The Global Innovation Index (GII) Conceptual Framework

The rationale for the Global Innovation Index

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

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

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

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

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

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

An inclusive perspective on innovation

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

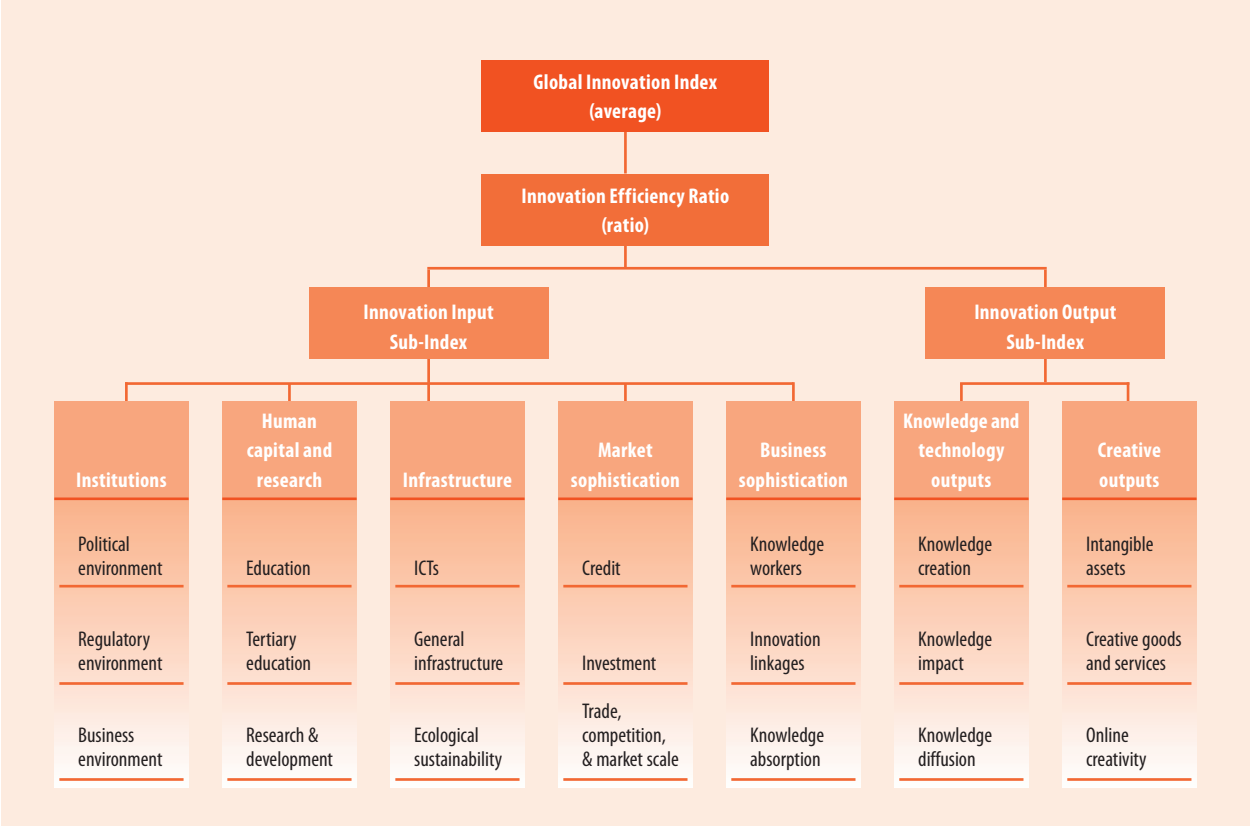
> An innovation is the implementation of a new or significantly improved product (good or service), a new process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations.

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

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

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

Figure 1: Framework of the Global Innovation Index 2016



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

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

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

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

The GII conceptual framework

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

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

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

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

Table 1a: Institutions pillar

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

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

The Innovation Input Sub-Index

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

Pillar 1: Institutions

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

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

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

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

Table 1b: Human capital & research pillar

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

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

Table 1c: Infrastructure pillar

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

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

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

Pillar 2: Human capital and research

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

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

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

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

Pillar 3: Infrastructure

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

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

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

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

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

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

Pillar 4: Market sophistication

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

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

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

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

Table 1d: Market sophistication pillar

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

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

Pillar 5: Business sophistication

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

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

Table 1e: Business sophistication pillar

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

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

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

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

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

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

The Innovation Output Sub-Index

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

Pillar 6: Knowledge and technology outputs

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

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

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

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

Table 1f: Knowledge & technology outputs pillar

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

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

Table 1g: Creative outputs pillar

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

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

Pillar 7: Creative outputs

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

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

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

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

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

Notes

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

2 Eurostat and OECD, 2005.

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

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

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

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

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

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