapter Chair of the Academy of International Business. He won the Richman Best Dissertation Award of the IM Division of the Academy of Management, the Hedlund Best Dissertation Award from the European International Business Association, the Chazen Teaching Innovation Award at Columbia Business School, the Korea Academy of Management Best Researcher Award, the SNU Teaching Award, as well as the Best Performing Professor award from Yonsei University. He was chosen as one of the top 10 business/management gurus in the Republic of Korea by *Maeil Economic Daily.* He was also chosen as a thought leader of the IM Division in 2015. He was a keynote speaker for GE's Global Leadership Meeting and SABIC's Year End meeting 2014. His research has appeared in top-tier journals such as *Management Science, Strategic Management Journal, Organization Science, JIBS, Harvard Business Review, Research Policy, Journal of Management, California Management Review,* and the *Journal of Economics & Management Strategy.* His book *The Samsung Way* has been published in multiple languages by McGraw Hill and other major publishers abroad.

Max von Zedtwitz is Director of GLORAD, the Research Center for Global R&D and Innovation with locations in Shanghai, St. Gallen, Beijing, Kaunas, San Jose, and Heilbronn; he is also Professor of International Business and Innovation at Kaunas University of Technology, Lithuania. Previously he was a Professor at IMD-International, Tsinghua University, and Skoltech, as well as a Vice President with PRTM Management Consultants and Managing Director of AsiaCompete Ltd. He has lived and worked in several countries, most notably in China for 12 years, but also in Russia, Japan, the USA, and Switzerland. He is a Visiting Professor at several universities and an advisor to Chinese and Western firms. He has published widely in academic and practitioner journals, including 11 books, and was recognized by IAMOT as one of the 50 most influential innovation scholars worldwide. A frequent public speaker, he has appeared on radio and television, and has been cited in publications such as *The Economist,* the *China Daily,* and *The New York Times.*

Daniel Vertesy is a Research Fellow at the Competence Centre on Composite Indicators and Scoreboards (COIN) at the Joint Research Centre (JRC) of the European Commission. He is conducting and coordinating econometric and applied statistical research projects focusing on the measurement of scientific and technological research and innovation performance at various levels, in support of EU policies. Prior to joining the European Commission, he worked at the United Nations University (UNU-MERIT) conducting research on sectoral innovation system dynamics and emerging aerospace industries. He holds a PhD in Innovation Studies and Development from Maastricht University and UNU-MERIT, in Economics from the Corvinus University of Budapest, and a Master's degree in International Relations from the latter university.

Sacha Wunsch-Vincent is Senior Economist at the World Intellectual Property Organization (WIPO). He joined WIPO in 2010 to help set up WIPO's economics work under the Chief Economist. At WIPO, he is one of the main authors of the *World Intellectual Property Report* and Editor of the *Global Innovation Index*. His primary research foci and current area of work are concerned with the interaction of innovation, intellectual property, and economic development. Before joining WIPO, he was an Economist at the OECD Directorate for Science, Technology, and Industry for seven years. Before that he was the Swiss National Science Fellow at the Berkeley Center for Law and Technology (University of California, Berkeley) and the Washington, DC–based Peterson Institute for International Economics. He has served as advisor to organizations such as the World Bank and the World Economic Forum, and has testified before national governments and parliaments. Dr Wunsch-Vincent holds a Master of International Economics from MERIT, University of Maastricht, and a PhD in Economics from the University of St. Gallen, Switzerland. He teaches International Economics at Sciences Po Paris.

Mauricio Zuazua is a Partner with A.T. Kearney. He gathers nearly two decades of experience advising business leaders and top public-sector officials on topics encompassing strategic growth, innovation, diversification, and capability development across 20 countries and multiple industries. Mr Zuazua is currently based in the UAE, but has worked out of Dallas, New York, São Paulo, Mexico City, and Washington, DC. In the public sector, Mr Zuazua has led the crafting and implementation of national development initiatives in emerging markets, including enhancing economic competitiveness through innovation, industrial stimulation and diversification, industrial clusters development, and building and enhancing institutions to effect national change. In the private sector, Mr Zuazua advises chief executive officers and leads the development, planning, and implementation of future-proof strategies, organization transformation programmes, and merger integrations in asset-intensive industries including aerospace and defence, logistics infrastructure, and other manufacturing sectors. Furthermore, he brings extensive experience in greenfield start-ups and mega-project structuring, planning, funding, business development, and launch in developing economies. He holds an MBA from Columbia Business School and a BS Hons in Civil Engineering from ITESM, Mexico.

Innovation is now widely recognized as a central driver of economic growth and development. The Global Innovation Index (GII) aims to capture the multi-dimensional facets of innovation by providing a rich database of detailed metrics for 128 economies, which represent 92.8% of the world's population and 97.9% of global GDP. As UN Secretary-General Ban Ki-moon noted at the UN Economic and Social Council in 2013, the GII is a *'unique tool for refining innovation policies… for providing an accurate picture on the role of science, technology and innovation in sustainable development'*.

Since the first edition of the GII, science and innovation have become more open, collaborative, and geographically dispersed. As the quest for innovative solutions expands, the likelihood of technological breakthroughs or affordable innovations—in areas as varied as health and the environment—increases. Yet innovation has sometimes not been portrayed as a global win-win proposition. On the contrary, most metrics and policies are designed at and for the national level. The analysis in this year's edition, *The Global Innovation Index 2016: Winning with Global Innovation,* is dedicated to this theme, paving the way for improved policy making that takes into account today's potential for collaborative global innovation.

Launched by INSEAD in 2007, today the GII is co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations. The 2016 edition of the GII draws on the expertise of its Knowledge Partners: the Confederation of Indian Industry, du, A.T. Kearney, and the IMP^{3}rove – European Innovation Management Academy, as well as an Advisory Board of eminent international experts. For the sixth consecutive year, the Joint Research Centre (JRC) of the European Commission audited the GII calculations.

The GII is concerned primarily with improving the journey towards a better way to measure and understand innovation and with identifying targeted policies and good practices that foster innovation. Written in a nontechnical language, the GII appeals to diverse groups including policy makers, business leaders, academics, and organizations of civil society.

The full report can be downloaded at **www.globalinnovationindex.org**.

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