The Global Innovation Index 2015: Effective Innovation Policies for Development

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Since the Global Innovation Index (GII) 2014 was released last year, the world economy has continued on its path of restrained recovery. The challenge of how to inject more momentum into the economic outlook, spurring economic growth around the globe, remains.

Overcoming a fragile recovery: Laying the foundations for future growth

The world's leading economic institutions predict moderate economic growth in 2015 at levels similar to 2014, preceding a more pronounced increase in growth in 2016.[1]

On average, growth in emerging markets is still clearly positive, despite a significant slowdown that involves Latin America and Sub-Sahara Africa in particular, but also fast-growing middle-income economies such as China.[2] Although risks remain, growth in nearly all high-income countries such as the United States of America (USA) and also in Japan and most countries of the European Union has, if only slightly in most cases, picked up as compared to last year.

Although welcome, the projected increases in growth continue to be modest and uneven. A shared growth momentum with the potential to reduce the persistent high unemployment and secure continued catch-up growth in less-developed nations is lacking.

Indeed, economic output is currently far below the growth trajectory that had been anticipated before the 2009 economic crisis. Worse, recent reports confirm that potential output growth has declined in recent years.[3] This concerns not only high-income but also developing economies, which could see a slowdown in their adoption of productivity-enhancing technologies as their investment and economic growth slows.[4] Whether this is primarily a cyclical issue—and thus a legacy of the economic setback in 2009—or a more structural problem endangering future growth is being vigorously debated by economists.

Regardless of the outcome of this debate, there are clear signs that actions to spur efficiency gains as measured by total factor productivity growth are urgently needed to avert a more persistent low-growth scenario. Increased investments, in areas including infrastructure and technology, and a focus on innovation will be critical in this context.

Innovation expenditures: Back to a new 'normal' of moderate growth

Over the last few years, this report and others have cautioned that the economic crisis might slow innovation more permanently, negatively impacting the future source of growth.[5]

In the aftermath of the economic crisis that began in 2009, the governments in many countries averted this threat.[6] The significant drop of private R&D in these countries was efficiently offset by government R&D investments in 2010 and 2011.[7] Continued high spending in select emerging countries such as China, Turkey, and Mexico, and also in high-income Republic of Korea, subsequently led to significant overall R&D growth through in 2012 (see Box 1).

By our estimates, global R&D expenditures have thus re-entered a moderate growth path. Importantly, on average, businesses are again the drivers of R&D spending growth.

Still, the stabilization or fall of government R&D budgets in advanced countries, the slowdown in emerging markets, and the decreased appetite of business investment have slowed the advance of innovation expenditures. In 2013, according to our estimates, global R&D growth was subdued—the result in part of weakening private R&D expenditure growth as of late 2012, which has seemingly intensified in 2014. Global R&D intensity—computed as global R&D expenditures over global GDP—stayed relatively flat: from 1.6% in 2008 to 1.7% in 2013, with Israel, the Republic of Korea, and Japan being the most R&D-intensive countries.[8]

In terms of the global use of intellectual property (IP), the latest figures point to 9% patent filing growth in 2013; this is slightly

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

After global R&D spending stagnated (or, in many advanced economies, fell) in 2009, combined global private and public R&D expenditure followed a path of constant growth, increasing by 3.7% in 2010, 5.3% in 2011, and 5.6% in 2012. Although data are still incomplete, estimated global R&D spending grew by about 4.3% in 2013.[1] Gross domestic expenditures on R&D (GERD) in the high-income economies of the Organisation for Economic Co-operation and Development (OECD) increased by 1.4% in 2010, 3.6% in 2011, 3% in 2012, and 2.6 % in 2013.[2] The slowdown after 2011 was triggered mainly by continued weakening public R&D spending in those economies.

The worldwide recovery of business enterprise expenditure on R&D (BERD) was quick, reaching 3.2% growth in 2010 and gaining at the faster pace of 7.2% in 2011 and 6.6% in 2012. Although data are incomplete for 2013, BERD is estimated to exhibit a more moderate growth of 5.1% in that year.[3] Businesses in high-income countries of the OECD contributed to the recovery of R&D expenditure with 4.8% growth in 2011, 4% growth in 2012, and 3.2 % growth in 2013.[4]

R&D spending by the top R&D performing 2,500 companies worldwide, as identified by the European Union's 2014 Industrial R&D Investment Scoreboard, grew by 8% in 2011, 7 % in 2012, and a slower 4.9% in 2013.[5] According to PricewaterhouseCoopers and Strategy&, R&D spending by the top R&D performing 1,000 companies worldwide grew by 9.7% in 2012 and 3.8% in 2013, but only 1.4% in 2014.[6]

Regardless of the global economic slowdown, business and total R&D spending are significantly above crisis levels in most economies; so is the spending of top R&D firms, which reached new heights in 2013 or 2014. The situation in terms of total R&D spending across countries is not uniform, however (see Tables 1.1 and 1.2). A large number of Eastern European countries, other large European economies such as France and Ireland, some high-income Asian economies such as the Republic of Korea, and emerging economies such as China and the Russian Federation have experienced no aggregate drop in R&D spending. Some economies, such as Slovakia and Estonia, have recovered from the slowdown quickly, offsetting the plunge in R&D spending seen during the crisis. Others, such as Israel and Germany, have seen a more timid recovery. Japan has recently returned to its pre-crisis levels for combined public and private R&D, and the United Kingdom's business R&D spending has now fully recovered.

Nonetheless, some high-income economies—such as Portugal, Finland, Singapore, and South Africa—continue to exhibit R&D spending below their pre-crisis levels.

Note

Thanks to Antanina Garanasvili, PhD candidate, University of Padova, and our colleagues from the UNESCO Institute for Statistics for help in producing Box 1.

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

(Continued)

weaker than the two-decade growth record set in 2012.[9] These aggregates hide the fact that actual IP filings have decreased in Japan and many European countries, while they have strongly increased in China and the Republic of Korea.

Considering these various factors—namely, sluggish investment, continued weak growth, and persistent unemployment—boosting innovation expenditures from businesses and ensuring the dynamic impact needed to re-fuel global growth is the challenge. This objective will require not only longer-term strategies on the corporate side but also ambitious policies from governments.

Importantly, the challenge of sustaining growth and innovation is no longer the prerogative of high-income countries alone. This is why this year's GII explores the theme of 'Effective Innovation Policies for Development'.

Effective innovation policies for development

On average, the technology gap between developing and developed countries appears to be narrowing.[10] One explanation is that more and more developing countries outperform in innovation inputs and outputs relative to their level of development (see Chapter 2). The GII 2015 studies these 'outperformers'—including Armenia, China, Georgia, India, Jordan, Kenya, Malaysia, the Republic of Moldova, Mongolia, Uganda, and Viet Nam.

These and other countries have realized that technology adoption alone is no longer sufficient to maintain a high-growth scenario; rather innovation is now crucial for catching up to high-income countries. As a result, national innovation policy programmes are flourishing in low- and middle-income countries.

The specificities of innovation systems in developing countries

One question looms large: How can the prevailing innovation policy approaches of high-income countries be adapted to work for developing countries, if at all?

To find an answer, the first step is to look at the innovation policy mixes that high-income economies have fine-tuned over the last decades.[11] Policy makers in these countries follow an *innovation system* approach in which innovation—understood broadly—is the result of complex

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
China	100	124	145	166	193	218
Poland	100	113	128	139	167	166
Turkey	100	111	121	134	147	157
Korea, Rep.	100	106	119	133	147	156
Slovenia	100	103	118	140	145	144p
Hungary	100	108	110	116	122	137
Belgium	100	100	107	114	119	121p
Russian Fed.	100	111	104	105	112	113
France	100	104	105	108	110	110p
Denmark	100	105	102	104	105	106p
Argentina	100	115	128	146	166	n/a
Switzerland	100	n/a	n/a	n/a	113	n/a
Mexico	100	102	113	110	n/a	n/a
Ireland	100	109	108	106	108	n/a
Australia	100	n/a	102	102	n/a	n/a
Italy*	100	99	101	100	102	99p

Note: * Countries that reached 99% of their 2008 GERD spending in 2013; 2008 is indexed as 100%.

Countries with fall in GERD but above pre-crisis levels in 2013

	CRISIS		RECOVERY			
	2008	2009	2010	2011	2012	2013
Slovakia	100	97	132	147	181	188
Czech Rep.	100	99	105	125	142	150p
Estonia	100	94	110	176	170	139p
Netherlands	100	99	102	114	116	116p
Germany	100	99	103	109	113	115p
Israel	100	96	97	105	112	115
Austria	100	97	104	105	111	111p
Norway	100	101	99	102	105	108p
Japan	100	91	93	96	97	102
Chile	100	93	92	104	113	n/a
United States	100	99	99	101	105p	n/a

GERD below crisis levels in 2013

	CRISIS		RECOVERY			
	2008	2009	2010	2011	2012	2013
United Kingdom	100	99	98	99	96	98p
Sweden	100	93	92	95	97	98m
Canada	100	100	99	99	97	94p
Finland	100	97	99	99	92	88
Greece	100	90	82	83	80	88p
Spain	100	99	99	96	90	88p
Portugal	100	106	105	98	89	87p
Luxembourg	100	99	91	87	71	73p
Romania	100	75	73	81	79	66
Singapore	100	82	88	100	96	n/a
Iceland	100	100	n/a	93	n/a	n/a
South Africa	100	92	83	85	88	n/a

Note: p = provisional data; m = underestimated or based on underestimated data.

Source: OECD MSTI, February 2015; data used: Gross domestic expenditure on R&D (GERD) at constant 2005 PPP$, index = 2008.

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
Poland	100	104	110	135	201	234
China	100	124	145	171	200	228
Hungary	100	118	125	138	152	180
Slovenia	100	103	124	160	170	171p
Turkey	100	101	116	131	150	168
Korea, Rep.	100	105	118	135	152	162
France	100	102	105	110	113	114p
Russian Fed.	100	110	100	102	104	109
Ireland	100	115	115	116	120	n/a
Mexico	100	109	113	111	n/a	n/a
Switzerland	100	n/a	n/a	n/a	106	n/a
Denmark*	100	105	98	99	99	99p

Note: * Countries that reached 99% of their 2008 BERD spending in 2013; 2008 is indexed as 100%.

Countries with fall in BERD during the crisis but above crisis levels in 2013

	CRISIS		RECOVERY			
	2008	2009	2010	2011	2012	2013
Slovakia	100	93	130	127	174	203
Estonia	100	98	127	257	226	153p
Czech Rep.	100	96	103	118	130	138p
Netherlands	100	93	98	127	134	134p
Belgium	100	97	105	114	120	123p
Israel	100	97	97	105	111	114
Germany	100	97	99	107	111	113p
Austria	100	96	103	104	110	110p
Norway	100	98	95	100	103	106p
United Kingdom	100	96	96	102	99	102p
Italy	100	99	102	103	103	100p
Argentina	100	93	108	131	130	n/a
United States	100	96	94	97	103p	n/a
Japan*	100	88	90	94	94	99

Note: * Countries that reached 99% of their 2008 BERD spending in 2013; 2008 is indexed as 100%.

BERD below crisis levels in 2013

	CRISIS		RECOVERY			
	2008	2009	2010	2011	2012	2013
Sweden	100	88	86	88	88	92
Canada	100	98	95	96	92	87
Spain	100	93	93	91	87	85p
Portugal	100	100	96	93	88	82p
Finland	100	93	93	94	86	82
Romania	100	101	94	97	103	67
Luxembourg	100	96	79	78	56	57p
Australia	100	96	97	97	n/a	n/a
Chile	100	68	68	88	96	n/a
Iceland	100	92	88	90	n/a	n/a
Singapore	100	70	75	87	81	n/a
South Africa	100	83	70	69	66	n/a

Note: p = provisional data.

Source: OECD MSTI, February 2015; data used: Business enterprise expenditure on R&D (BERD) at constant 2005 PPP$, index = 2008.

interactions among all innovation actors, policies, and institutions.[12] They also draw on the understanding, born of experience, that converting a scientific breakthrough or an idea into a successfully commercialized innovation often involves a long journey with no guaranteed outcomes. Beyond incentivizing research, complementary measures are required to bring product, process, marketing, and organizational innovation to fruition.

Two main policy strands form the core of present innovation policy. On the one hand, there is a need to improve the framework conditions for innovation; these include the business environment, access to finance, competition, and trade openness, as captured in the Innovation Input Sub-Index of the GII model.

On the other hand, nations also need dedicated innovation policies targeting both innovation actors and the linkages among them; these include collaborative research projects, public-private partnerships, and clusters.[13] High-income countries follow a set of dedicated supply- and demand-side innovation policies (see Chapter 3 by Goedhuys et al.).[14] This entails creating a strong human capital and research base that includes research infrastructures, sophisticated firms and markets, innovation linkages, and knowledge absorption, and that fosters innovation outputs as captured by the GII. Direct support for business R&D and innovation is provided in the form of grants, subsidies, or indirect measures such as R&D tax credits. Universities and public research organizations are funded either via across-the-board or more competitive funding mechanisms.

In addition, there is also renewed interest in demand-side measures. This interest is evident while using classic instruments such as public procurement, as well as while testing out new approaches to promote innovation specific to overcoming a key societal challenge in fields such as clean energy and health. Demand-side measures also facilitate the uptake of specific innovations (including via standards or regulations) and can foster user-led innovation.[15] Business executives in charge of innovation surveyed in Chapter 5 by Engel et al. stress the importance of forward-thinking legislation to support future innovation and the related markets (e.g., for autonomous cars). They also stress the need for the international harmonization of regulations for new technologies so they can diffuse more rapidly and be commercially viable.

Another new policy development is the focus on creating an 'innovation culture' with businesses, students, and society at large. This is meant to spur greater entrepreneurial activity and to achieve a better public appreciation of the role of science and innovation. The design of proper metrics and evaluation strategies of policies is emphasized too. Indeed, the formulation and measurement of innovation policies is increasingly treated as a science in its own right.

Regardless of these developments, finding the right combination between demand and supply measures, and between public and private funding for innovation, remains largely a trial-and-error type of endeavour. In addition, although it is tempting to think so, a simple migration of policy mixes developed in high-income countries to developing countries is unlikely to bear fruit. Innovation policies and institutions need to be context-specific, reflecting the extensive heterogeneity and varying trajectories of countries.[16]

The heterogeneity among countries aside, broadly speaking a number of differences between developed and developing countries need to be considered:[17]

First, evidently the framework conditions for innovation are more challenging in developing countries. Beyond macroeconomic challenges, this often manifests itself in poorer infrastructure; weaker product, capital, and labour markets; and weaker education systems. Ineffective regulatory set-ups that do not provide the proper incentives to innovation are often a problem.[18] Developing countries also frequently face inherently dissimilar pressures—for example, high population growth and a resulting younger population, or more intense inequalities.

Second, for sheer budgetary reasons, the capacity to finance, coordinate, and evaluate a large package of innovation policies is constrained in developing countries. Although arguably all components of innovation policy dimensions seem important, tough priority-setting is required. Moreover, in the context of developing countries, the innovation policy coordination between various local, regional, and national levels of government is often even more demanding than it is in developed ones.

Third, the industrial structure of most low- and middle-income countries is usually different, with a greater reliance on agriculture, the extraction of raw materials, and too few—mostly low-value-added—manufacturing activities (e.g., food processing, textiles), as well as an increasing reliance on services industries such as creative sectors, tourism, transport, and retail activities. Micro- and small businesses play an above-average role for the

broader economy and potentially for innovation too. Although frequently neglected, the informal sector often matters greatly, as described in Chapters 9 by Ndemo on Kenya and 11 by Ecuru and Kawooya on Uganda.

Fourth, country- or sector-specific exceptions aside, innovation capabilities in developing countries are typically less advanced than those in developed countries. For one, the human resource base remains comparatively weak (see Chapter 2); the brain drain abroad is high (see Chapter 7 by Chaminade and Moskovo on Georgia and the GII report of 2014). Innovation actors and linkages between them are usually weaker; public research organizations are often the only actors engaged in research and often operate in an isolated fashion without links to the real economy, while firms tend to have a low absorptive capacity. In the formal sector, improvements in maintenance, engineering, and quality control, rather than fresh R&D investment, tend to drive innovation. Sources of learning and innovation frequently result from foreign direct investment (FDI) or technology acquisition from technologies developed abroad. Firms tend to have a low absorptive capacity and do not interact with scientific institutions or science more broadly. As noted in Chapter 5, collaborating with external partners in innovation remains an important challenge for companies.

In turn, innovation under scarcity is the daily dare of dynamic clusters of small, informal firms and other actors in developing countries. As outlined by Mashelkar (a member of the GII Advisory Board) in 2012, the focus is often on innovating with limited means and with the aim of providing more affordable access of quality goods and services and improving the livelihood for poorer segments of the population.[19]

Tailoring innovation policies to the needs of developing countries

A few lessons that apply to the future of innovation policy approaches in developing countries emerge from this edition of the GII and existing innovation policy experiences.

Institutionally speaking, a persistent, well-coordinated national innovation policy plan with clear targets and a matching institutional set-up have proved a key ingredient for success. All too often a succession of vaguely defined, often uncoordinated, and inadequately implemented innovation policy plans can be observed. In many areas, however, perseverance is key to success. China, for example, has succeeded in making science and technology a cornerstone of higher education and R&D driving innovation (see Chapter 6 by Chen et al.); India is another example of success in education and ICT development driving innovation (see Chapter 8 by Gopalakrishnan and Dasgupta). Institution-building—the development of human resources and innovation capacities in certain fields of science or particular sectors—is indeed an expensive medium- to long-term process that can hardly be fast-tracked.

In terms of organizational set-up, a coordinating ministry or body often offers the managing and leadership hub required, as shown in Chapter 10 by Rasiah and Yap on Malaysia. The fragmentation of key innovation responsibilities across different ministries or agencies is often a drag on effectiveness. The mere creation of an 'innovation ministry', however, will rarely prove successful if it remains surrounded by a plethora of other often more powerful ministries. Instead, cross-cutting innovation agencies or councils reporting directly to, or chaired by, top-level government officials such as the prime minister have been successful (see Chapters 7 and 9 on Georgia and Kenya).

Importantly, developing countries should not forget the significance of coordinating with other, related policy strategies—in particular those aimed at enhancing education and skills, as well as key economic policy matters such as foreign investment and international trade (see Chapter 4 by Atkinson and Ezell and Chapter 10 on Malaysia).

A more strategic coordination of IP policies with innovation policy objectives is desirable, while also fostering the creation of recognized brands, strong physical or intangible assets, and appealing creative works.

At the outset, the design of innovation policies will require a thorough review of the existing innovation system, along with its strengths and weaknesses. The involvement of key innovation actors in this process, including successful national innovators and entrepreneurs abroad—is critical.

Effective implementation will entail building the skills needed to execute policy. Ensuring access to suitably skilled science, technology, and innovation (STI) policy managers remains a work in progress even in high-income countries.

In addition, innovation metrics are needed to assess the state of play. Developing countries are increasingly adopting rich-country STI indicators and surveys (refer to Box 1 in Annex 1 of the first chapter of the GII 2013). Yet metrics focused on R&D personnel or expenditures, or innovation surveys sent to formal firms, for instance, might provide only a partial—or even distorted—measure of innovation realities in

developing economies. In many of them innovation works differently than it does in advanced economies, and is more incremental and based in grassroots experience, often taking place outside the formal business sector. Including but not limited to the GII, work is still needed to produce innovation metrics and survey approaches that are more appropriate for developing countries.

In terms of innovation policy substance, a few lessons emerge from this edition of the GII and the experience of developing countries. Despite of the specific nature of innovation in developing countries, policies are often framed narrowly and focus on high-tech products, clusters, or special economic zones, and are formulated with an eye on the integration of local operations and products into global value chains through the support of FDI and the use of lower tariffs. For this reason, these strategies are also often focused on absorbing technology from foreign multinational enterprises and creating national champions or particular sectoral high-tech or global value chain–related strengths.

This 'international specialization'-type approach is not without success: indeed, it was often vital in driving the ascension of many technology-savvy developing countries. China, for instance, focused on telecommunications and electronics assembly, India on software back-office operations and software, Viet Nam on IT and automotive assembly, and Malaysia on IT assembly. All are innovation outperformers as identified in Chapter 2 of this report.

However, this type of strategy has often led to enclaves of higher-productivity activities, with weak links to the rest of the economy, composed by a plethora of micro and small firms that operate far from the technological frontier. Hence, even if a country has been successful in attracting FDI and in becoming an integral part of the global value chain, there is no guarantee that spillovers will automatically spur more domestic innovation (see Chapters 7 and 10 on Georgia and Malaysia).

Overall, risks associated with policies aimed at fostering national champions or pockets of excellence remain high. The number of announced high-tech clusters that remain empty shells and of strategic 'national priority' sectors that never took off is a vivid reminder of such risks. Top-down approaches in designating clusters or picking champions and priority sectors might come at the expense of fostering true bottom-up entrepreneurship that thrives on the creation of an open and competitive level playing field that gives space to potential local innovators. Every so often these activities come at the expense of focusing on more domestically generated innovation. Domestic innovation is significant because it can address actual local challenges through technologies that are not at the world frontier but that work in the local context.

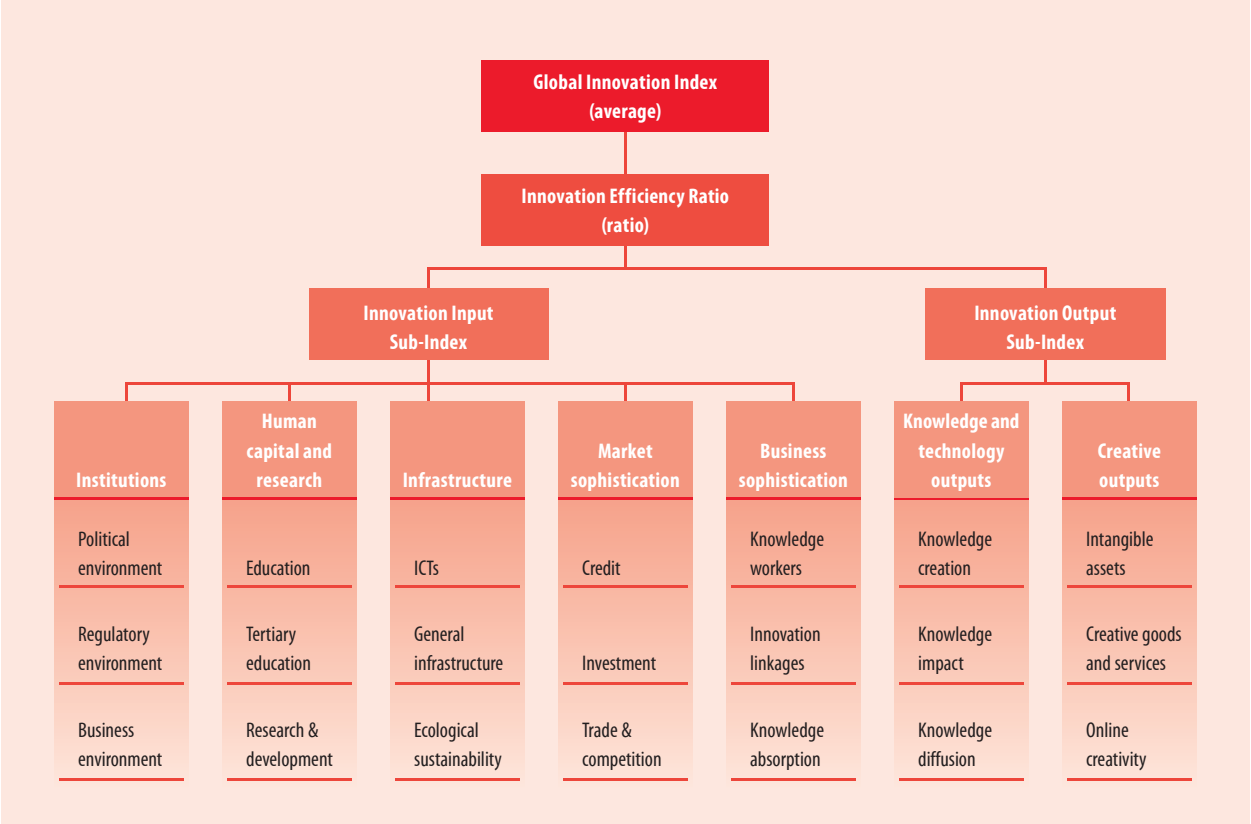
Fostering existing domestic innovation capabilities—including in traditional sectors such as agriculture, food, mining, energy—should be emphasized. This will require, first, a more strategic focus on and assessment of key strengths, and then a determination of how these strengths can be built up. In the process, and to leverage their strengths, countries will also want to devise smart and more customized IP strategies (see the example of Georgia in Chapter 7 for agricultural sciences and of Uganda in Chapter 11 for the agro-processing industry).

Furthermore, the disruptive and remarkable nature of innovation that is more service-based and works from the bottom up tends to be underestimated. Indeed, certain African countries have experienced rapid and spontaneous innovations in finance (e-banking), telecommunications, medical technologies, and other areas in recent years. The well-known case of M-PESA in Kenya noted in Chapters 3 and 9 is just one example. The developing-country context and a regulatory environment that is sometimes more permissive can help innovation in the service sector and promote leapfrogging in ways rarely seen in higher-income economies. Moreover, developing countries have seen the emergence of more grassroots-type innovations for health, education, and transport that make significant contributions to the quality of daily lives.

In sum, the potential payoff of creating technology-neutral framework conditions for more bottom-up innovation, along with a certain degree of serendipity, remains significant. Introducing more labour market flexibility; allowing for fair competition among private, foreign, and state-owned firms; facilitating access to finance; making it easier to start a business; and fostering an efficient ICT infrastructure (see Chapter 4) are actions that—at times—might be both faster to implement and can yield quicker returns. Yet this approach comes with less control; progress and impacts are not easily monitored by data.

Priorities for dedicated innovation policies should focus on three opportunities. First, all the GII-related national assessments on the ground show that increasing business sophistication—in terms of its linkages to science and its institutions (for example, via joint research projects), foreign subsidiaries, and the recruitment of scientists—is often the single biggest challenge.

Figure 1: Framework of the Global Innovation Index 2015



Unfortunately, some developing countries produce above-par science and engineering graduates and researchers but never put these talents to use in local business innovation, leaving these precious resources idle.

Second, although significant resources are devoted to attracting foreign multinationals and investment, less attention is paid to the question of how to capture and maximize positive spillovers to the local economy. Intermediate organizations such as non-governmental organizations or measuring and testing centres can play a crucial role in transmitting the knowledge of multinationals to local actors, as documented in Chapter 7 on Georgia. Furthermore, labour mobility and the upgrading of supplier activities are essential. People working for multinationals can also incentivized to start their own businesses. Moreover, scaling up innovative activities in small and micro-enterprises in the informal sector as well as in formal firms and strengthening their linkages to formal institutions should be a priority.[20]

Finally, steering innovation and research to finding context-specific solutions to local challenges that are not necessarily frontier technologies or part of existing global value chains seems underexplored.[21] Such solutions can be applicable to particular energy, transport, or sanitation needs; or can be for processing local produce, upgrading local artisanship, or reaping economic rewards from a thriving creative industry.

Rallying national efforts around particular health or other developing-country challenges that remain unaddressed by innovation systems in higher-income countries is also promising. Other developing countries facing similar conditions and seeking similar solutions constitute a large potential set of buyers for context-specific innovation; south-south trade in tailored innovative goods and services is increasingly both a reality and a goal.

The GII conceptual framework

The GII is focused both on improving ways to measure innovation and understanding it, and on identifying targeted policies and good practices. The GII helps to create an environment in which innovation factors are continually evaluated. It provides a key tool of detailed metrics for 141 economies this year, representing 95.1% of the world's population and 98.6% 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 1).

- **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 79 indicators. 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).

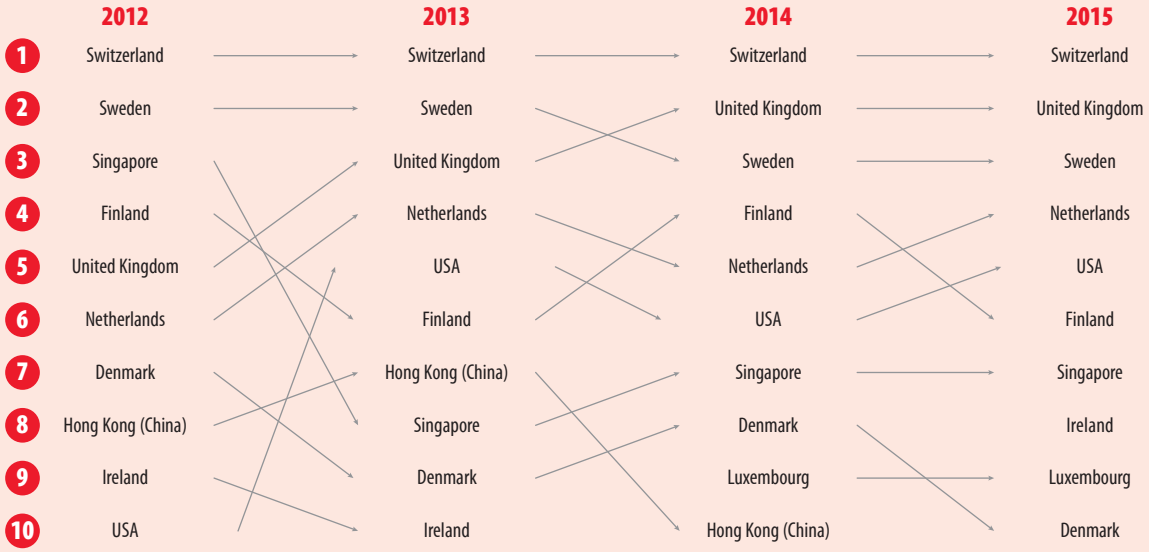
The Global Innovation Index 2015: Main findings

The GII 2015 results have shown consistency in areas such as top rankings and the innovation divide. However, there have also been some new developments, particularly evident within the middle-income economies and the Sub-Sahara Africa region. In the following pages, a number of findings from the report are exposed in greater detail. The key messages are:

- **Among the top, quality matters.** Among high-income countries, a major divider can be found in the quality of innovation. This is the area in which the USA and the United Kingdom (UK), largely as a result of their world-class universities, stay ahead of the pack (refer to Box 3 on pages 14–15 for further details).
- **Several emerging innovators are now on the heels of rich countries.** Differences are eroding between the champions of the middle-income countries (Malaysia, China) and the lower tier of high-income countries (refer to Box 2 on page 12–13 for further details).
- **Institutions matter.** Across regions, the most visible differentiator in terms of innovation performance is found in the Institutions pillar. GII metrics hence confirm a core principle of international policy literature: good innovation policies start with good innovation institutions.

  The set of rules defined by institutions is particularly important for developing economies because the rules stipulate norms of interaction among actors in recurrent situations. Eventually, these rules set the formal and informal guidelines followed by national, international, private, and public realms as they interact to produce and develop new ideas and innovations in particular regions.
- **Among poor economies, business sophistication makes a big difference.** Low-income countries that have made efforts on business sophistication are able to do well, sometimes overtaking some middle-income countries (refer to Box 2 for further details).
- **Encouraging signs emerge in Sub-Saharan Africa.** In 2015 the Sub-Saharan Africa region has caught up with and even superseded Central and Southern Asia in several pillars (Institutions, Business sophistication, and Creative outputs). In addition to South Africa, some preeminent performances from this region include some of the same economies flagged in 2014 as stand-out innovation achievers: Burkina Faso, Kenya, Malawi, Rwanda, Senegal (refer to Figure 4 for further details and Chapter 1, Box 4, in the GII 2014 report).
- **BRICS economies—particularly China—are gaining ground in innovation quality.** Among the middle-income top 10 in innovation quality, the BRICS economies are at the top. At the same time, the distance between China and the others is rapidly increasing (see Box 3). The Russian Federation is now among the high-income group; it would be 3rd if it was still considered among the upper-middle income countries.

Figure 2: Movement in the top 10 of the GII



Stability at the top, with a strong performance from the UK and the USA

As seen in recent editions of the GII, there is relative stability in the top 10: Switzerland leads again in 2015, the UK takes the second spot, and the USA makes it into the top 5. Switzerland ranks consistently as number 1 in the GII and among the top 25 in all pillars and all but four sub-pillars. Finland (6th) declines by two spots this year. Except for one change, the top 10 ranked economies in the GII 2015 remain the same as in 2014. Ireland (ranked 11th in 2014) enters the top 10 at 8th position, pushing Hong Kong (China) just over to 11th position (down from rank 10 in 2014). The top 10 economies in 2015 are listed below; Figure 2 shows movement in the top 10 ranked economies over the last four years:

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

Furthermore, stability across the top 25 has also been evident across the years. With the exception of Malta dropping out (26th this year) and the Czech Republic moving in (24th), the top 25 have included the same set of countries since 2011. Within this group, however, some notable large high-income countries are moving upwards and closer to the top-tier performers. Three clear cases are Germany (15th in 2013, 13th in 2014, 12th in 2015), the Republic of Korea (18th in 2013, 16th in 2014, 14th in 2015), and Japan (22nd in 2013, 21st in 2014, 19th in 2015): The Republic of Korea and Japan can attribute their ascent primarily to improved rankings on the Output Sub-Index, and Germany to the Input Sub-Index.

Several emerging countries now on the heels of richer countries

The GII 2015 confirms the continued existence of global innovation divides (see Box 2). The gap between the innovation performance of high-income top performers and those poorer economies that follow is large. However, in the case of a few countries, this gap is beginning to erode. This is especially noticeable between the lower tier of high-income economies and the upper-middle-income group. China (GII 29th) and Malaysia (GII 32nd) now achieve scores closer to those of high-income countries in four of the GII pillars. More specifically, they are closing the gap in areas associated with credit, investment, and economic competition (Market sophistication); those linked to the acquisition and transfer of knowledge (Business sophistication); those associated with education and with R&D (Human capital and research); and those associated with the creation, impact, and diffusion of

Box 2: The persistent global innovation divide: A few countries about to bridge the gap

Stability among the top economies has always been a recognized feature of the GII rankings. This steadiness has allowed Switzerland to remain number 1 for the fifth consecutive year and for the composition of the top 25 economies to continue mostly unchanged. Yet the countries within the top 10 and top 25 ranks have seen some movement: for the first time the Czech Republic (24th) is part of the top 25 group, and Ireland (8th) is back in the top 10. Conversely, Hong Kong (China) (11th) and Malta (26th) have left their positions among the top 10 and top 25 economies, respectively.

The persistence of an innovation divide is confirmed by the fact that the cluster of the top 25 GII leaders are all high-income economies, and that its composition has remained relatively unchanged since 2011. Although consistency has been unmistakable at the high-income level, noticeable ranking moves are happening more frequently within lower-income groups.

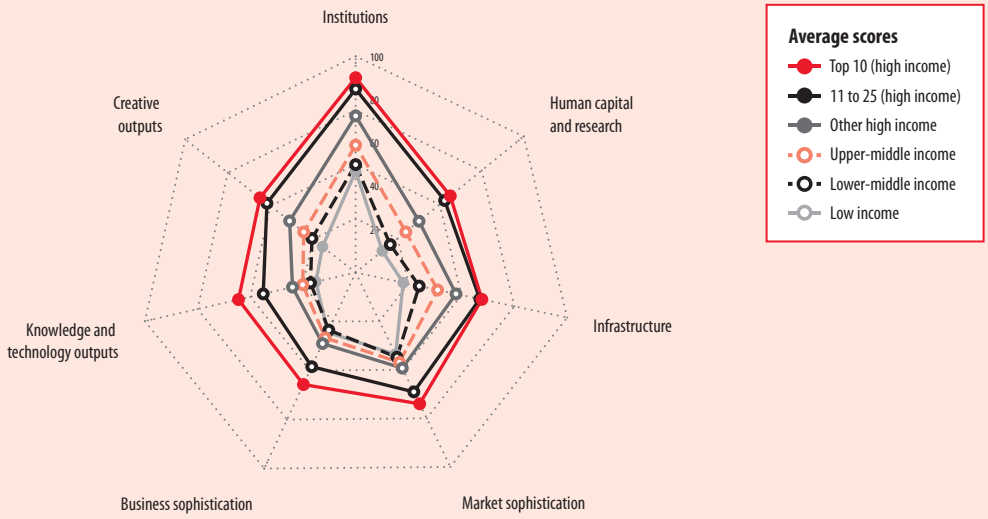
The distance between the top-ranked economies and the groups that follow is still apparent, however, as captured by Figure 2.1. This figure shows the three different echelons of the high-income economies (the top 10, the top 11 to 25, and other high-income economies that rank below 25), as well as the upper- and lower-middle-income and low-income groups.

High-income economies

This year the top 10 high-income economies perform better than the second-tier high-income group in all pillars, particularly in Market sophistication (pillar 4), Business sophistication (pillar 5), and Knowledge and technology outputs (pillar 6). Compared with the results of the GII 2014, the gap between these two groups has expanded, as seen most markedly in pillars 5 and 6, and marginally in Human capital and research (pillar 2). However, a reduction in the divide between the two high-income groups is visible in Infrastructure (pillar 3), and especially in the two pillars—Market sophistication (pillar 4) and Creative outputs (pillar 7)—where both groups have achieved almost the same average scores (59.7 and 58.7, respectively).

The largest divide between income groups is evident between the second and third tiers of high-income economies. The high-income economies that are ranked above 25 perform at significantly lower levels in the Human capital and research (pillar 2), Knowledge and technology outputs (pillar 6), and Creative outputs (pillar 7) than the second-tier high-income group (those ranked 11–25). Yet, as the third-tier high-income group starts to perform better in Institutions (1), Human capital and research

Figure 2.1: The persistent innovation divide: Stability among the GII 2015 top 10 and top 25



Note: Countries/economies are classified according to the World Bank Income Group Classification (July 2013).

(Continued)

Box 2: The persistent global innovation divide: A few countries about to bridge the gap *(cont'd.)*

(2), and Knowledge and technology outputs (6), the gap between the two groups is beginning to lessen.

Middle-income economies

When contrasting high-income with middle-income performance, the divide can be most clearly seen in Institutions (pillar 1), Infrastructure (3), and Creative outputs (7). It is only in Business sophistication (5) that the gap between these two groups is narrowing. On average, the upper-middle-income group has scores similar to those of third-tier high-income economies. For example, China (29th) and Malaysia (32nd) from the upper-middle-income group almost mimic the performance of the third-tier high-income group, increasing the likelihood that they might join the top 25 group in the near future.

Low-income economies

This year the lower-income groups continue to show some success at closing the innovation divide. Although this group as a whole performs at levels below those of lower-middle-income economies in six out of the seven GII pillars, their respective scores are comparable in Market sophistication (a difference of only 1.4 points) and Knowledge and technology outputs (a difference of 2.6 points). Since 2013, the low-income cluster has gotten closer to the lower-middle cluster in Business sophistication (pillar 5). This performance is comparable with that of the upper-middle-income group (a difference of 2.8 points) and suggests that greater efforts to adopt market economy frameworks are taking place within economies at that income level.

Regional differences

Aggregate regional rankings based on the GII average scores show the Northern America region at the top (57.9), followed by Europe (48.0), South East Asia and Oceania (42.7), Northern Africa and Western Asia (35.3), and Latin America and the Caribbean (32.5).[1] This year Sub-Saharan Africa's average score (27.1) is marginally above that of Central and Southern Asia (27.0).

Note

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

knowledge (Knowledge and technology outputs).

Similarly, a select number of low-income economies are also performing increasingly well at levels hitherto reserved for the lower-middle-income group. Cambodia (GII 91st) is closing the gap in Market sophistication and Business sophistication as well as Institutions; Malawi (GII 98th) is doing so in Institutions, Business sophistication, and Knowledge and technology outputs; Mozambique (GII 95th) in Human capital and research, and Market and Business sophistication and Knowledge technology outputs; and Rwanda (GII 94th) in Institutions and both Market and Business sophistication.

The greatest divide between developed and developing economies is in Institutions, Infrastructure, and areas related to intangible assets, creative goods and services, and online creativity (Creative outputs). Conversely, the divide appears to be reducing in two other pillars: upper-middle-income economies South Africa (GII 60th) and Malaysia (GII 32nd) are now performing at the levels seen in second-tier high-income economies in Market sophistication, and Malaysia and China at those same levels in Business sophistication (see also Chapter 2).

Beyond quantity: The critical importance of high-quality innovation

In terms of innovation *quality*—as measured by university performance, the reach of scholarly articles, and the international dimension of patent applications—the USA holds the top place within the high-income group, followed by the UK, Japan, Germany, and Switzerland (see Box 3). Top-scoring middle-income economies are narrowing the gap on innovation quality with China in the lead, followed by Brazil and India, fuelled by an improvement in the quality of higher-education institutions.

On average, the gap in innovation quality between top-performing high-income and top-performing middle-income economies appears to be shrinking. Although the average number of patents filed has increased for the middle-income group, the gradual improvement in innovation quality for these countries appears to stem from an expansion in the quality of higher-education institutions.[22]

The BRICS economies are at the top of the innovation quality composite ranking among the middle-income group.[23] This group of nations, with the exception of Brazil's score for the number of patents filed, increased their scores in all three quality indicators. China's score for quality of innovation has improved more rapidly than both those of its BRICS neighbours and

Box 3: Innovation quality: USA and China at the top, with a large gap between them

Measuring the quality of innovation-related input and output indicators as well as their quantity is critical. Indeed, some countries have managed to ramp up the quantity of some indicators—such as education expenditures, patents, or publications, for instance—without making much impact. It is to address this concern that three additional indicators were introduced into the Global Innovation Index (GII) in 2013, aiming to better measure the *quality* of innovation: (1) quality of local universities (2.3.3, QS university rankings average score of top 3 universities); (2) internationalization of local inventions (5.2.5, patent families filed in at least three offices); and the number of citations that local research documents receive abroad (6.1.5, citable documents H index). Figure 3.1 shows the sum of the scores of these three indicators and captures the top 10 highest-performing high- and middle-income economies for this composite indicator.

Top 10 high-income economies

Among the high-income economies, the United States of America (USA) tops the GII rankings in innovation quality. This performance results from its 2nd place in top university rankings and its 1st place in the number of research document citations abroad (citable documents abroad) for the third year in a row. The United Kingdom (UK) regains the 2nd position in innovation quality this year, above Japan and Germany, with its 1st place in the top university rankings and citable documents abroad (where it ties with the USA), keeping the spot it has held since 2013. This upward movement can be also attributed to increasing levels of patents filed in at least three offices (patents filed). Similarly, in 2015 the UK also holds 2nd place in the overall GII for second year in a row. Japan (GII rank of 19), while moving up in the overall GII rankings, drops one position this year to 3rd in innovation quality. Although retaining the same rank in top university rankings and citable documents abroad (7th and 6th, respectively), Japan slipped from 1st to 2nd in patents filed this year, affecting its overall performance on the quality of innovation.

Like Japan, Canada (GII 16) and France (GII 21) perform better in the combined quality indicators ranking than in the overall GII ranking. In combined innovation quality, Canada moves up one position to 6th, switching places with France. This can be explained in part by Canada's improvement in both the top university rankings and patents filed, in addition to France's slightly less robust performance in the latter this year. France, however, retains its 4th position in citable documents abroad for the third consecutive year and achieves 7th place in the quality of innovation. The Republic of Korea moves up two positions in both the overall GII (rank 14) and in the composite quality of innovation (8) this year. This is partially the result of a marginally better performance in the top university rankings indicator. Although Germany (GII 12) performs the same as last year in these indicators, it drops one position in the innovation quality composite, primarily because of going from top position in citable documents abroad last year to 3rd in 2015.

Top 10 middle-income economies

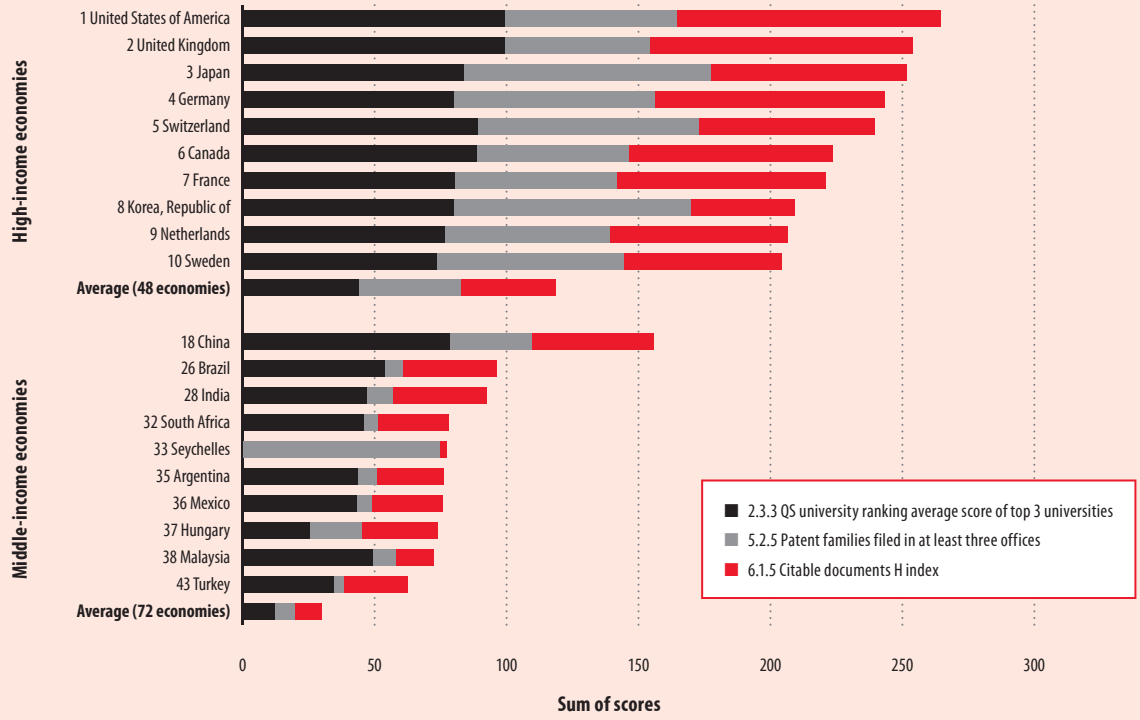
Following renewed domestic policy attention on ramping up innovation quality, China (GII 29) moves up to 18th position in the innovation quality ranking, retaining the top place among the middle-income economies and narrowing the gap that separates it from the high-income group. This upward movement can be attributed to its 1st place ranking among middle-income economies in the top university rankings (11th out of all GII economies) plus an improvement in the number of patents filed. Brazil (GII 70) and India (GII 81)—two of the four BRICS economies in this list—remain in 2nd and 3rd position, respectively, in the innovation quality composite ranking among the middle-income nations for the second consecutive year. Although both countries moved down in their overall GII ranking, their performance (similar to that of 2014 in all three quality indicators) has both kept them in the top 5 among middle-income economies and helped them move upwards in terms of the quality of innovation composite (26th and 28th, respectively). For India, this year's substantial improvement in patents filed also contributed to this performance. South Africa (GII 60) keeps its upward trajectory in innovation quality, moving into the 32nd composite position—4th among middle-income economies. Along with most of the other BRICS economies, it has also seen a drop in its GII rank this year but has retained its strong performance in innovation quality. Even though the Russian Federation (GII 48) is not among the top 10 high-income innovation quality performers, its sum of scores for these indicators this year is much better than most middle-income countries in the top 10. Its ranking for the combined indicators is 27, above that of India and South Africa.

With the exception of China and Hungary, whose innovation quality scores display a balance similar to that of high-income economies, the majority of middle-income economies still face a significant journey if they are to improve their innovation quality metrics. It is also noteworthy that even the innovation quality top performers depend heavily on their high university rankings to achieve their top-quality scores. More priority could be given to the calibre of publications and—the area in which middle-income countries show the weakest relative performance—to patents filed globally.

(Continued)

Box 3: Innovation quality: USA and China at the top, with a large gap between them *(cont'd.)*

Figure 3.1: 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 2013). Upper- and lower-middle income categories were grouped together as middle-income economies.

the rest of the top 10 ranked in the composite. The gap between China and the other middle-income economies has consistently increased since 2013. Although India has also steadily improved its quality of innovation score, its improvement has not been as substantial as that of China. Brazil, on the other hand, has worsened in this metric, although the gap in score between India and Brazil has considerably reduced since 2013. South Africa has remained at constant levels, yet below all those of its BRICS peers.

2015 results: The world's top innovators

The following section describes and analyses the prominent features of the GII 2015 results for the global leaders in each index and the best performers in light of their income level.[24] A short discussion of the rankings at the regional level follows.[25]

Tables 1 through 3 present the rankings of all economies included in the GII 2015 for the GII and the Input and Output Sub-Indices.

The top 10 in the Global Innovation Index

The top 10 economies in the GII 2015 edition are discussed in detail below.

Switzerland maintains its number 1 position in the GII since 2011, as well as its number 1 position in the Output Sub-Index and in the Knowledge and technology outputs pillar since 2012. It achieves a spot among the top 25 in all pillars and sub-pillars with only four exceptions: sub-pillars Business environment (where it ranks 28th), Education (28th), Information and communication technologies (41st), and General infrastructure (26th). A knowledge-based economy of 8.1 million people with one of the highest GDP per capita in the world (PPP$47,863), its high Innovation Efficiency Ratio (2nd highest of all economies in the sample, and

Table 1: Global Innovation Index rankings

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.71
Switzerland	68.30	**1**	HI	**1**	EUR	**1**	1.01	2	
United Kingdom	62.42	2	HI	2	EUR	2	0.86	18	
Sweden	62.40	3	HI	3	EUR	3	0.86	16	
Netherlands	61.58	4	HI	4	EUR	4	0.92	8	
United States of America	60.10	5	HI	5	NAC	**1**	0.79	33	
Finland	59.97	6	HI	6	EUR	5	0.77	41	
Singapore	59.36	7	HI	7	SEAO	**1**	0.65	100	
Ireland	59.13	8	HI	8	EUR	6	0.88	12	
Luxembourg	59.02	9	HI	9	EUR	7	1.00	3	
Denmark	57.70	10	HI	10	EUR	8	0.75	49	
Hong Kong (China)	57.23	11	HI	11	SEAO	2	0.69	76	
Germany	57.05	12	HI	12	EUR	9	0.87	13	
Iceland	57.02	13	HI	13	EUR	10	0.98	4	
Korea, Republic of	56.26	14	HI	14	SEAO	3	0.80	27	
New Zealand	55.92	15	HI	15	SEAO	4	0.77	40	
Canada	55.73	16	HI	16	NAC	2	0.71	70	
Australia	55.22	17	HI	17	SEAO	5	0.70	72	
Austria	54.07	18	HI	18	EUR	11	0.77	37	
Japan	53.97	19	HI	19	SEAO	6	0.69	78	
Norway	53.80	20	HI	20	EUR	12	0.73	63	
France	53.59	21	HI	21	EUR	13	0.75	51	
Israel	53.54	22	HI	22	NAWA	**1**	0.83	20	
Estonia	52.81	23	HI	23	EUR	14	0.86	17	
Czech Republic	51.32	24	HI	24	EUR	15	0.89	11	
Belgium	50.91	25	HI	25	EUR	16	0.74	59	
Malta	50.48	26	HI	26	EUR	17	0.95	7	
Spain	49.07	27	HI	27	EUR	18	0.72	67	
Slovenia	48.49	28	HI	28	EUR	19	0.82	22	
China	47.47	29	UM	**1**	SEAO	7	0.96	6	
Portugal	46.61	30	HI	29	EUR	20	0.73	62	
Italy	46.40	31	HI	30	EUR	21	0.74	57	
Malaysia	45.98	32	UM	2	SEAO	8	0.74	56	
Latvia	45.51	33	HI	31	EUR	22	0.81	26	
Cyprus	43.51	34	HI	32	NAWA	2	0.66	90	
Hungary	43.00	35	UM	3	EUR	23	0.78	35	
Slovakia	42.99	36	HI	33	EUR	24	0.76	48	
Barbados	42.47	37	HI	34	LCN	**1**	0.81	25	
Lithuania	42.26	38	HI	35	EUR	25	0.70	74	
Bulgaria	42.16	39	UM	4	EUR	26	0.83	21	
Croatia	41.70	40	HI	36	EUR	27	0.75	50	
Montenegro	41.23	41	UM	5	EUR	28	0.79	29	
Chile	41.20	42	HI	37	LCN	2	0.68	82	
Saudi Arabia	40.65	43	HI	38	NAWA	3	0.72	69	
Moldova, Republic of	40.53	44	LM	**1**	EUR	29	0.98	5	
Greece	40.28	45	HI	39	EUR	30	0.65	98	
Poland	40.16	46	HI	40	EUR	31	0.66	93	
United Arab Emirates	40.06	47	HI	41	NAWA	4	0.41	133	
Russian Federation	39.32	48	HI	42	EUR	32	0.74	60	
Mauritius	39.23	49	UM	6	SSF	**1**	0.65	96	
Qatar	39.01	50	HI	43	NAWA	5	0.61	110	
Costa Rica	38.59	51	UM	7	LCN	3	0.79	32	
Viet Nam	38.35	52	LM	2	SEAO	9	0.92	9	
Belarus	38.23	53	UM	8	EUR	33	0.70	73	
Romania	38.20	54	UM	9	EUR	34	0.74	58	
Thailand	38.10	55	UM	10	SEAO	10	0.76	43	
TFYR of Macedonia	38.03	56	UM	11	EUR	35	0.73	64	
Mexico	38.03	57	UM	12	LCN	4	0.73	61	
Turkey	37.81	58	UM	13	NAWA	6	0.81	23	
Bahrain	37.67	59	HI	44	NAWA	7	0.63	105	
South Africa	37.45	60	UM	14	SSF	2	0.66	94	
Armenia	37.31	61	LM	3	NAWA	8	0.79	34	
Panama	36.80	62	UM	15	LCN	5	0.78	36	
Serbia	36.47	63	UM	16	EUR	36	0.75	55	
Ukraine	36.45	64	LM	4	EUR	37	0.87	15	
Seychelles	36.44	65	UM	17	SSF	3	0.67	88	
Mongolia	36.41	66	LM	5	SEAO	11	0.61	111	
Colombia	36.41	67	UM	18	LCN	6	0.60	114	
Uruguay	35.76	68	HI	45	LCN	7	0.66	91	
Oman	35.00	69	HI	46	NAWA	9	0.67	86	
Brazil	34.95	70	UM	19	LCN	8	0.65	99	
Peru	34.87	71	UM	20	LCN	9	0.60	113	

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

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.71
Argentina	34.30	72	UM	21	LCN	10	0.75	52	
Georgia	33.83	73	LM	6	NAWA	10	0.62	107	
Lebanon	33.82	74	UM	22	NAWA	11	0.67	87	
Jordan	33.78	75	UM	23	NAWA	12	0.72	68	
Tunisia	33.48	76	UM	24	NAWA	13	0.71	71	
Kuwait	33.20	77	HI	47	NAWA	14	0.73	65	
Morocco	33.19	78	LM	7	NAWA	15	0.64	102	
Bosnia and Herzegovina	32.31	79	UM	25	EUR	38	0.39	135	
Trinidad and Tobago	32.18	80	HI	48	LCN	11	0.66	92	
India	31.74	81	LM	8	CSA	**1**	0.79	31	
Kazakhstan	31.25	82	UM	26	CSA	2	0.53	124	
Philippines	31.05	83	LM	9	SEAO	12	0.76	44	
Senegal	30.95	84	LM	10	SSF	4	0.81	24	
Sri Lanka	30.79	85	LM	11	CSA	3	0.76	46	
Guyana	30.75	86	LM	12	LCN	12	0.65	95	
Albania	30.74	87	UM	27	EUR	39	0.49	129	
Paraguay	30.69	88	LM	13	LCN	13	0.75	54	
Dominican Republic	30.60	89	UM	28	LCN	14	0.61	108	
Botswana	30.49	90	UM	29	SSF	5	0.54	120	
Cambodia	30.35	91	LI	**1**	SEAO	13	0.69	80	
Kenya	30.19	92	LI	2	SSF	6	0.79	30	
Azerbaijan	30.10	93	UM	30	NAWA	16	0.60	115	
Rwanda	30.09	94	LI	3	SSF	7	0.42	131	
Mozambique	30.07	95	LI	4	SSF	8	0.63	104	
Jamaica	29.95	96	UM	31	LCN	15	0.54	121	
Indonesia	29.79	97	LM	14	SEAO	14	0.77	42	
Malawi	29.71	98	LI	5	SSF	9	0.75	53	
El Salvador	29.31	99	LM	15	LCN	16	0.62	106	
Egypt	28.91	100	LM	16	NAWA	17	0.68	83	
Guatemala	28.84	101	LM	17	LCN	17	0.67	89	
Burkina Faso	28.68	102	LI	6	SSF	10	0.68	85	
Cabo Verde	28.59	103	LM	18	SSF	11	0.54	119	
Bolivia, Plurinational State of	28.58	104	LM	19	LCN	18	0.76	45	
Mali	28.37	105	LI	7	SSF	12	0.87	14	
Iran, Islamic Republic of	28.37	106	UM	32	CSA	4	0.63	103	
Namibia	28.15	107	UM	33	SSF	13	0.51	126	
Ghana	28.04	108	LM	20	SSF	14	0.69	79	
Kyrgyzstan	27.96	109	LM	21	CSA	5	0.53	122	
Cameroon	27.80	110	LM	22	SSF	15	0.84	19	
Uganda	27.65	111	LI	8	SSF	16	0.57	118	
Gambia	27.49	112	LI	9	SSF	17	0.77	39	
Honduras	27.48	113	LM	23	LCN	19	0.57	117	
Tajikistan	27.46	114	LI	10	CSA	6	0.65	101	
Fiji	27.31	115	UM	34	SEAO	15	0.28	140	
Côte d'Ivoire	27.16	116	LM	24	SSF	18	0.90	10	
Tanzania, United Republic of	27.00	117	LI	11	SSF	19	0.77	38	
Lesotho	26.97	118	LM	25	SSF	20	0.50	128	
Ecuador	26.87	119	UM	35	LCN	20	0.51	127	
Angola	26.20	120	UM	36	SSF	21	1.02	1	
Bhutan	26.06	121	LM	26	CSA	7	0.33	138	
Uzbekistan	25.89	122	LM	27	CSA	8	0.53	123	
Swaziland	25.37	123	LM	28	SSF	22	0.42	132	
Zambia	24.64	124	LM	29	SSF	23	0.68	81	
Madagascar	24.42	125	LI	12	SSF	24	0.59	116	
Algeria	24.38	126	UM	37	NAWA	18	0.52	125	
Ethiopia	24.17	127	LI	13	SSF	25	0.72	66	
Nigeria	23.72	128	LM	30	SSF	26	0.80	28	
Bangladesh	23.71	129	LI	14	CSA	9	0.61	112	
Nicaragua	23.47	130	LM	31	LCN	21	0.47	130	
Pakistan	23.07	131	LM	32	CSA	10	0.76	47	
Venezuela, Bolivarian Republic of	22.77	132	UM	38	LCN	22	0.68	84	
Zimbabwe	22.52	133	LI	15	SSF	27	0.69	77	
Niger	21.22	134	LI	16	SSF	28	0.29	139	
Nepal	21.08	135	LI	17	CSA	11	0.40	134	
Burundi	21.04	136	LI	18	SSF	29	0.36	137	
Yemen	20.80	137	LM	33	NAWA	19	0.65	97	
Myanmar	20.27	138	LI	19	SEAO	16	0.69	75	
Guinea	18.49	139	LI	20	SSF	30	0.61	109	
Togo	18.43	140	LI	21	SSF	31	0.24	141	
Sudan	14.95	141	LM	34	SSF	32	0.37	136	

Note: World Bank Income Group Classification (July 2013): 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 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: 41.68
Singapore	72.12	**1**	HI	**1**	SEAO	**1**	
Switzerland	67.96	2	HI	2	EUR	**1**	
Finland	67.91	3	HI	3	EUR	2	
Hong Kong (China)	67.61	4	HI	4	SEAO	2	
United States of America	67.31	5	HI	5	NAC	**1**	
United Kingdom	67.15	6	HI	6	EUR	3	
Sweden	67.01	7	HI	7	EUR	4	
Denmark	65.87	8	HI	8	EUR	5	
Canada	65.05	9	HI	9	NAC	2	
Australia	64.84	10	HI	10	SEAO	3	
Netherlands	64.23	11	HI	11	EUR	6	
Japan	63.83	12	HI	12	SEAO	4	
New Zealand	63.14	13	HI	13	SEAO	5	
Ireland	62.90	14	HI	14	EUR	7	
Korea, Republic of	62.37	15	HI	15	SEAO	6	
Norway	62.18	16	HI	16	EUR	8	
France	61.25	17	HI	17	EUR	9	
Germany	60.99	18	HI	18	EUR	10	
Austria	60.95	19	HI	19	EUR	11	
Luxembourg	59.02	20	HI	20	EUR	12	
Belgium	58.61	21	HI	21	EUR	13	
Israel	58.50	22	HI	22	NAWA	**1**	
Iceland	57.48	23	HI	23	EUR	14	
Spain	57.00	24	HI	24	EUR	15	
United Arab Emirates	56.85	25	HI	25	NAWA	2	
Estonia	56.78	26	HI	26	EUR	16	
Czech Republic	54.18	27	HI	27	EUR	17	
Portugal	53.80	28	HI	28	EUR	18	
Italy	53.38	29	HI	29	EUR	19	
Slovenia	53.22	30	HI	30	EUR	20	
Malaysia	52.78	31	UM	**1**	SEAO	7	
Cyprus	52.35	32	HI	31	NAWA	3	
Malta	51.81	33	HI	32	EUR	21	
Latvia	50.41	34	HI	33	EUR	22	
Lithuania	49.86	35	HI	34	EUR	23	
Chile	48.96	36	HI	35	LCN	**1**	
Slovakia	48.93	37	HI	36	EUR	24	
Greece	48.81	38	HI	37	EUR	25	
Poland	48.44	39	HI	38	EUR	26	
Qatar	48.42	40	HI	39	NAWA	4	
China	48.36	41	UM	2	SEAO	8	
Hungary	48.25	42	UM	3	EUR	27	
Croatia	47.65	43	HI	40	EUR	28	
Mauritius	47.49	44	UM	4	SSF	**1**	
Saudi Arabia	47.31	45	HI	41	NAWA	5	
Barbados	46.94	46	HI	42	LCN	2	
Bosnia and Herzegovina	46.42	47	UM	5	EUR	29	
Bahrain	46.24	48	HI	43	NAWA	6	
Bulgaria	46.10	49	UM	6	EUR	30	
Montenegro	45.94	50	UM	7	EUR	31	
Colombia	45.44	51	UM	8	LCN	3	
Russian Federation	45.33	52	HI	44	EUR	32	
Mongolia	45.23	53	LM	**1**	SEAO	9	
South Africa	45.19	54	UM	10	SSF	2	
Belarus	44.91	55	UM	11	EUR	33	
TFYR of Macedonia	43.99	56	UM	12	EUR	34	
Romania	43.95	57	UM	13	EUR	35	
Mexico	43.87	58	UM	14	LCN	4	
Seychelles	43.68	59	UM	15	SSF	3	
Peru	43.50	60	UM	16	LCN	5	
Costa Rica	43.21	61	UM	17	LCN	6	
Thailand	43.17	62	UM	18	SEAO	10	
Uruguay	43.06	63	HI	45	LCN	7	
Fiji	42.61	64	UM	19	SEAO	11	
Brazil	42.38	65	UM	20	LCN	8	
Rwanda	42.33	66	LI	**1**	SSF	4	
Georgia	41.84	67	LM	2	NAWA	7	
Oman	41.83	68	HI	46	NAWA	8	
Armenia	41.79	69	LM	3	NAWA	9	
Serbia	41.78	70	UM	21	EUR	36	
Turkey	41.68	71	UM	22	NAWA	10	

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

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 41.68
Panama	41.40	72	UM	23	LCN	9	
Albania	41.22	73	UM	24	EUR	37	
Moldova, Republic of	40.99	74	LM	4	EUR	38	
Kazakhstan	40.98	75	UM	25	CSA	1	
Morocco	40.55	76	LM	5	NAWA	11	
Lebanon	40.53	77	UM	26	NAWA	12	
Viet Nam	40.04	78	LM	6	SEAO	12	
Botswana	39.63	79	UM	27	SSF	5	
Jordan	39.29	80	UM	28	NAWA	13	
Argentina	39.22	81	UM	29	LCN	10	
Bhutan	39.20	82	LM	7	CSA	2	
Tunisia	39.10	83	UM	30	NAWA	14	
Ukraine	39.06	84	LM	8	EUR	39	
Jamaica	38.93	85	UM	31	LCN	11	
Trinidad and Tobago	38.80	86	HI	47	LCN	12	
Kuwait	38.44	87	HI	48	NAWA	15	
Dominican Republic	37.92	88	UM	32	LCN	13	
Azerbaijan	37.59	89	UM	33	NAWA	16	
Guyana	37.21	90	LM	9	LCN	14	
Namibia	37.18	91	UM	34	SSF	6	
Cabo Verde	37.13	92	LM	10	SSF	7	
Mozambique	36.86	93	LI	2	SSF	8	
Kyrgyzstan	36.57	94	LM	11	CSA	3	
El Salvador	36.18	95	LM	12	LCN	15	
Cambodia	35.98	96	LI	3	SEAO	13	
Lesotho	35.93	97	LM	13	SSF	9	
Swaziland	35.71	98	LM	14	SSF	10	
Ecuador	35.63	99	UM	35	LCN	16	
India	35.51	100	LM	15	CSA	4	
Philippines	35.24	101	LM	16	SEAO	14	
Uganda	35.17	102	LI	4	SSF	11	
Paraguay	35.15	103	LM	17	LCN	17	
Sri Lanka	35.01	104	LM	18	CSA	5	
Honduras	34.94	105	LM	19	LCN	18	
Iran, Islamic Republic of	34.75	106	UM	36	CSA	6	
Guatemala	34.62	107	LM	20	LCN	19	
Egypt	34.42	108	LM	21	NAWA	17	
Burkina Faso	34.20	109	LI	5	SSF	12	
Senegal	34.13	110	LM	22	SSF	13	
Malawi	34.00	111	LI	6	SSF	14	
Uzbekistan	33.88	112	LM	23	CSA	7	
Kenya	33.75	113	LI	7	SSF	15	
Indonesia	33.74	114	LM	24	SEAO	15	
Tajikistan	33.39	115	LI	8	CSA	8	
Ghana	33.22	116	LM	25	SSF	16	
Niger	32.87	117	LI	9	SSF	17	
Bolivia, Plurinational State of	32.49	118	LM	26	LCN	20	
Algeria	32.08	119	UM	37	NAWA	18	
Nicaragua	31.94	120	LM	27	LCN	21	
Gambia	31.03	121	LI	10	SSF	18	
Burundi	30.96	122	LI	11	SSF	19	
Madagascar	30.66	123	LI	12	SSF	20	
Tanzania, United Republic of	30.45	124	LI	13	SSF	21	
Mali	30.37	125	LI	14	SSF	22	
Cameroon	30.19	126	LM	28	SSF	23	
Nepal	30.02	127	LI	15	CSA	9	
Togo	29.65	128	LI	16	SSF	24	
Bangladesh	29.48	129	LI	17	CSA	10	
Zambia	29.26	130	LM	29	SSF	25	
Côte d'Ivoire	28.57	131	LM	30	SSF	26	
Ethiopia	28.04	132	LI	18	SSF	27	
Venezuela, Bolivarian Republic of	27.15	133	UM	38	LCN	22	
Zimbabwe	26.61	134	LI	19	SSF	28	
Nigeria	26.30	135	LM	31	SSF	29	
Pakistan	26.25	136	LM	32	CSA	11	
Angola	25.91	137	UM	39	SSF	30	
Yemen	25.20	138	LM	33	NAWA	19	
Myanmar	23.92	139	LI	20	SEAO	16	
Guinea	22.92	140	LI	21	SSF	31	
Sudan	21.90	141	LM	34	SSF	32	

Note: World Bank Income Group Classification (July 2013): 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 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: 27.86
Switzerland	68.63	1	HI	1	EUR	1	
Luxembourg	59.02	2	HI	2	EUR	2	
Netherlands	58.93	3	HI	3	EUR	3	
Sweden	57.78	4	HI	4	EUR	4	
United Kingdom	57.70	5	HI	5	EUR	5	
Iceland	56.56	6	HI	6	EUR	6	
Ireland	55.37	7	HI	7	EUR	7	
Germany	53.11	8	HI	8	EUR	8	
United States of America	52.89	9	HI	9	NAC	1	
Finland	52.04	10	HI	10	EUR	9	
Korea, Republic of	50.15	11	HI	11	SEAO	1	
Denmark	49.53	12	HI	12	EUR	10	
Malta	49.16	13	HI	13	EUR	11	
Estonia	48.83	14	HI	14	EUR	12	
New Zealand	48.71	15	HI	15	SEAO	2	
Israel	48.59	16	HI	16	NAWA	1	
Czech Republic	48.46	17	HI	17	EUR	13	
Austria	47.19	18	HI	18	EUR	14	
Hong Kong (China)	46.86	19	HI	19	SEAO	3	
Singapore	46.60	20	HI	20	SEAO	4	
China	46.57	21	UM	1	SEAO	5	
Canada	46.42	22	HI	21	NAC	2	
France	45.93	23	HI	22	EUR	15	
Australia	45.61	24	HI	23	SEAO	6	
Norway	45.43	25	HI	24	EUR	16	
Japan	44.10	26	HI	25	SEAO	7	
Slovenia	43.77	27	HI	26	EUR	17	
Belgium	43.22	28	HI	27	EUR	18	
Spain	41.14	29	HI	28	EUR	19	
Latvia	40.60	30	HI	29	EUR	20	
Moldova, Republic of	40.06	31	LM	1	EUR	21	
Italy	39.41	32	HI	30	EUR	22	
Portugal	39.41	33	HI	31	EUR	23	
Malaysia	39.18	34	UM	2	SEAO	8	
Bulgaria	38.23	35	UM	3	EUR	24	
Barbados	38.00	36	HI	32	LCN	1	
Hungary	37.74	37	UM	4	EUR	25	
Slovakia	37.05	38	HI	33	EUR	26	
Viet Nam	36.65	39	LM	2	SEAO	9	
Montenegro	36.52	40	UM	5	EUR	27	
Croatia	35.75	41	HI	34	EUR	28	
Lithuania	34.66	42	HI	35	EUR	29	
Cyprus	34.66	43	HI	36	NAWA	2	
Saudi Arabia	33.99	44	HI	37	NAWA	3	
Costa Rica	33.96	45	UM	6	LCN	2	
Turkey	33.93	46	UM	7	NAWA	4	
Ukraine	33.85	47	LM	3	EUR	30	
Chile	33.45	48	HI	38	LCN	3	
Russian Federation	33.32	49	HI	39	EUR	31	
Thailand	33.02	50	UM	8	SEAO	10	
Armenia	32.83	51	LM	4	NAWA	5	
Romania	32.45	52	UM	9	EUR	32	
Panama	32.20	53	UM	10	LCN	4	
Mexico	32.19	54	UM	11	LCN	5	
TFYR of Macedonia	32.07	55	UM	12	EUR	33	
Poland	31.87	56	HI	40	EUR	34	
Greece	31.75	57	HI	41	EUR	35	
Belarus	31.55	58	UM	13	EUR	36	
Serbia	31.16	59	UM	14	EUR	37	
Mauritius	30.98	60	UM	15	SSF	1	
South Africa	29.70	61	UM	16	SSF	2	
Qatar	29.60	62	HI	42	NAWA	6	
Argentina	29.38	63	UM	17	LCN	6	
Seychelles	29.21	64	UM	18	SSF	3	
Bahrain	29.10	65	HI	43	NAWA	7	
Uruguay	28.45	66	HI	44	LCN	7	
Jordan	28.26	67	UM	19	NAWA	8	
Oman	28.16	68	HI	45	NAWA	9	
India	27.97	69	LM	5	CSA	1	
Kuwait	27.96	70	HI	46	NAWA	10	
Tunisia	27.86	71	UM	20	NAWA	11	

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

Country/Economy	Score (0–100)	Rank	Income	Rank	Region	Rank	Median: 27.86
Senegal	27.77	72	LM	6	SSF	4	
Mongolia	27.59	73	LM	7	SEAO	11	
Brazil	27.52	74	UM	21	LCN	8	
Colombia	27.37	75	UM	22	LCN	9	
Lebanon	27.11	76	UM	23	NAWA	12	
Philippines	26.86	77	LM	8	SEAO	12	
Kenya	26.64	78	LI	**1**	SSF	5	
Sri Lanka	26.56	79	LM	9	CSA	2	
Angola	26.49	80	UM	24	SSF	6	
Mali	26.37	81	LI	2	SSF	7	
Peru	26.24	82	UM	25	LCN	10	
Paraguay	26.22	83	LM	10	LCN	11	
Morocco	25.84	84	LM	11	NAWA	13	
Indonesia	25.83	85	LM	12	SEAO	13	
Georgia	25.81	86	LM	13	NAWA	14	
Côte d'Ivoire	25.74	87	LM	14	SSF	8	
Trinidad and Tobago	25.55	88	HI	47	LCN	12	
Malawi	25.42	89	LI	3	SSF	9	
Cameroon	25.40	90	LM	15	SSF	10	
Cambodia	24.72	91	LI	4	SEAO	14	
Bolivia, Plurinational State of	24.68	92	LM	16	LCN	13	
Guyana	24.28	93	LM	17	LCN	14	
Gambia	23.95	94	LI	5	SSF	11	
Tanzania, United Republic of	23.56	95	LI	6	SSF	12	
Egypt	23.39	96	LM	18	NAWA	15	
Mozambique	23.29	97	LI	7	SSF	13	
Dominican Republic	23.28	98	UM	26	LCN	15	
United Arab Emirates	23.27	99	HI	48	NAWA	16	
Burkina Faso	23.16	100	LI	8	SSF	14	
Guatemala	23.06	101	LM	19	LCN	16	
Ghana	22.86	102	LM	20	SSF	15	
Azerbaijan	22.62	103	UM	27	NAWA	17	
El Salvador	22.43	104	LM	21	LCN	17	
Iran, Islamic Republic of	21.99	105	UM	28	CSA	3	
Tajikistan	21.54	106	LI	9	CSA	4	
Kazakhstan	21.52	107	UM	29	CSA	5	
Botswana	21.35	108	UM	30	SSF	16	
Nigeria	21.15	109	LM	22	SSF	17	
Jamaica	20.97	110	UM	31	LCN	18	
Ethiopia	20.29	111	LI	10	SSF	18	
Albania	20.26	112	UM	32	EUR	38	
Uganda	20.13	113	LI	11	SSF	19	
Cabo Verde	20.05	114	LM	23	SSF	20	
Zambia	20.02	115	LM	24	SSF	21	
Honduras	20.01	116	LM	25	LCN	19	
Pakistan	19.90	117	LM	26	CSA	6	
Kyrgyzstan	19.35	118	LM	27	CSA	7	
Namibia	19.11	119	UM	33	SSF	22	
Zimbabwe	18.42	120	LI	12	SSF	23	
Venezuela, Bolivarian Republic of	18.40	121	UM	34	LCN	20	
Bosnia and Herzegovina	18.21	122	UM	35	EUR	39	
Madagascar	18.17	123	LI	13	SSF	24	
Ecuador	18.11	124	UM	36	LCN	21	
Lesotho	18.01	125	LM	28	SSF	25	
Bangladesh	17.94	126	LI	14	CSA	8	
Uzbekistan	17.89	127	LM	29	CSA	9	
Rwanda	17.85	128	LI	15	SSF	26	
Algeria	16.68	129	UM	37	NAWA	18	
Myanmar	16.62	130	LI	16	SEAO	15	
Yemen	16.41	131	LM	30	NAWA	19	
Swaziland	15.03	132	LM	31	SSF	27	
Nicaragua	15.00	133	LM	32	LCN	22	
Guinea	14.06	134	LI	17	SSF	28	
Bhutan	12.93	135	LM	33	CSA	10	
Nepal	12.14	136	LI	18	CSA	11	
Fiji	12.01	137	UM	38	SEAO	16	
Burundi	11.13	138	LI	19	SSF	29	
Niger	9.57	139	LI	20	SSF	30	
Sudan	8.00	140	LM	34	SSF	31	
Togo	7.20	141	LI	21	SSF	32	

Note: World Bank Income Group Classification (July 2013): 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 and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

1st among the GII top 10) allows Switzerland to translate its robust innovation capabilities into high-level innovation outputs.

The runner-up, **the United Kingdom** (UK), keeps its position from last year after a strong rise from 10th in 2011 to 2nd in 2014 and 2015, with strengths in both its innovation inputs (6th) and outputs (5th). The UK places within the top 25 in all pillars and sub-pillars with only three exceptions: sub-pillars General infrastructure (48th), Knowledge absorption (30th), and Intangible assets (31st). Although it keeps its 2nd place in the overall GII rankings, the UK improves its ranking in the Human capital and research pillar (by three places) and Creative outputs (two places). Conversely, it slightly worsens in the Knowledge and technology outputs pillar (three places), with the remaining pillars moving up or down by only one place. The UK has strengths in all pillars except Institutions and ranks 1st in two of the three innovation quality indicators (see Box 3). Its weaknesses are mainly in the areas of education, investment, and productivity—for example, in graduates in science and engineering (39th), the pupil-teacher ratio for secondary education (56th), gross capital formation (122nd), and the growth rate of GDP per person engaged (78th), as well as in domestic trademark applications (50th).

The stability in the top three continues with **Sweden** in 3rd place, leading the Nordic countries. It achieves positions among the top 25 in all pillars, ranking 4th in overall outputs (2nd in Knowledge and technology outputs and 11th in Creative outputs), and in all sub-pillars with the exception of Trade and competition (28th) and Knowledge impact (28th). Sweden has improved its ranking by two places in two of the seven GII pillars: Human capital and research (4th), notably in the quality of its universities; and Business sophistication (7th), notably in the areas of knowledge workers and knowledge absorption. Sweden also drops three places in Infrastructure (7th)—in part as a result of the methodological changes of the UNPAN data on Government online service and E-participation data,[26] as well as five places in Market sophistication (14th) and two in Creative outputs (11th).

The Netherlands is ranked 4th in the GII this year (up from 5th in 2014), and is 3rd in the Output Sub-Index and 11th in the Input Sub-Index. It achieves positions among the top 25 in all pillars, improving the most in Human capital and research (by five places to reach 17th) and Knowledge and technology outputs (by three places to 6th). Its weakest showing is in Market sophistication at 17th place, which, however, also improved by two places this year. At the indicator level, the Netherlands ranks the strongest in the online e-participation index (1st), the logistics performance index (2nd), royalties and license fee payments and receipts (1st and 2nd places, respectively), and country-code top level domains (1st). Some of its major weaknesses (measured in percent ranks to take account of missing values) are in the Tertiary education sub-pillar, with a low number of tertiary graduates in science and engineering, and in the ease of starting a business, ease of protecting investors, joint venture/strategic alliance deals, and the cultural and creative services exports variables.

The United States of America (USA) is ranked 5th, up one spot from 6th in 2014, coming in 5th in inputs and 9th in outputs. The USA keeps its 1st place position in the Market sophistication pillar and Credit sub-pillar and has leading positions (within the top 25) for the rest of the pillars and 16 of the 21 sub-pillars. It also comes 1st in 7 of the 74 indicators with available data, including the cost of redundancy dismissal, total value of stocks traded, national office patent applications, citable documents H index, total computer software spending, generic top-level domains, and video uploads on YouTube. A weaker performance is seen in the number of ISO 14001 environmental certificates (96th), ISO 9001 quality certificates (90th), gross capital formation (89th), growth rate of GDP per person engaged (79th), GDP per unit of energy use (76th), number of graduates in science and engineering (75th), and GERD financed by business abroad (72nd).

Finland ranks 6th, down two positions from 2014, as a result of worsening in the Infrastructure pillar by eight places, Knowledge and technology outputs by three places, and Creative outputs by five places. However, it still ranks 1st in both Institutions and Human capital and research. Finland falls more than five places in the ICTs—notably also the consequence of a change of the methodology underlying the Government online service and e-participation data of UNPAN,[27] as well as dropping in the Knowledge diffusion and Creative goods and services sub-pillars. Conversely, Finland improves by more than five places in the Trade and competition and Knowledge absorption sub-pillars. The improvement in Knowledge absorption is mainly the result of other countries performing worse in this sub-pillar, lifting Finland up. Its loss of three positions in Knowledge and technology outputs is partly caused by lower high-tech and ICT services exports, which is potentially linked to the

lesser prominence of the ICT firm Nokia.

Singapore maintains its 2014 position at 7th place, the top-ranked country in the South East Asia and Oceania region. Singapore ranks 1st in innovation inputs (because of its 1st place in the Infrastructure and Business sophistication pillars and 2nd place in the Institutions pillar), yet it ranks 20th in innovation outputs, thus achieving quite a low ranking in innovation efficiency (100th). Singapore remains consistent across most areas of the GII, but with some notable progress in the Political environment (where it improves by 15 places), Ecological sustainability (9 places), Knowledge impact (5 places), and Knowledge diffusion (11 places) sub-pillars. Although the improvement in Political environment is the result of the removal of the press freedom index variable this year (see Annex 2), Singapore greatly improves in the GDP per unit of energy use variable, the growth rate of GDP per person engaged variable, and most of the variables in sub-pillar 6.3, Knowledge diffusion. Conversely, Singapore declines in the Investment (down four places), Trade and competition (six places), and Knowledge creation sub-pillars (five places).

Ireland is ranked 8th in 2015 (up three places from 2014) and is back in the top 10 for the second time. This improvement is attributable to a much improved innovation efficiency ranking (from 47th to 12th), a consequence of strengthening its innovation outputs (from 11th place in 2014 to 7th place in 2015). Ireland ranks in the top 25 across all pillars, with its biggest progress in Infrastructure (14 places) and Creative outputs (7 places). These pillar improvements are the result of significant improvement in all variables within the Ecological sustainability and Intangible assets sub-pillars.[28] Conversely, Ireland worsens slightly in Institutions (six places), Human capital and research (two places), Market sophistication (six places), and Business sophistication (one place). At the variable level, some of Ireland's weaknesses are the cost of redundancy dismissal, total value of stocks traded, intensity of local competition, high-tech imports, national office patent applications, and cultural and creative services exports.

Luxembourg maintains its 9th place position while improving its innovation output ranking to 2nd place (from 5th in 2014) and its innovation efficiency ranking to 3rd place (from 9th in 2014). It greatly improved in the Market sophistication pillar by 28 places, mainly because of improvements made in the Investment and Trade and competition sub-pillars. This is the result of an increased number of venture capital deals and the removal of the non-agricultural market access weighted tariff indicator from the GII model. The rest of Luxembourg's performance in the GII this year remains relatively stable with the exception of Human capital and research, where it drops from 27nd place in 2014 to 34th. This is the consequence of a drop in both the amount of government expenditure per pupil in secondary education and the number of graduates in science and engineering. Identified strengths include ICT access, environmental performance, employment in knowledge-intensive services, joint venture deals, and cultural and creative services exports.

Denmark is ranked 10th, down two positions from 8th place in 2014. This fall is similar to that of Finland, and—except for Sweden—there has been a noticeable decrease in the GII innovation performance of the Nordic European countries since 2011. Despite this decline, the country performs strongly in both the Input Sub-Index (at 8th place) and the Output Sub-Index (12th). It achieves a leading position (within the top 25) in all pillars and in 14 out of 21 sub-pillars, with strengths in its government effectiveness, regulatory quality, rule of law, school life expectancy, number of researchers, ICT use, and number of scientific and technical publications. Denmark's several steep drops in 2015 are mainly in the Infrastructure pillar in areas such as the government's online index and e-participation index,[29] GDP per unit of energy use, and the number of ISO 14001 certificates.

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, Switzerland, Finland, Hong Kong (China), the USA, the UK, Sweden, Denmark, Canada, and Australia. Hong Kong (China), Canada, and Australia are the only economies in this group that are not also in the GII top 10.

Hong Kong (China) is ranked 11th in the GII overall, down from 10th in 2014. However, it ranks 4th in the Input Sub-Index, with top 10 rankings in the Institutions (8th), Infrastructure (2nd), and Market sophistication (2nd) input pillars. It also ranks 8th in Creative outputs. Hong Kong (China)'s biggest strengths in the input variables are in regulatory quality, GDP per unit of energy use, domestic credit to private sector, ease of protecting investors, market capitalization,

intensity of local competition, and high-tech imports. Its biggest drop this year is in Business sophistication (where it falls by nine places to 15th) and in the Knowledge workers sub-pillar, mainly the result of its performance in the percentage of females employed with advanced degrees.[30] Hong Kong (China)'s biggest improvement is in the Knowledge and technology output pillar (it improves by 14 places to 31st place) in all sub-pillars and most variables.

Canada is ranked 16th, down from 12th in 2014 and 11th in 2013. It ranks 9th in the Input Sub-Index, with top 10 rankings on the Institutions pillar (6th)—linked to its strong performance (1st) in the Business environment sub-pillar—and the Market sophistication pillar (4th), the result of a robust performance in the Investment (5th) and Credit (9th) sub-pillars. Canada's decline is mostly the result of its drop in the Human capital and research pillar, from 13th in 2014 to 22nd this year. Its main weakness in this pillar is linked to government expenditure on secondary education per pupil, where it ranks 65th.

Australia maintains its 17th place overall GII rank and 10th place rank in the Input Sub-Index from 2014. It also maintains its top 10 rankings in three pillars: Human capital and research (9th), Infrastructure (4th), and Market sophistication (9th). It improves by three places in the Infrastructure pillar across two sub-pillars: ICTs (7th) and Ecological sustainability (27th). It also improves in Business sophistication by three places to 23rd, as a result of improvements made in two sub-pillars: Knowledge workers and Innovation linkages. In relation to innovation outputs, Australia also improved in Creative outputs by five places to 7th place, with improvements within all three sub-pillars. Australia's main falls take place in Human capital and research (down two places) and Knowledge and technology outputs (down eight places).

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 increased innovation outputs.

The top 10 countries in the Innovation Output Sub-Index this year are Switzerland, Luxembourg, the Netherlands, Sweden, the UK, Iceland, Ireland, Germany, the USA, and Finland. Ireland enters the list this year (ranked 11th in 2014), while Malta drops to 13th place. Eight of these countries are already in the GII top 10; the profiles of the other two economies are discussed below.

Iceland is ranked 13th in the GII overall, up six positions from 19th in 2014. This Nordic country ranks 23th in the Input Sub-Index and 6th in the Output Sub-Index. While the main leverage on the output side comes from its consistent 1st place in Creative outputs, where Iceland shows strengths in all sub-pillars and most indicators, it also shows great progress in the Knowledge and technology outputs sub-pillar (with an improvement of 12 places to reach 24th). This advance is linked to a substantial improvement in FDI net outflows.[31] In addition, notable developments have been made in the percentage of graduates in science and engineering (18 places), its performance in the e-participation index (15 places), and ease of protecting investors (14 places). Notable weaknesses for Iceland are its high-tech imports (100th), growth rate of labour productivity (103rd), high-tech and medium-high-tech output (85th), and creative goods exports (92nd).

Germany is ranked 12th in the overall GII, up one place from 2014. As has been the case for the past three years, Germany's relative strengths lies in the Output Sub-Index (8th), although it ranks a respectable 18th in the Input Sub-Index and shows a balanced profile, with pillar rankings ranging from 10th to 22nd. All sub-pillars rank among the top 40 with the exception of Investment (59th) and Creative goods and services (43rd). Germany's output strengths are attributable to its 1st place ranking in national office patent applications and country-code top-level domains, its 3rd place in the citable documents H index, and its 5th position in high-tech and medium-high-tech output.

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. This report attempts to abide by this underlying principle by assessing results on the basis of the development stages of countries.

Table 4 shows the 10 best performers in each index by income group. The top 28 positions in the GII are taken by high-income economies, the same number as in 2014. Switzerland, the UK, Sweden, and the USA are among the high-income top 10 on the three main indices, while Switzerland is the

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 (48 in total)				
1	**Switzerland (1)**	Singapore (1)	**Switzerland (1)**	**Switzerland (2)**
2	**United Kingdom (2)**	**Switzerland (2)**	Luxembourg (2)	Luxembourg (3)
3	**Sweden (3)**	**Finland (3)**	Netherlands (3)	Iceland (4)
4	Netherlands (4)	Hong Kong (China) (4)	**Sweden (4)**	Malta (7)
5	**United States of America (5)**	**United States of America (5)**	**United Kingdom (5)**	Netherlands (8)
6	**Finland (6)**	**United Kingdom (6)**	Iceland (6)	Czech Republic (11)
7	Singapore (7)	**Sweden (7)**	Ireland (7)	Ireland (12)
8	Ireland (8)	Denmark (8)	Germany (8)	Germany (13)
9	Luxembourg (9)	Canada (9)	**United States of America (9)**	**Sweden (16)**
10	Denmark (10)	Australia (10)	**Finland (10)**	Estonia (17)
Upper-middle-income economies (38 in total)				
1	**China (29)**	**Malaysia (31)**	**China (21)**	Angola (1)
2	**Malaysia (32)**	**China (41)**	**Malaysia (34)**	**China (6)**
3	**Hungary (35)**	**Hungary (42)**	**Bulgaria (35)**	**Bulgaria (21)**
4	**Bulgaria (39)**	Mauritius (44)	**Hungary (37)**	Turkey (23)
5	**Montenegro (41)**	Bosnia and Herzegovina (47)	**Montenegro (40)**	**Montenegro (29)**
6	Mauritius (49)	**Bulgaria (49)**	Costa Rica (45)	Costa Rica (32)
7	Costa Rica (51)	**Montenegro (50)**	Turkey (46)	**Hungary (35)**
8	Belarus (53)	Colombia (51)	Thailand (50)	Panama (36)
9	Romania (54)	South Africa (54)	Romania (52)	Thailand (43)
10	Thailand (55)	Belarus (55)	Panama (53)	Argentina (52)
Lower-middle-income economies (34 in total)				
1	**Moldova, Republic of (44)**	**Mongolia (53)**	**Moldova, Republic of (31)**	**Moldova, Republic of (5)**
2	**Viet Nam (52)**	Georgia (67)	**Viet Nam (39)**	**Viet Nam (9)**
3	**Armenia (61)**	**Armenia (69)**	**Ukraine (47)**	Côte d'Ivoire (10)
4	**Ukraine (64)**	**Moldova, Republic of (74)**	**Armenia (51)**	**Ukraine (15)**
5	**Mongolia (66)**	Morocco (76)	India (69)	Cameroon (19)
6	Georgia (73)	**Viet Nam (78)**	Senegal (72)	Senegal (24)
7	Morocco (78)	Bhutan (82)	**Mongolia (73)**	Nigeria (28)
8	India (81)	**Ukraine (84)**	Philippines (77)	India (31)
9	Philippines (83)	Guyana (90)	Sri Lanka (79)	**Armenia (34)**
10	Senegal (84)	Cabo Verde (92)	Paraguay (83)	Indonesia (42)
Low-income economies (21 in total)				
1	**Cambodia (91)**	Rwanda (66)	**Kenya (78)**	Mali (14)
2	**Kenya (92)**	**Mozambique (93)**	Mali (81)	**Kenya (30)**
3	Rwanda (94)	**Cambodia (96)**	**Malawi (89)**	Tanzania, United Republic of (38)
4	**Mozambique (95)**	Uganda (102)	**Cambodia (91)**	**Gambia (39)**
5	**Malawi (98)**	**Burkina Faso (109)**	**Gambia (94)**	**Malawi (53)**
6	**Burkina Faso (102)**	**Malawi (111)**	Tanzania, United Republic of (95)	Ethiopia (66)
7	Mali (105)	**Kenya (113)**	**Mozambique (97)**	Myanmar (75)
8	Uganda (111)	**Tajikistan (115)**	**Burkina Faso (100)**	Zimbabwe (77)
9	**Gambia (112)**	Niger (117)	**Tajikistan (106)**	**Cambodia (80)**
10	**Tajikistan (114)**	**Gambia (121)**	Ethiopia (111)	**Burkina Faso (85)**

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.

only economy also in the high-income top 10 in the efficiency ratio.

Among the upper-middle-income 10 best performers, five remain from 2014: China (29th), Malaysia (32nd), Hungary (35th), Bulgaria (39th), and Mauritius (49th); Thailand (55th) enters this list again this year. Newcomers to this group of 10 best performers are Montenegro (41st), Costa Rica (51st), Belarus (53rd), and Romania (54th), which displace Turkey (58th), South Africa (60th), Panama (62nd), and Seychelles (65th).

China, Malaysia, Hungary, Bulgaria, and Montenegro are among the 10 best performers in the three indices; of these, all except Malaysia also make it to the upper-middle-income top 10 in the efficiency ratio.

The same analysis for lower-middle-income countries shows that eight of the top 10 countries from 2014 remain in the top 10 this year, which include the Republic of Moldova (44th), Viet Nam (52nd), Armenia (61st), Ukraine (64th), Mongolia (66th), Georgia (73rd), Morocco (78th), India (81st); new this year are the Philippines (83rd) and Senegal (84th). The Republic of Moldova, Viet Nam, Ukraine, Armenia, and Mongolia are among the top 10 in the three indices; all of these except Mongolia are the only countries from this income group with top 10 positions in the efficiency ratio as well.

There has also been a strong consistency among low-income countries, with nine out of 10 economies remaining in the top 10. Cambodia paves its way to 1st place in this income group (91st),[32] followed by Kenya (92nd), Rwanda (94th), Mozambique (95th), Malawi (98th), Burkina Faso (102nd), Mali (105th), Uganda (111st), and Gambia (112nd), while Tajikistan (114th) displaces Kyrgyzstan (109th).

Performing strongly across all aspects of the GII, Cambodia, Kenya, Mozambique, Malawi, Burkina Faso, Gambia, and Tajikistan are among the top 10 in all three indices; of these except Malaysia and Tajikistan are in the low-income top 10 on efficiency.

The effectiveness of innovation systems and policies: 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 is designed to assess the effectiveness of innovation systems and policies. 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): Angola (120th), Switzerland (1st), Luxembourg (9th), Iceland (13th), the Republic of Moldova (44th), China (29th), Malta (26th), the Netherlands (4th), Viet Nam (52nd), and Côte d'Ivoire (116th). Countries in this list such as Angola and Côte d'Ivoire do not show significant innovation input and output results, yet their efficiency ratios appear high because their outputs outweigh their inputs on a low level. Indeed, economies might reach a relatively high 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.

Five of the top 10 most efficient economies are high-income economies: Switzerland, Luxembourg, Iceland, Malta, and the Netherlands. Countries from Sub-Saharan Africa, Europe, South East Asia and Oceania, and Northern Africa and Western Asia take up the first 20 positions in this ratio.

Among upper-middle-income countries, Angola—with the proviso noted above—and China are in the top 10. China makes it to the top 25 globally in outputs, surmounting lower capabilities. In this income group, 50% of countries have better rankings in outputs than they do in inputs.

Among lower-middle-income countries, the Republic of Moldova, Viet Nam, and Côte d'Ivoire are among the global top 10. The Republic of Moldova and Viet Nam are in the global top 50 in outputs, with lower positions in inputs. Within this income group, 61.8% of countries have better rankings in outputs than in inputs. No low-income countries are in the top 10 innovation efficiency rankings.

Leaders and achievers: Leveraging strengths and addressing weaknesses

Figure 3 on pages 28–29 illustrates the above findings by presenting the GII scores plotted against GDP per capita in PPP$ (in natural logs). When countries' stages of development are considered, the GII results can be interpreted in a new light (refer to Box 2 in Chapter 2).

The economies that appear close to the trend line show results that are in accordance with what is expected from their level of development.[33] A majority of economies are in this category. The farther up and above the trend line a country 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 already discussed above: They are the same economies as in 2014, with the exception of the Czech Republic (new this year) and the removal of Malta—all with GII scores above 50. They have succeeded in creating well-linked innovation systems where investments in human capital thrive in fertile and stable innovation infrastructures to create impressive levels of innovation outputs.
- 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 rising levels of innovation results because they have made improvements to their institutional frameworks and they have a skilled labour force with expanded tertiary education, better innovation infrastructures, a deeper integration with global credit investment and trade markets, and a sophisticated business community—even if progress on these dimensions is not uniform across their economies.
- There is also a group of economies that perform at least 10 percent below their peers for their level of GDP. This group of economies includes 34 countries: 7 from the high-income group (6 of these are from the Middle East), 14 from the upper-middle-income group, 7 from the lower-middle, and 5 low-income.

Latin America and the Caribbean: Untapped innovation potential

When reviewing the performance of regions at the pillar level it becomes evident that each has its own strengths. Latin America and the Caribbean is an example where these strengths are latent, yet innovation has still not reached desired levels. In this region, Brazil, Argentina, and Mexico—three of the world largest economies based on their GDPs—stand out as economies performing above the region's GII average. Yet none have been signalled as innovation achievers, while smaller nations such as Costa Rica and Guyana have reached this category in the past (see Box 4).

Although it has been noted that the region is converging towards higher scores in Infrastructure and Market sophistication, largely as a result of consistent policies to invigorate these areas, its aggregate performance has remained stable. However, economies such as Chile, Colombia, and Costa Rica, as well as Mexico and Peru, perform increasingly well (refer to Box 4 on pages 33–34 for more details).

Regional rankings

This section discusses regional and sub-regional trends, with snapshots for some of the economies leading in the rankings.

Table 6 on page 30 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 4 on page 31 presents, for each region, bars representing the median pillar scores (second quartile) as well as the range of scores determined by the first and second quartile; regions are presented in decreasing order of their average GII rankings (except for the EU, which is placed at the end).

Table 5: Innovation achievers and their income groups and regions

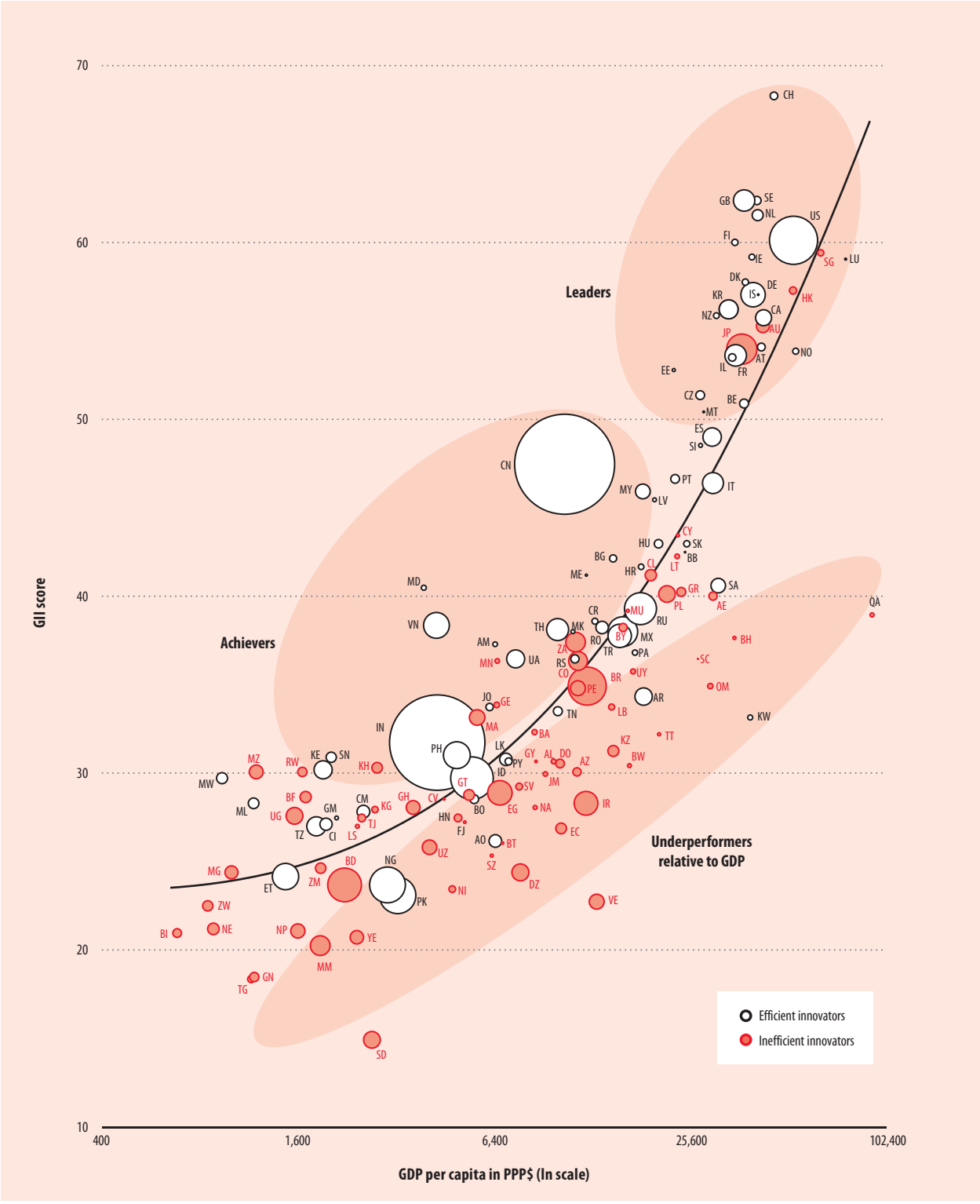
Economy	Income group	Region
Latvia	High-income	EUR
Malta	High-income	EUR
China	Upper-middle	SEAO
Malaysia	Upper-middle	SEAO
Montenegro	Upper-middle	EUR
Bulgaria	Upper-middle	EUR
Thailand	Upper-middle	SEAO
Jordan	Upper-middle	NAWA
Moldova, Rep.	Lower-middle	EUR
Viet Nam	Lower-middle	SEAO
Armenia	Lower-middle	NAWA
Senegal	Lower-middle	SSF
Mongolia	Lower-middle	SEAO
Ukraine	Lower-middle	EUR
India	Lower-middle	CSA
Morocco	Lower-middle	NAWA
Malawi	Low-income	SSF
Mozambique	Low-income	SSF
Rwanda	Low-income	SSF
Kenya	Low-income	SSF
Mali	Low-income	SSF
Burkina Faso	Low-income	SSF
Cambodia	Low-income	SEAO
Uganda	Low-income	SSF

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 and Oceania; NAWA = Northern Africa and Western Asia; SSF = Sub-Saharan Africa.

Sub-Saharan Africa (32 countries)

In recent years, three Sub-Saharan African countries have reached positions in the upper half of the GII rankings: Mauritius has been in the top half since 2011 and is 49th in 2015 (although down from 40th in 2014); South Africa, which has been in the top half of the rankings in all previous editions of the GII, is 60th in 2015 (down from 53rd in 2014); and Seychelles, which was in the top half of the rankings (51st) in 2014, is down to 65th in 2015. In addition,

Figure 3: GII scores and GDP per capita in PPP$ (bubbles sized by population)



Note: 'Efficient innovators' are countries/economies with Innovation Efficiency ratios ≥ 0.71; 'Inefficient innovators' have ratios < 0.71; the trend line is a polynomial of degree three with intercept ($R^2 = 0.739$).

Figure 3: GII scores and GDP per capita in PPP$ (bubbles sized by population): ISO-2 Country Codes

Code	Country
AE	United Arab Emirates
AL	Albania
AM	Armenia
AO	Angola
AR	Argentina
AT	Austria
AU	Australia
AZ	Azerbaijan
BA	Bosnia and Herzegovina
BB	Barbados
BD	Bangladesh
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BH	Bahrain
BI	Burundi
BO	Bolivia, Plurinational St.
BR	Brazil
BT	Bhutan
BW	Botswana
BY	Belarus
CA	Canada
CH	Switzerland
CI	Côte d'Ivoire
CL	Chile
CM	Cameroon
CN	China
CO	Colombia
CR	Costa Rica
CV	Cabo Verde
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
DO	Dominican Republic
DZ	Algeria
EC	Ecuador
EE	Estonia
EG	Egypt
ES	Spain
ET	Ethiopia
FI	Finland
FJ	Fiji
FR	France
GB	United Kingdom
GE	Georgia
GH	Ghana

Code	Country
GM	Gambia
GN	Guinea
GR	Greece
GT	Guatemala
GY	Guyana
HK	Hong Kong (China)
HN	Honduras
HR	Croatia
HU	Hungary
ID	Indonesia
IE	Ireland
IL	Israel
IN	India
IR	Iran, Islamic Rep.
IS	Iceland
IT	Italy
JM	Jamaica
JO	Jordan
JP	Japan
KE	Kenya
KG	Kyrgyzstan
KH	Cambodia
KR	Korea, Rep.
KW	Kuwait
KZ	Kazakhstan
LB	Lebanon
LK	Sri Lanka
LS	Lesotho
LT	Lithuania
LU	Luxembourg
LV	Latvia
MA	Morocco
MD	Moldova, Rep.
ME	Montenegro
MG	Madagascar
MK	TFYR of Macedonia
ML	Mali
MM	Myanmar
MN	Mongolia
MT	Malta
MU	Mauritius
MW	Malawi
MX	Mexico
MY	Malaysia
MZ	Mozambique
NA	Namibia
NE	Niger

Code	Country
NG	Nigeria
NI	Nicaragua
NL	Netherlands
NO	Norway
NP	Nepal
NZ	New Zealand
OM	Oman
PA	Panama
PE	Peru
PH	Philippines
PK	Pakistan
PL	Poland
PT	Portugal
PY	Paraguay
QA	Qatar
RO	Romania
RS	Serbia
RU	Russian Federation
RW	Rwanda
SA	Saudi Arabia
SC	Seychelles
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SN	Senegal
SV	El Salvador
SZ	Swaziland
TG	Togo
TH	Thailand
TJ	Tajikistan
TN	Tunisia
TR	Turkey
TT	Trinidad and Tobago
TZ	Tanzania, United Rep.
UA	Ukraine
UG	Uganda
US	United States of America
UY	Uruguay
UZ	Uzbekistan
VE	Venezuela, Bolivarian Rep.
VN	Viet Nam
YE	Yemen
ZA	South Africa
ZM	Zambia
ZW	Zimbabwe

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	68.29	89.62	59.22	58.63	72.33	59.97	67.95	72.41	64.84	68.63	1.01
United Kingdom	62.42	87.32	57.45	63.04	74.31	53.59	67.14	54.92	60.48	57.70	0.86
Sweden	62.39	90.00	61.67	62.75	63.70	56.92	67.01	60.45	55.10	57.77	0.86
Netherlands	61.58	91.88	51.72	60.50	61.77	55.26	64.23	55.93	61.92	58.93	0.92
United States of America	60.10	86.81	54.03	58.84	81.48	55.35	67.30	57.96	47.81	52.89	0.79
Finland	59.97	95.84	64.89	58.51	61.51	58.75	67.90	51.89	52.18	52.03	0.77
Singapore	59.35	95.44	60.89	69.54	71.57	63.13	72.11	51.47	41.71	46.59	0.65
Ireland	59.13	87.22	50.05	54.86	63.96	58.36	62.89	55.70	55.02	55.36	0.88
Luxembourg	59.01	83.54	40.84	54.23	56.23	60.24	59.02	49.06	68.96	59.01	1.00
Denmark	57.70	93.13	62.43	55.71	68.35	49.71	65.87	46.06	52.99	49.53	0.75
Average	**37.01**	**62.10**	**31.15**	**39.25**	**48.55**	**35.66**	**43.35**	**28.23**	**33.10**	**30.67**	**0.69**
Region											
Northern America	57.91	89.74	51.50	59.88	77.48	52.31	66.18	49.94	49.36	49.65	0.75
Europe	47.99	76.37	44.15	49.61	54.95	42.29	53.48	39.44	45.56	42.50	0.79
South East Asia and Oceania	42.68	65.87	38.43	46.25	56.16	41.70	49.68	35.53	35.84	35.69	0.72
Northern Africa and Western Asia	35.26	61.05	32.08	41.74	46.24	30.44	42.31	24.83	31.59	28.21	0.67
Latin America and the Caribbean	32.49	54.87	25.29	35.37	44.29	35.37	39.04	21.01	30.86	25.94	0.66
Sub-Saharan Africa	27.05	51.66	16.89	25.60	41.37	30.29	33.16	19.34	22.53	20.94	0.64
Central and Southern Asia	27.03	47.67	22.41	31.77	43.00	25.60	34.09	20.12	19.82	19.97	0.59
Income level											
High income	49.63	79.98	46.35	53.51	56.81	44.27	56.18	39.64	46.50	43.07	0.76
Upper-middle income	34.58	58.90	29.85	38.75	46.17	33.31	41.40	25.10	30.44	27.77	0.67
Lower-middle income	29.10	49.90	20.60	30.04	43.53	29.34	34.68	21.41	25.61	23.51	0.68
Low income	25.35	46.76	15.88	22.49	42.14	30.48	31.55	18.86	19.43	19.14	0.61

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 2012 and 11 February 2013, respectively)

six other countries from this region are ranked among the top 100: Senegal (84th), Botswana (90th), Kenya (92nd), Rwanda (94th), Mozambique (95th), and Malawi (98th). However, with 31 missing values, Seychelles ranks 1st in the list of economies with the highest number of missing values (see Annex 2). If one removes Seychelles from the top list for this reason, the top regional performers are Mauritius, South Africa, and Senegal.

The remaining 23 countries in this region can be found at the bottom of the rankings (100 or lower); 10 of them have improved since 2014. Malawi, Mozambique, Senegal, Rwanda, Kenya, Mali, Burkina Faso, and Uganda—also an innovation outperformer—are among the innovation achievers this year, while Burundi, Niger, Namibia, Angola, Swaziland, Guinea, Togo, Seychelles, Botswana, and Sudan have below-par performances.

Countries from this region with the biggest improvement in GII rankings are Malawi and Angola (improving 15 places each), Senegal and Mali (14 each), Mozambique (12), Rwanda (8), Burkina Faso (7), and the United Republic of Tanzania (6).

Figure 4: 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.

Nearly 50% of the countries with the highest number of missing values (20 or more) are from this region (see Annex 2). Because the GII does not impute values for missing data, including missing values can have a positive impact on some economies' overall rankings. If only those countries with data coverage of 75% or higher were assessed, Seychelles would lose its 2nd place ranking (it ties for the highest number of missing values), as would Rwanda (95th, data coverage of 72%) and Malawi (98th, data coverage of 71%), which now rank 7th and 9th in the region, respectively. This would make Senegal number 3 in the region, and bring in Namibia as 8th, Ghana as 9th, and Uganda as 10th. Conversely, two countries from this region should be commended for having over 90% data coverage: South Africa and Kenya.

Central and Southern Asia (11 economies)

In all prior editions of the GII, of the countries in Central and Southern Asia, only India (81st) and Kazakhstan (82nd) have consistently achieved positions among the first 100; this year, Bhutan (121st) drops out of the top 100 and is displaced by Sri Lanka (85th). The remaining seven countries of the region are found at the bottom of the rankings: the Islamic Republic of Iran (106th), Kyrgyzstan (109th), Tajikistan (114th), Uzbekistan (122nd), Bangladesh (129th), Pakistan (131st), and Nepal (135th). In 2015 only India remains an innovation achiever, with Nepal and Bhutan joining Tajikistan, Uzbekistan, Pakistan, Kazakhstan, and the Islamic Republic of Iran with below-par performances relative to their GDP (Figure 3). All of these countries, with the exception of Pakistan and Kazakhstan, are highlighted as being among those economies with the highest number of missing values (see Annex 2).

India still comes 1st in the region, although it is now 8th among lower-middle-income countries (7th in 2014) and has dropped five positions in the overall GII since 2014. With more than 1.2 billion inhabitants and a robust economy, this lower-middle-income country is again among the innovation achievers and has also been highlighted as an innovation outperformer (see Chapters 2 and 8). Its new government is dedicated to focusing on further improving the economy, business investment, and innovation. India's strengths lie in the sub-pillars Knowledge diffusion (34th), R&D (44th), General infrastructure (43rd), and Investment (42nd). India has made some progress in Institutions (improving two places) and Knowledge and technology outputs (improving one place to reach 49th). Still, its position remains weaker in Institutions (104th) and Infrastructure (87th), with rankings deteriorating in Human capital and research (103rd), Market sophistication (72nd), Business sophistication (116th), and Creative outputs (95th) (falling from 96th, 50th, 93rd, and 82nd in 2014, respectively).

Sri Lanka makes commendable progress in its GII ranking from 105th in 2014 to 85th this year. With the exception of Creative outputs, Sri Lanka advances significantly in all GII pillars. Although some of this development can be linked to methodological changes (see Annex 2) and other countries worsening (particularly in Human capital and research), Sri Lanka makes advancements at the raw data level in areas such as the government's online service index and online e-participation,[34] GDP per unit of energy use, and communications and computer and information services imports. Conversely, Sri Lanka worsened at the raw data level in areas such as ease of starting a business, ease of resolving insolvency, rule of law, employment in knowledge-intensive services, and new business density.

Latin America and the Caribbean (22 economies)

Latin America and the Caribbean includes only upper- and lower-middle-income economies except for high-income Barbados, Trinidad and Tobago, Chile, and Uruguay (see also Box 4 for details about this region).

This year Barbados (37th) reaches 1st place in the regional rankings,[35] followed by Chile (42nd) and upper-middle-income countries Costa Rica (51st), Mexico (57th), Panama (62nd), Colombia (67th), Uruguay (68th), and Brazil (70th)—all in the first half of the rankings. However, with 26 missing values, Barbados is among the economies with the highest number of missing values (see Annex 2). If Barbados is eliminated from the top list for this reason, the top regional performers are Chile, Costa Rica, and Mexico.

The remaining countries in the top 100 are Peru (71st), Argentina (72nd), Trinidad and Tobago (80th), Guyana (86th), Paraguay (88th), Dominican Republic (89th), Jamaica (96th), and El Salvador (99th). The remaining countries are ranked below 100: Guatemala (101st), the Plurinational State of Bolivia (104th), Honduras (113th), Ecuador (119th), Nicaragua (130th), and the Bolivarian Republic of Venezuela (132nd).

No countries in the region are among innovation achievers this year; seven display below-par performances relative to their GDP per capita (Figure 3): Jamaica and Dominican Republic (both drop from performing at par to

Box 4: Latin America and the Caribbean: A region with improving but largely untapped innovation potential

This year the Global Innovation Index (GII) identifies a small set of emerging economies that exhibit remarkable innovation performance over time. Innovation performance is reviewed by assessing a country's GII score and its performance in each of the seven innovation input and output factors relative to its level of development (see Chapter 2).

In this analysis, no economies from Latin America qualify as innovation outperformers.[1]

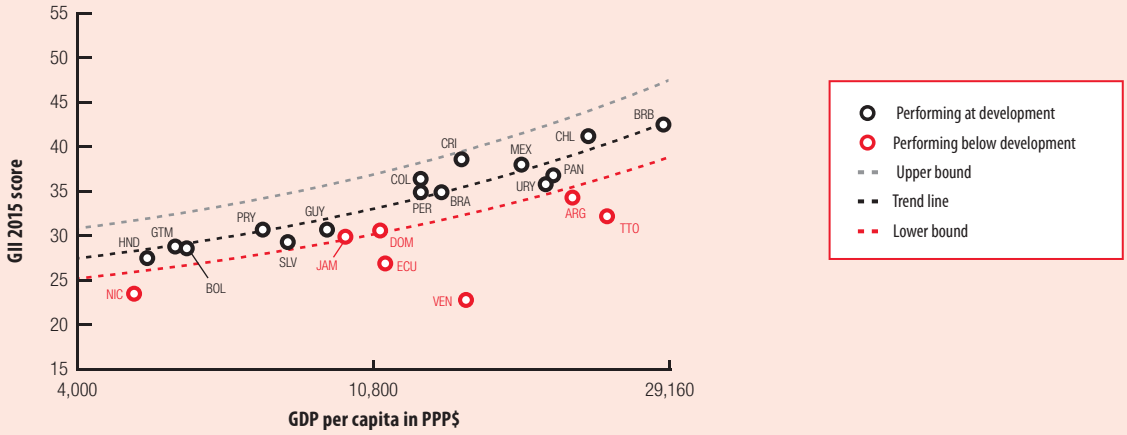
However, between 2011 and 2014, only Costa Rica (2013) and Guyana (2011) were once reported as outperforming on innovation relative to their development level.[2] The fact that Chile is a high-income economy—and thus is now competing with world leaders—makes it harder for it to outperform relative to its development level.

Figure 4.1 and the data for 2015 show that only Chile, Colombia, and Costa Rica detach themselves from their expected performance and move in the direction of outperforming relative to their GDP per capita.[3] Mexico and Peru are next in line, and they also do well on various innovation inputs and outputs in 2015.

This tendency of the relatively strong performance exhibited by the countries noted above is also mirrored by the regional comparison. Since 2011—in addition to Argentina, Brazil, and Uruguay—Chile, Colombia, and Costa Rica have consistently performed above the region's average GII, both overall as well as on input and output metrics. Mexico and Peru excel primarily in the area of innovation inputs.

When it comes to outperformance at the pillar level, six Latin-American economies scored above their income group average in four or more pillars almost every year since 2011: Brazil and Costa Rica (every year) and Argentina, El Salvador, Panama, and Peru (every year except one) (see Table 4.1). Nine countries have done so in 2015. Colombia and Costa Rica both outperform in five or more pillars in 2015. At the regional level both these economies also outperform in most pillars, with the exception of Market sophistication for Colombia and Creative outputs for Costa Rica. Chile is far from outperforming its high-income peers in four or more pillars, yet its notable performance is shown by above-average regional scores in all seven pillars. Mexico stands out in 2015 because it is the only country in the region to score above the upper-middle-income averages in all seven pillars this year.

Figure 4.1: Latin America and the Caribbean economies closest to the innovation achievers' threshold, 2015



Note: ARG = Argentina; BOL = Bolivia, Plurinational State of; BRB = Barbados; BRA = Brazil; CHL = Chile; COL = Colombia; CRI = Costa Rica; DOM = Dominican Republic; ECU = Ecuador; GTM = Guatemala; GUY = Guyana; HND = Honduras; JAM = Jamaica; MEX = Mexico; NIC = Nicaragua; PAN = Panama; PER = Peru; PRY = Paraguay; SLV = El Salvador; TTO = Trinidad and Tobago; URY = Uruguay; and VEN = Venezuela, Bolivarian Republic.

(Continued on next page)

performing below-par), Nicaragua, Argentina, Ecuador, Trinidad and Tobago, and the Bolivarian Republic of Venezuela. Honduras, El Salvador, and Uruguay, all improved since 2014, move out of this underperformer group.

Barbados is ranked 37th, up four positions from 41st place in 2014. With a population of 0.3 million and a GDP per capita of PPP$25,193, Barbados ranks 46th in the Input Sub-Index (down from 38th in 2014). It comes in at 36th in the Output Sub-Index (up from 53rd), where its significant improvement is determined by better rankings in

Box 4: Latin America and the Caribbean: A region with improving but largely untapped innovation potential *(cont'd.)*

Table 4.1: Latin America and the Caribbean: Innovation achievers and pillar outperformers, 2011–15

Economy	Income group	Years as an innovation achiever (total)	Years as a pillar outperformer (total)
Argentina	Upper-middle income		2014, 2013, 2012, 2011 (4)
Bolivia, Plurinational St.	Lower-middle income		2015, 2013 (2)
Brazil	Upper-middle income		2015, 2014, 2013, 2012, 2011 (5)
Colombia	Upper-middle income		2015, 2013 (2)
Costa Rica	Upper-middle income	2013 (1)	2015, 2014, 2013, 2012, 2011 (5)
El Salvador	Lower-middle income		2015, 2014, 2013, 2012 (4)
Guatemala	Lower-middle income		2012 (1)
Guyana	Lower-middle income	2011 (1)	2013, 2012, 2011 (3)
Honduras	Lower-middle income		2013 (1)
Panama	Upper-middle income		2015, 2014, 2012, 2011 (4)
Mexico	Upper-middle income		2015, 2014, 2013 (3)
Nicaragua	Lower-middle income		2013, 2012 (2)
Paraguay	Lower-middle income		2015, 2014, 2012 (3)
Peru	Upper-middle income		2015, 2014, 2013, 2012 (4)

Notes

1 For a country to be labeled as 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—2013 and 2014. In 2015 11 economies were identified as innovation outperformers this was 2013 and 2014. Northern America is the only other region that has no representation among this group of 11 innovation outperformers. This is because the countries that comprise this region are among the top 25 innovation leaders and hence not eligible for innovation outperformer status. See Chapter 2 for more details.

2 Guyana is missing 33% of the data points for its analysis (27 out of 80 indicators have no data available).

3 The general trendline 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 trendline (see Box 2 in Chapter 2 for more details).

the pillars of Knowledge and technology outputs (18th up from 33rd) and Creative outputs (63rd up from 85th).

Brazil is ranked 70th (down from 61st in 2014), 19th among upper-middle-income countries (down from 16th), and 8th in the region (down from 5th). Although Brazil drops in its overall GII ranking, it improves in a number of innovation inputs. The country improves in six of the eight variables in Institutions, bringing up this pillar ranking by 11 places to reach 85th. In addition, it improves in Market sophistication by two places to 87th, a result of bettering eight of this pillar's nine variables. Conversely, Brazil's major falls take place in both innovation output pillars, where it drops from 65th to 72nd in Knowledge and technology outputs and from 64th to 82nd in Creative outputs. Although its fall in Knowledge diffusion is mainly the result of other countries improving in this area, it is declining in ICTs and business and organizational model creation, and in online creativity, as measured by the GII.

Northern Africa and Western Asia (19 economies)

Israel (22nd) and Cyprus (34th) achieve the top positions in the region for the third year running. Three of the six countries of the Gulf Cooperation Council (GCC) come next: Saudi Arabia (43rd), the United Arab Emirates (47th), and Qatar (50th).

Although the scaling by GDP of a few indicators (required for comparability across countries) penalizes the relatively wealthy, resource-rich countries of the GCC, they often exhibit relative shortcomings in important areas in which this effect does not prevail, 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 2013 and 2014 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.

Furthermore, the revisions to the PPP conversion factors implemented by the World Bank's International Comparison Program (ICP) (refer to Annex 2), a scaling factor used for 11 of the 79 GII variables, had a particularly significant impact on nine economies in this region, especially the United Arab Emirates, Jordan, Kuwait, Bahrain, Saudi Arabia, and Oman. Although the revised PPP values did not greatly affect the overall GII rankings in the region,

they did affect some of the variable-level rankings.

Most of the countries in this region rank in the top 100, including Turkey (58th), Bahrain (59th), Armenia (61st), Oman (69th), Georgia (73rd), Lebanon (74th), Jordan (75th), Tunisia (76th), Kuwait (77th), Morocco (78th), Azerbaijan (93rd), and Egypt (100th). Only two fall out of the top 100—Algeria (126th) and Yemen (137th).

Although Israel is the only innovation leader in the region, Armenia and Jordan remain in the group of innovation achievers (both are also flagged as innovation outperformers; see Chapter 2) and are joined by Morocco this year, while Georgia just falls out of this group. Morocco has made a notable improvement of eight places—another example of a country putting in effort to improve its innovation metrics. Improving at the raw data level in expenditure on education and government expenditure on secondary education per pupil are the main reasons for Morocco's progress in Human capital and research, where it advances from 64th to 56th. Conversely, its improvement in Infrastructure is linked to methodological changes to the UN e-Government Survey methodology questionnaire (variables 3.1.3 and 3.1.4).

Lebanon, Azerbaijan, Saudi Arabia, the United Arab Emirates, Yemen, Algeria, Bahrain, Oman, Kuwait, and Qatar show below-par performances compared to their income levels (Figure 3).

Israel falls seven places from 15th in 2014 to 22nd in 2015, yet still remains number 1 in the region. With an innovation input rank of 22 and an output rank of 16, it has improved its overall efficiency ratio ranking from 42nd to 20th. Israel's biggest drops are in Human capital and research (5th in 2014 to 11th in 2015), Market sophistication (12th in 2014 to 21st in 2015), and Business sophistication (3rd in 2014 to 11th in 2015). Since last year Israel has considerably improved its data availability. But while helping to provide a more accurate picture of its innovation ranking, the inclusion of these new data is partially responsible for Israel's fall in Human capital and research and its overall ranking (see Annex 2). Israel also makes some notable improvements at the variable level, particularly in applied tariff rates, communications, computer and information services imports, and cultural and creative services exports.

South East Asia and Oceania (16 economies)

This region's 16 economies range across all income groups. The first five rank among the top 25 in the three indices (GII, inputs, and outputs): Singapore (7th), which displaces Hong Kong (China) at the top of the regional rankings this year; Hong Kong (China), which is now 11th globally; the Republic of Korea (14th); New Zealand (15th); and Australia (17th). These five economies, as well as Japan (19th), are innovation leaders, all placing within the top 25.

Among upper-middle-income economies, China (29th) and Malaysia (32nd) rank high, with Thailand falling back down the ranks from 48th in 2014 to 55th in 2015 and Fiji performing poorly at 115th. Lower-middle-income Viet Nam keeps its innovation achiever status—and is flagged as an innovation outperformer—while advancing 19 places to 52nd. Mongolia drops to 66th, the Philippines progresses to 83rd, and Indonesia falls to 97th. Low-income Cambodia now places in the top 100 (up from 106th in 2014 to 91st in 2015) and Myanmar is ranked 138th.

This region has six innovation achievers: China, Viet Nam, Mongolia (also an innovation outperformer), Malaysia, Cambodia (a new addition), and Thailand. With the exception of Northern America, South East Asia and Oceania is the region with the lowest number of economies with below-par innovation performances (only Myanmar;see Figure 3).

For the fourth year in a row **China** maintains its strengths: overall, it preserves its 29th place ranking and is 1st among upper-middle-income countries and 7th in the region. China advances in all areas of the Institutions pillar (ranked 91st) and makes slight improvements in Human capital and research (up one place to 31st), Infrastructure (up seven places to 32nd), Business sophistication (up one place to 31st), and Creative outputs (up five places to 54th). China has also been flagged as an innovation outperformer in this year's edition (see Chapters 2 and 6). Conversely, China dropped slightly in Market sophistication (down five places to 59th) and Knowledge and technology outputs (down one place to 3rd). China is only 3.5 points away from making it into the GII top 25, an improvement over the 3.9 points away it was in 2014.[36]

Malaysia, improving one place to reach 32nd this year, has put considerable effort into improving its innovation performance and coordinating its STI via the Ministry of Science, Technology and Innovation. The result of this effort is also evident in its low level of missing values (only two). It improves in three overall pillars of the GII: Institutions (by eight places to 42nd), Business sophistication (by seven places to 22nd), and Knowledge technology and outputs (by four places to 35th). Conversely, while it dropped only seven places

in Creative outputs, it dropped nine and ten places in Infrastructure and Market sophistication, respectively. Malaysia has also been flagged as an innovation outperformer in this year's edition (see Chapter 2).

Europe (39 countries)

As last year, a total of 16 European countries (13 of them from the EU) are among the top 25: Switzerland (1st), the UK (2nd), Sweden (3rd), the Netherlands (4th), Finland (6th), Ireland (8th), Luxembourg (9th), Denmark (10th), Germany (12th), Iceland (13th), Austria (18th), Norway (20th), France (21st), Estonia (23rd), the Czech Republic (24th), and Belgium (25th). All of these achieve positions in the top 25 in both the Output and Input Sub-Indices with the exception of Estonia (26th in inputs), the Czech Republic (27th in inputs), and Belgium (28th in outputs). It should be noted that most of the countries in this region have the fewest missing values, leading them to display the most accurate GII rankings (see Annex 2).

Sixteen countries follow among the top 50 and maintain relatively stable rankings since 2014, including all remaining EU countries, with the exception of Romania (54th): Malta (26th), Spain (27th), Slovenia (28th), Portugal (30th), Italy (31st), Latvia (33rd), Hungary (35th), Slovakia (36th), Lithuania (38th), Bulgaria (39th), Croatia (40th), Montenegro (41st), the Republic of Moldova (44th), Greece (45th), Poland (46th), and the Russian Federation (48th).

The remaining European economies, with the exception of Ukraine, improve their overall GII rankings from 2014 to 2015: Belarus (53rd, up from 58th in 2014), the Former Yugoslav Republic of Macedonia (56th, up from 60th in 2014), Serbia (63rd, 67th in 2014), Ukraine (64th, 63rd in 2014), Bosnia and Herzegovina (79th, 81st in 2014), and Albania (87th, 94th in 2014). In addition, the Republic of Moldova and Ukraine are positioned among the innovation achievers (the Republic of Moldova is also an innovation outperformer), while Greece and Albania show below-par performances (see Figure 3).

Ranking 48th, up one position from its 49th place in 2014, **the Russian Federation** is ranked 32nd in Europe. This year the country maintains a relatively stable position across innovation inputs (from 56th in 2014 to 52nd in 2015) and outputs (from 45th in 2014 to 49th in 2015). Its biggest improvements lie in the Market and Business sophistication pillars, improving 17 positions to 94th and 16 positions to 44th place, respectively. Within these pillars, the Russian Federation's strengths are employment in knowledge-intensive services, the percentage of females employed with advanced degrees, royalties and license fee payments, national office patent applications, national office utility model applications, citable documents H index, and FDI net outflows. Its biggest fall is in Infrastructure, dropping 14 places to 65th. Its main weakness in this pillar is GDP per unit of energy use.

Conclusions

The theme for this year's GII is 'Effective Innovation Policies for Development'. This chapter has provided a current assessment of global innovation expenditures in the context of a fragile economic recovery. In addition, it has analysed opportunities and challenges when designing innovation policies in a developing country context.

Finally, this chapter has presented the main GII 2015 results, distilling six main messages. The six key messages addressed by this chapter—that quality matters at the top; that emerging economies are catching up to rich economies; that institutions matter (especially because of their role in establishing rules for international interaction); that the Business sophistication pillar makes a particularly big difference among low-income economies; that encouraging signs are emerging in Sub-Saharan Africa; and that the BRICS economies, especially China, are gaining ground in innovation quality—indicate that there is potential for those economies on the cusp of the top 10 or top 25 to make their way into the top rankings, provided they focus their efforts on improving key areas of innovation such as innovation institutions and the quality of innovation.

The remaining chapters provide more details on developing countries that have outperformed on innovation. Chapter 2 identifies a set of low- and middle-income countries that—over time—have succeeded in outperforming on innovation generally and on specific innovation inputs and outputs more specifically. Chapters 3 through 11 then provide additional details on innovation policies adapted in some of these developing countries, assessing their strengths and further development potential.

Notes and References for Box 1

Notes

1 Data are based on the UNESCO-UIS Science & Technology Data Center, updated February 2015. Data used: GERD, performed by business enterprise (in '000 PPP$, constant prices, 2005).

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 4 February 2015. Data used: Gross domestic expenditure on R&D (GERD) at constant 2005 PPP$. OECD countries are represented by the MSTI indicator 'OECD-total'.

3 UNESCO-UIS Science & Technology Data Center and OECD Main Science and Technology Indicators (MSTI), updated February 2015. Data used: GERD, performed by business enterprise (in '000 PPP$, constant prices, 2005).

Economies included are the same as those listed in endnote 1.

4 OECD MSTI, updated 4 February 2015. Data used: Business enterprise expenditure on R&D (BERD) at constant 2005 PPP$, See Main Science and Technology Indicators (MSTI) indicator 'OECD-total'.

5 Based on the *2014 EU Industrial R&D Investment Scoreboard* from the European Commission (DG Research and Innovation and DG Joint Research Centre). The *2014 Scoreboard* is based on a changing sample of the top 2,500 R&D spenders of a given year. What is measured is the total value of these firms' global R&D expenditures, irrespective of the location where the relevant R&D takes place. The distribution of countries in global top 2,500 R&D spenders shows that firms with headquarters in the United States of America, Japan, and Germany were still the top R&D spenders in 2013. Firms in China have increased their share to 3.8% in 2013, while the share of Japanese firms has decreased to 15.9%.

6 PricewaterhouseCoopers and Strategy&, 2014. This growth is based on a changing sample of firms of the top 1,000 R&D spenders of a given year. It also measures the total value of their global R&D expenditures, irrespective of the location where the relevant R&D takes place.

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Notes and References for Chapter 1

Notes

1 IMF, 2015a; OECD, 2015.

2 IMF, 2015a.

3 Conference Board, 2015; IMF, 2015b.

4 World Bank, 2015.

5 OECD, 2009; WIPO, 2010; Dutta et al., 2013, 2014.

6 Dutta et al., 2014.

7 Dutta et al., 2014, based on UNESCO Institute for Statistics R&D data and OECD Main Science and Technology Indicators. See also OECD, 2014.

8 The biggest increase in R&D intensity between 2008 and 2013 was achieved by the Republic of Korea, with a jump from 3.12% to 4.15% of GDP. Slovenia exhibited an increase of nearly 1%, expanding from 1.66% in 2008 to 2.65% in 2013, while the Czech Republic, China, and Serbia have increased their R&D Intensity by 0.7%, 0.61%, and 0.59%.

9 WIPO, 2014. Note also that patent applications under WIPO's Patent Cooperation Treaty (PCT) saw a 4.5% increase in 2014; this represents a fall in growth compared with previous years (WIPO, 2015).

10 WIPO, 2011a.

11 It must be noted that even in these experienced innovative nations, deciding and implementing the right innovation policy mix remains a continual challenge because innovation parameters and objectives tend to evolve. See OECD, 2014.

12 The innovation system approach aims to provide a holistic framework to analyse innovation performance (Freeman, 1987; Lundvall, 1992; Edquist, 1997). It starts from the assumption that firms do not conduct innovation in isolation, but instead are part of a larger system made of multiple agents—for example, universities, financial institutions, governments, and so on—that interact with each other. The functioning and outcomes of innovation systems also depend on institutional, organizational, historical, and political framework conditions.

13 OECD, 2010, proposes a conceptual innovation policy framework of this sort.

14 See also OECD, 2014.

15 Technopolis, 2011.

16 Chaminade et al., 2009; Lundvall et al., 2009; Gault et al., 2010. This heterogeneity is well reflected in the 11 countries chosen as developing-country outperformers this year, which range from Armenia and China to Uganda.

17 Kraemer-Mbula and Wamae, 2010; WIPO, 2011b.

18 Maharajh and Kraemer-Mbula, 2010.

19 Mashelkar, 2012.

20 Fu et al., 2014; Kraemer-Mbula and Wunsch-Vincent, forthcoming.

21 Srinivas and Sutz, 2008.

22 China, which relies heavily on the number of patents, is an exception to this finding.

23 The Russian Federation, which is now classified as a high-income economy, is an exception to this finding.

24 Economies are grouped according to the World Bank classification, which divides them according to 2011 gross national income (GNI) per capita, calculated using the World Bank Atlas method. The groups are: low income, US$1,025 or less; lower-middle income, US$1,026 to US$4,035; upper-middle income, US$4,036 to US$12,475; and high income, US$12,476 or more.

25 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 and Oceania; NAWA = Northern Africa and Western Asia; and SSF = Sub-Saharan Africa.

26 Note the change in UN methodology for indicators 3.1.3 and 3.1.4 (see Annex 2).

27 Note the change in UN methodology for indicators 3.1.3 and 3.1.4 (see Annex 2).

28 Ireland's improvements in these sub-pillars are partly the result of missing data for indicator 7.1.1 (domestic res trademark app./bn PPP$ GDP).

29 Please note the change in UN methodology at the source for indicators 3.1.3 and 3.1.4 (see Annex 2).

30 This variable was introduced into the GII model in 2015.

31 Following the financial crisis, the Icelandic government introduced a number of measures, including capital controls. These measures strongly affected the patterns of FDI net outflows in Iceland, making a significant impact on Iceland's performance in Knowledge and technology outputs.

32 It should be noted that Cambodia has a significantly high number of missing values (23), which may impact its overall GII ranking.

33 The trend line is defined as a polynomial of degree 3 with intercept.

34 Despite some changes in the UN e-Government Survey methodology questionnaire to better reflect new trends, Sri-Lanka makes very good progress in e-government development.

35 This regional ranking, however, should take into account the fact that a significant number of variables are missing for Barbados. If Barbados was disregarded in the rankings due to low data coverage, Chile would be ranked 1st in the region. Conversely, Colombia is one of the best-performing economies in terms of data coverage, with only one missing value. Colombia also improved its overall GII ranking by one place this year.

36 In order to make it into the top 25, typically a country needs a score of 50. However, there have been instances where a country has had a score of over 50, but did not make it into the top 50, because there were already 50 countries above it.

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