



APPENDIX III

Sources and Definitions

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SOURCES AND DEFINITIONS

This appendix complements the data tables by providing, for each of the 80 indicators included in the Global Innovation Index (GII) this year, its title, its description, its definition, and its source. For each indicator for each country/economy, the most recent value within the 2007–17 period was used. The single year given next to the description corresponds to the most frequent year for which data were available; when more than one year is considered, the period is indicated at the end of the indicator’s source in parentheses.

Some indicators received special treatment in the computation. A few variables required scaling by some other indicator to be comparable across countries, or through division by gross domestic product (GDP) in current US dollars, purchasing power parity GDP in international dollars (PPP\$ GDP), population, total exports, total trade, and so on. Details are provided in this appendix. The scaling factor was in each case the value corresponding to the same year of the particular indicator. In addition, 36 indicators that were assigned half weight are singled out with an ‘a’. Finally, indicators for which higher scores indicate worse outcomes, commonly known as ‘bads’, are differentiated with a ‘b’ (details on the computation can be found in Appendix IV Technical Notes).

A total of 57 variables are hard data; 18 are composite indicators from international agencies, distinguished with an asterisk (*); and 5 are survey questions from the World Economic Forum’s Executive Opinion Survey (EOS), singled out with a dagger (†).

1 Institutions

1.1 Political environment

1.1.1 Political stability and absence of violence/terrorism

Political stability and absence of violence/terrorism index^a | 2016

Index that measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Scores are standardized.

Source: World Bank, *Worldwide Governance Indicators, 2017 update*. (<http://info.worldbank.org/governance/wgi/index.aspx#home>)

1.1.2 Government effectiveness

Government effectiveness index^a | 2016

Index that reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Scores are standardized.

Source: World Bank, *Worldwide Governance Indicators, 2017 update*. (<http://info.worldbank.org/governance/wgi/index.aspx#home>)

1.2 Regulatory environment

1.2.1 Regulatory quality

Regulatory quality index^a | 2016

Index that reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development. Scores are standardized.

Source: World Bank, *Worldwide Governance Indicators, 2017 update*. (<http://info.worldbank.org/governance/wgi/index.aspx#home>)

1.2.2 Rule of law

Rule of law index^a | 2016

Index that reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Scores are standardized.

Source: World Bank, *Worldwide Governance Indicators, 2017 update*. (<http://info.worldbank.org/governance/wgi/index.aspx#home>)

1.2.3 Cost of redundancy dismissal

Sum of notice period and severance pay for redundancy dismissal (in salary weeks, averages for workers with 1, 5, and 10 years of tenure, with a minimum threshold of 8 weeks)^b | 2017

Redundancy cost measures the cost of advance notice requirements and severance payments due when terminating a redundant worker, expressed in weeks of salary. The average value of notice requirements and severance payments applicable to a worker with 1 year of tenure, a worker with 5 years, and a worker with 10 years is also

considered. One month is recorded as 4 and 1/3 weeks. If the redundancy cost adds up to 8 or fewer weeks of salary, a value of 8 is assigned but the actual number of weeks is published. If the cost adds up to more than 8 weeks of salary, the score is the number of weeks.

Source: World Bank, *Ease of Doing Business Index 2018: Reforming to Create Jobs*. (<http://www.doingbusiness.org/reports/global-reports/doing-business-2018>)

1.3 Business environment

1.3.1 Ease of starting a business

Ease of starting a business (distance to frontier)* | 2017

The ranking of economies on the ease of starting a business is determined by sorting their distance to frontier scores for starting a business. These scores are the simple average of the distance to frontier scores for each of the component indicators. *Doing Business* records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete these procedures and the paid-in minimum capital requirement. These procedures include obtaining all necessary licenses and permits and completing any required notifications, verifications, or inscriptions for the company and employees with relevant authorities. Data are collected from limited liability companies based in the largest business cities. For 11 economies, the data are also collected for the second-largest business city. The distance to frontier score shows the distance of an economy to the 'frontier', which is derived from the most efficient practice or highest score achieved on each indicator.

Source: World Bank, *Ease of Doing Business Index 2018: Reforming to Create Jobs*. (<http://www.doingbusiness.org/reports/global-reports/doing-business-2018>)

1.3.2 Ease of resolving insolvency

Ease of resolving insolvency (distance to frontier)* | 2017

The ranking of economies on the ease of resolving insolvency is determined by sorting their distance to frontier scores for resolving insolvency. These scores are the simple average of the distance to frontier scores for the recovery rate and the strength of insolvency framework index. The recovery rate is recorded as cents on the dollar recovered by secured creditors through reorganization, liquidation, or debt enforcement (foreclosure or receivership) proceedings. The calculation takes into account the outcome: whether the business emerges from the proceedings as a going concern or the assets are sold piecemeal. Then the costs of the proceedings are deducted (1 cent for each percentage point of the value of the debtor's estate). Finally, the value lost as a result of the time that the money remains tied up in insolvency proceedings is taken into account, including the loss of value due to depreciation of a hotel's furniture. Consistent with international accounting practice, the annual depreciation rate for furniture is taken to be 20%. The furniture is assumed to account for a quarter of the total value of assets. The recovery rate is the present value of the remaining proceeds, based on end-2017 lending rates from the International Monetary Fund's *International Financial Statistics*, supplemented with data from central banks and the Economist Intelligence Unit. If an economy had zero cases a year over the past five years involving a judicial reorganization, judicial liquidation, or debt enforcement

procedure (foreclosure or receivership), the economy receives a 'no practice' mark on the time, cost, and outcome indicators. This means that creditors are unlikely to recover their money through a formal legal process. The recovery rate for 'no practice' economies is zero. In addition, a 'no practice' economy receives a score of 0 on the strength of insolvency framework index even if its legal framework includes provisions related to insolvency proceedings (liquidation or reorganization). The strength of insolvency framework index is based on four other indices: commencement of proceedings index, management of debtor's assets index, reorganization proceedings index, and creditor participation index. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, *Ease of Doing Business Index 2018: Reforming to Create Jobs*. (<http://www.doingbusiness.org/reports/global-reports/doing-business-2018>)

2 Human capital and research

2.1 Education

2.1.1 Expenditure on education

Government expenditure on education (% of GDP) | 2014

Government operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment, as a percentage of gross domestic product (GDP).

Source: UNESCO Institute for Statistics, *UIS online database* (2008–17). (<http://data.uis.unesco.org/>)

2.1.2 Initial government funding per secondary student

Initial government funding per secondary student (% of GDP per capita) | 2014

Total general (local, regional, and central) government expenditure (current and capital) on the secondary level of education minus international transfers to the government for education, divided by the number of students enrolled in secondary education. This is then expressed as a share of GDP per capita, in US\$.

Source: UNESCO Institute for Statistics, *UIS online database* (2011–16). (<http://data.uis.unesco.org/>)

2.1.3 School life expectancy

School life expectancy, primary to tertiary education, both sexes (years) | 2016

Total number of years of schooling that a child of a certain age can expect to receive in the future, assuming that the probability of his or her being enrolled in school at any particular age is equal to the current enrolment ratio for that age. For a child of a certain age, the school life expectancy is calculated as the sum of the age-specific enrolment rates for primary to tertiary levels of education. The part of the enrolment that is not distributed by age is divided by the school-age population for the primary to tertiary level of education in which they are enrolled, and multiplied by the duration of that level of education. The result is then added to the sum of the age-specific enrolment rates. A relatively high value indicates a greater probability that children will spend more years in education and a higher overall retention within

the education system. It must be noted that the expected number of years spent in school does not necessarily coincide with the expected number of grades of education completed, because of grade repetition.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–17). (<http://data.uis.unesco.org/>)

2.1.4 Assessment in reading, mathematics, and science

PISA average scales in reading, mathematics and science^a | 2015

The Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) develops triennial international surveys that examine 15-year-old students' performance in reading, mathematics, and science. The scores are calculated in each year so that the mean is 500 and the standard deviation 100. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem, and Israeli settlements in the West Bank under the terms of international law. B-S-J-G (China) refers to the four PISA-participating China provinces: Beijing, Shanghai, Jiangsu, and Guangdong. CABA (Argentina) refers to the adjudicated region of Ciudad Autónoma de Buenos Aires (CABA). FYROM refers to The former Yugoslav Republic of Macedonia. Russia refers to the Russian Federation. 2015 scores from the United Arab Emirates are from Dubai. 2010 scores from India are from Himachal Pradesh and Tamil Nadu (average); 2010 scores from the Bolivarian Republic of Venezuela are from Miranda. The results of adjudication and subsequent further examinations showed that the PISA Technical Standards were met in all countries and economies that participated in PISA 2015 except for the following countries: In Albania, the PISA assessment was conducted in accordance with the operational standards and guidelines of the OECD. However, because of the ways in which the data were captured, it was not possible to match the data in the test with the data from the student questionnaire. As a result, Albania cannot be included in analyses that relate students' responses from the questionnaires to the test results. In Argentina, the PISA assessment was conducted in accordance with the operational standards and guidelines of the OECD. However, there was a significant decline in the proportion of 15-year-olds who were covered by the test, both in absolute and relative numbers. There had been a re-structuring of Argentina's secondary schools, except for those in the adjudicated region of Ciudad Autónoma de Buenos Aires, which is likely to have affected the coverage of eligible schools listed in the sampling frame. As a result, Argentina's results may not be comparable with those of other countries or with results for Argentina from previous years. In Kazakhstan, the national coders were found to be lenient in marking. Consequently the human-coded items did not meet PISA standards and were excluded from the international data. Since human-coded items form an important part of the constructs that are tested by PISA, the exclusion of these items resulted in a significantly smaller coverage of the PISA test. As a result, Kazakhstan's results may not be comparable with those of other countries or with results for Kazakhstan from previous years. In Malaysia, the PISA assessment was conducted in accordance with the operational standards and guidelines of the OECD. However, the weighted response rate among the initially sampled Malaysian schools (51%) falls well short of the standard PISA response rate of 85%.

Therefore the results may not be comparable to those of other countries or to results for Malaysia from previous years.

Source: OECD Programme for International Student Assessment (PISA) (2010–15). (www.pisa.oecd.org/)

2.1.5 Pupil-teacher ratio, secondary

Pupil-teacher ratio, secondary^{a,b} | 2016

The number of pupils enrolled in secondary school divided by the number of secondary school teachers (regardless of their teaching assignment). Where the data are missing for some countries, the ratios for upper-secondary are reported; if these are also missing, the ratios for lower-secondary are reported instead.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–17).

(<http://data.uis.unesco.org>)

2.2 Tertiary education

2.2.1 Tertiary enrolment

School enrolment, tertiary (% gross)^a | 2016

The ratio of total tertiary enrolment, regardless of age, to the population of the age group that officially corresponds to the tertiary level of education. Tertiary education, whether or not at an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level. The school enrolment ratio can exceed 100% as a result of grade repetition and the inclusion of over-aged and under-aged students because of early or late entrants.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–17). (<http://data.uis.unesco.org>)

2.2.2 Graduates in science and engineering

Tertiary graduates in science, engineering, manufacturing, and construction (% of total tertiary graduates) | 2016

The share of all tertiary-level graduates in natural sciences, mathematics, statistics, information and technology, manufacturing, engineering, and construction as a percentage of all tertiary-level graduates.

Source: UNESCO Institute for Statistics, *UIS online database* (2010–17). (<http://data.uis.unesco.org>)

2.2.3 Tertiary-level inbound mobility

Tertiary-level inbound mobility rate (%)^a | 2016

The number of students from abroad studying in a given country as a percentage of the total tertiary-level enrolment in that country.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–17). (<http://data.uis.unesco.org>)

2.3 Research and development (R&D)

2.3.1 Researchers

Researchers, full-time equivalent (FTE) (per million population) | 2016

Researchers per million population, full-time equivalent. Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products,

processes, methods, or systems and in the management of the projects concerned. Postgraduate PhD students (ISCED97 level 6) engaged in R&D are included.

Source: UNESCO Institute for Statistics, *UIS online database* (2007–16). (<http://data.uis.unesco.org>)

2.3.2 Gross expenditure on R&D (GERD)

GERD: Gross expenditure on R&D (% of GDP) | 2016

Total domestic intramural expenditure on R&D during a given period as a percentage of GDP. 'Intramural R&D expenditure' is all expenditure for R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds.

Source: UNESCO Institute for Statistics, *UIS online database* (2007–16). (<http://data.uis.unesco.org>)

2.3.3 Global R&D companies, average expenditure top 3

Average expenditure of the top 3 global companies by R&D, mn \$US* | 2017

Average expenditure on R&D of the top three global companies. If a country has fewer than three global companies listed, the figure is either the average of the sum of the two companies listed or the total for a single listed company. A score of 0 is given to countries with no listed companies.

Source: EU JRC Industrial R&D Investment Scoreboard 2017. (<http://iri.jrc.ec.europa.eu/scoreboard17.html>)

2.3.4 QS university ranking average score of top 3 universities

Average score of the top 3 universities at the QS world university ranking* | 2017

Average score of the top three universities per country. If fewer than three universities are listed in the QS ranking of the global top 700 universities, the sum of the scores of the listed universities is divided by three, thus implying a score of 0 for the non-listed universities.

Source: QS Quacquarelli Symonds Ltd, QS World University Ranking 2017/2018, Top Universities. (<https://www.topuniversities.com/university-rankings/world-university-rankings/2018>)

3 Infrastructure

3.1 Information and communication technologies (ICTs)

3.1.1 ICT access

ICT access index* | 2017

The ICT access index is a composite index that weights five ICT indicators (20% each): (1) Fixed telephone subscriptions per 100 inhabitants; (2) Mobile cellular telephone subscriptions per 100 inhabitants; (3) International Internet bandwidth (bit/s) per Internet user; (4) Percentage of households with a computer; and (5) Percentage of households with Internet access. It is the first sub-index in ITU's ICT Development Index (IDI).

Source: International Telecommunication Union, *Measuring the Information Society 2017*, ICT Development Index 2017

(2016–17). (<http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>)

3.1.2 ICT use

ICT use index* | 2017

The ICT use index is a composite index that weights three ICT indicators (33% each): (1) Percentage of individuals using the Internet; (2) Fixed (wired)-broadband Internet subscriptions per 100 inhabitants; (3) Active mobile-broadband subscriptions per 100 inhabitants. It is the second sub-index in ITU's ICT Development Index (IDI).

Source: International Telecommunication Union, *Measuring the Information Society 2017*, ICT Development Index 2017 (2016–17). (<http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>)

3.1.3 Government's online service

Government's online service index* | 2016

To arrive at a set of Online Service Index (OSI) values for 2016, a total of 111 researchers, including UN experts and online United Nations Volunteers (UNVs) from over 60 countries with coverage of 66 languages assessed each country's national website in the native language, including the national portal, e-services portal, and e-participation portal, as well as the websites of the related ministries of education, labour, social services, health, finance, and environment as applicable. The UNVs included qualified graduate students and volunteers from universities in the field of public administration.

Note: The precise meaning of these values varies from one edition of the Survey to the next as understanding of the potential of e-government changes and the underlying technology evolves. Read about the methodology at <http://unpan3.un.org/egovkb/en-us/About/Methodology>.

Source: United Nations Public Administration Network, *e-Government Survey 2016*. (<https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2016>)

3.1.4 Online e-participation

E-Participation Index* | 2016

The E-Participation index (EPI) is derived as a supplementary index to the UN E-Government Survey. It extends the dimension of the Survey by focusing on the use of online services to facilitate the provision of information by governments to citizens ('e-information sharing'), interaction with stakeholders ('e-consultation'), and engagement in decision-making processes.

A country's EPI reflects its e-participation mechanisms that are deployed by the government as compared to all other countries. The purpose of this measure is not to prescribe any particular practice, but rather to offer insight into how different countries are using online tools to promote interaction between citizen and government, as well as among citizens, for the benefit of all. Because the EPI is a qualitative assessment based on the availability and relevance of participatory services available on government websites, the comparative ranking of countries is for illustrative purposes and should serve only as an indicator of the broad trends in promoting citizen engagement. As with the E-Government Development Index (EGDI), the EPI is not intended as an absolute measurement of e-participation, but rather it attempts to capture the e-participation performance of countries relative to one another at a particular point in

time. The index ranges from 0 to 1, with 1 showing greater e-participation.

Note: The precise meaning of these values varies from one edition of the Survey to the next as understanding of the potential of e-government changes and the underlying technology evolves. Read about the methodology at <http://unpan3.un.org/egovkb/en-us/About/Methodology>.

Source: United Nations Public Administration Network, *e-Government Survey 2016*. (<https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2016>)

3.2 General infrastructure

3.2.1 Electricity output

Electricity output (kWh per capita)^a | 2015

Electricity production, measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, this indicator covers generation by geothermal, solar, wind, and tide and wave energy, as well as that from combustible renewables and waste. Production includes the output of electric plants that are designed to produce electricity only as well as that of combined heat and power plants. Electricity output in kWh is scaled by population.

Source: International Energy Agency (IEA) *World Energy Balances on-line data service, 2017 edition* (2015–16). (<http://www.iea.org/statistics/>)

3.2.2 Logistics performance

Logistics Performance Index^{a,b} | 2016

A multidimensional assessment of logistics performance, the Logistics Performance Index (LPI) ranks 160 countries on six dimensions of trade—including customs performance, infrastructure quality, and timeliness of shipments—that have increasingly been recognized as important to development. The data used in the ranking come from a survey of logistics professionals who are asked questions about the foreign countries in which they operate. The LPI's six components include: (1) the efficiency of customs and border management clearance ('Customs'); (2) the quality of trade and transport infrastructure ('Infrastructure'); (3) the ease of arranging competitively priced shipments ('Ease of arranging shipments'); (4) the competence and quality of logistics services—trucking, forwarding, and customs brokerage ('Quality of logistics services'); (5) the ability to track and trace consignments ('Tracking and tracing'); and (6) the frequency with which shipments reach consignees within scheduled or expected delivery times ('Timeliness'). The LPI uses standard statistical techniques to aggregate the data into a single indicator that can be used for cross-country comparisons.

Source: World Bank and Turku School of Economics, *Logistics Performance Index 2016*; Arvis et al., 2016, *Connecting to Compete 2016: Trade Logistics in the Global Economy—The Logistics Performance Index and its Indicators*. (<http://lpi.worldbank.org/>; (<https://openknowledge.worldbank.org/handle/10986/24598>))

3.2.3 Gross capital formation

Gross capital formation (% of GDP) | 2017

Gross capital formation is expressed as a ratio of total investment in current local currency to GDP in current local

currency. Investment or gross capital formation is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector, on the basis of the System of National Accounts (SNA) of 1993.

Source: International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP). (<https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

3.3 Ecological sustainability

3.3.1 GDP per unit of energy use

GDP per unit of energy use (2010 PPP\$ per kg of oil equivalent) | 2015

Purchasing power parity gross domestic product (PPP\$ GDP) per kilogram of oil equivalent of energy use. Total primary energy supply (TPES) is made up of production + imports – exports – international marine bunkers – international aviation bunkers +/- stock changes.

Source: International Energy Agency (IEA) *World Energy Balances on-line data service, 2017 edition* (2015–16). (<http://www.iea.org/statistics/>)

3.3.2 Environmental performance

Environmental Performance Index* | 2017

This index ranks countries on 24 performance indicators tracked across ten issue categories that cover both environmental public health and ecosystem vitality. This is an update from the 2016 index, which had 20 performance indicators across nine issues. These indicators gauge how close countries are to established environmental policy goals. The index ranges from 0 to 100, with 100 indicating best performance.

Source: Yale University and Columbia University *Environmental Performance Index 2018*. (<http://epi.yale.edu/>)

3.3.3 ISO 14001 environmental certificates

ISO 14001 Environmental management systems— Requirements with guidance for use: Number of certificates issued (per billion PPP\$ GDP)^a | 2016

ISO 14001:2016 specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance. ISO 14001 is intended for use by an organization seeking to manage its environmental responsibilities in a systematic manner that contributes to the environmental pillar of sustainability. ISO 14001 helps an organization achieve the intended outcomes of its environmental management system, which provide value for the environment, the organization itself, and interested parties. Consistent with the organization's environmental policy, the intended outcomes of an environmental management system include enhancement of environmental performance, fulfilment of compliance obligations, and achievement of environmental objectives. ISO 14001 is applicable to any organization, regardless of size, type, or nature, and applies to the environmental aspects of its activities, products, and services that the organization determines it can either control or influence from a life cycle perspective. ISO 14001 does not state specific environmental performance criteria. ISO 14001 can be used in whole or in part to systematically improve environmental management. Claims of conformity to ISO 14001, however, are not acceptable unless all its requirements are incorporated

into an organization's environmental management system and fulfilled without exclusion. The data are reported per billion PPP\$ GDP.

Source: International Organization for Standardization, *The ISO Survey 2016*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2014–16). (<https://www.iso.org/the-iso-survey.html>); <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

4 Market sophistication

4.1 Credit

4.1.1 Ease of getting credit

Ease of getting credit (distance to frontier)* | 2017

The ranking of economies on the ease of getting credit is determined by sorting their distance to frontier scores for getting credit. These scores are the distance to frontier score for the sum of the strength of the legal rights index (range 0–12) and the depth of credit information index (range 0–8). *Doing Business* measures the legal rights of borrowers and lenders with respect to secured transactions through one set of indicators and the reporting of credit information through another. The first set of indicators measures whether certain features that facilitate lending exist within the applicable collateral and bankruptcy laws. The second set measures the coverage, scope, and accessibility of credit information available through credit reporting service providers such as credit bureaus or credit registries. Although *Doing Business* compiles data on getting credit for public registry coverage (% of adults) and for private bureau coverage (% of adults), these indicators are not included in the ranking. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, *Ease of Doing Business Index 2018: Reforming to Create Jobs*. (<http://www.doingbusiness.org/reports/global-reports/doing-business-2018>)

4.1.2 Domestic credit to private sector

Domestic credit to private sector (% of GDP) | 2016

'Domestic credit to private sector' refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other financial corporations are finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.

Source: International Monetary Fund, International Financial Statistics and data files; and World Bank and OECD GDP estimates; extracted from the World Bank's *World Development Indicators* database (2008–16). (<http://data.worldbank.org/>)

4.1.3 Microfinance institutions' gross loan portfolio

Microfinance institutions: Gross loan portfolio (% of GDP) | 2016

Combined gross loan balances of microfinance institution (current US\$) in a country as a percentage of its GDP (current US\$).

Source: Microfinance Information Exchange, *Mix Market database*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (current US\$ GDP) (2007–16). (<https://reports.themix.org/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

4.2 Investment

4.2.1 Ease of protecting minority investors

Ease of protecting minority investors (distance to frontier)* | 2017

This ranking is the simple average of the distance to frontier scores for the extent of conflict of interest regulation index and the extent of shareholder governance index. The extent of conflict of interest regulation index measures the protection of shareholders against directors' misuse of corporate assets for personal gain by distinguishing three dimensions of regulation that address conflicts of interest: transparency of related-party transactions (extent of disclosure index), shareholders' ability to sue and hold directors liable for self-dealing (extent of director liability index), and access to evidence and allocation of legal expenses in shareholder litigation. The extent of shareholder governance index measures shareholders' rights in corporate governance by distinguishing three dimensions of good governance: shareholders' rights and role in major corporate decisions (extent of shareholder rights index); governance safeguards protecting shareholders from undue board control and entrenchment (extent of ownership and control index); and corporate transparency on ownership stakes, compensation, audits, and financial prospects (extent of corporate transparency index). The index also measures whether a subset of relevant rights and safeguards are available in limited companies. The data come from a questionnaire administered to corporate and securities lawyers and are based on securities regulations, company laws, civil procedure codes, and court rules of evidence. Refer to indicator 1.3.1 for details regarding the distance to frontier measure.

Source: World Bank, *Ease of Doing Business Index 2018: Reforming to Create Jobs*. (<http://www.doingbusiness.org/reports/global-reports/doing-business-2018>)

4.2.2 Market capitalization

Market capitalization of listed domestic companies (% of GDP, three-year average)^a | 2016

Market capitalization (also known as 'market value') is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. Investment funds, unit trusts, and companies whose only business goal is to hold shares of other listed companies are excluded. Data are the average of the end-of-year values for the last three years.

Source: World Federation of Exchanges database; extracted from the World Bank's *World Development Indicators* database (2008–16). (<http://data.worldbank.org/>)

4.2.3 Venture capital deals

Venture capital per investment location: Number of deals (per billion PPP\$ GDP)^a | 2017

Thomson Reuters data on private equity deals, per deal, with information on the location of investment, investment company, investor firms, and funds, among other details. The series corresponds to a query on venture capital deals from 1 January 2017 to 31 December 2017, with the data collected by investment location, for a total of 12,591 deals in 80 countries in 2017. The data are reported per billion PPP\$ GDP.

Note: Formerly the Intellectual Property and Science business of Thomson Reuters, *Clarivate Analytics* is now an independent company.

Source: Thomson Reuters, *Thomson One Banker Private Equity* database; International Monetary Fund, *World Economic Outlook Database* October 2017 (PPP\$ GDP). (<https://www.thomsonone.com>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

4.3 Trade, competition, and market scale

4.3.1 Applied tariff rate, weighted mean

Tariff rate, applied, weighted mean, all products (%)^{a,b} | 2016

'Weighted mean applied tariff' is the average of effectively applied rates weighted by the product import shares corresponding to each partner country. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups and import weights. To the extent possible, specific rates have been converted to their ad valorem equivalent rates and have been included in the calculation of weighted mean tariffs. Import weights were calculated using the United Nations Statistics Division's Commodity Trade (Comtrade) database. Effectively applied tariff rates at the six- and eight-digit product level are averaged for products in each commodity group. When the effectively applied rate is unavailable, the most favoured nation rate is used instead.

Source: World Bank, based on data from United Nations Conference on Trade and Development's Trade Analysis and Information System (TRAINS) database and the World Trade Organization's (WTO) Integrated Data Base (IDB) and Consolidated Tariff Schedules (CTS) database; extracted from World Bank *World Development Indicators* database (2011–16). (<http://data.worldbank.org/>)

4.3.2 Intensity of local competition

Average answer to the survey question: In your country, how intense is competition in the local markets? [1 = not intense at all; 7 = extremely intense]^a | 2017

Source: World Economic Forum, *Executive Opinion Survey 2017–2018*. (<https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018>)

4.3.3 Domestic market scale

Domestic market size as measured by GDP, bn PPP\$ | 2017

The domestic market size is measured by gross domestic product (GDP) based on the purchasing-power-parity (PPP)

valuation of country GDP, in current international dollars (billions).

Source: World Bank, International Monetary Fund, *World Economic Outlook Database* October 2017 (PPP\$ GDP) 2017. (<https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

5 Business sophistication

5.1 Knowledge workers

5.1.1 Employment in knowledge-intensive services

Employment in knowledge-intensive services (% of workforce) | 2016

Sum of people in categories 1 to 3 as a percentage of total people employed, according to the International Standard Classification of Occupations (ISCO). Categories included in ISCO-08 are: 1 Managers, 2 Professionals, and 3 Technicians and associate professionals (years 2008–17). Where ISCO-08 data were not available, ISCO-88 data were used. Categories included in ISCO-88 are: 1 Legislators, senior officials and managers; 2 Professionals; 3 Technicians and associate professionals (2007–15).

Source: International Labour Organization *ILOSTAT Database of Labour Statistics* (2008–17). (<http://www.ilo.org/ilostat/>)

5.1.2 Firms offering formal training

Firms offering formal training (% of firms) | 2013

The percentage of firms offering formal training programs for their permanent, full-time employees in the sample of firms in the World Bank's Enterprise Survey in each country.

Source: World Bank, *Enterprise Surveys* (2007–17). (<http://www.enterprisesurveys.org/>).

5.1.3 GERD performed by business enterprise

GERD: Performed by business enterprise (% of GDP)^a | 2016

Gross expenditure on R&D performed by business enterprise as a percentage of GDP. For the definition of GERD see indicator 2.3.2.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–16). (<http://data.uis.unesco.org>)

5.1.4 GERD financed by business enterprise

GERD: Financed by business enterprise (% of total GERD)^a | 2015

Gross expenditure on R&D financed by business enterprise as a percentage of total gross expenditure on R&D. For the definition of GERD see indicator 2.3.2

Source: UNESCO Institute for Statistics, *UIS online database* (2007–17). (<http://data.uis.unesco.org>)

5.1.5 Females employed with advanced degrees

Females employed with advanced degrees, % total employed (25+ years old)^a | 2016

The percentage of females employed with advanced degrees out of total employed. The employed comprise all persons of working age who, during a specified brief period, were in one of the following categories: (1) paid employment (whether

at work or with a job but not at work); or (2) self-employment (whether at work or with an enterprise but not at work). Data are disaggregated by level of education, which refers to the highest level of education completed, classified according to the International Standard Classification of Education (ISCE). Data for Canada are based on Table 282-0004 of the country's Labour Force Survey estimates.

Source: International Labour Organization, *ILOSTAT Annual Indicators* (2008–17); and Statistics Canada, Table 282-0004; Labour Force Survey estimates (LFS) by educational attainment, sex and age group, annual, CANSIM, accessed 23 February 2018. (<http://www.ilo.org/ilostat/>; <http://laborsta.ilo.org/>; <http://www.statcan.gc.ca/>)

5.2 Innovation linkages

5.2.1 University/industry research collaboration

Average answer to the survey question: In your country, to what extent do businesses and universities collaborate on research and development (R&D)? [1 = do not collaborate at all; 7 = collaborate extensively]^a | 2017

Source: World Economic Forum, *Executive Opinion Survey 2017–2018*. (<https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018>)

5.2.2 State of cluster development

Average answer to the survey question on the role of clusters in the economy: In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? [1 = nonexistent; 7 = widespread in many fields]^a | 2017

Source: World Economic Forum, *Executive Opinion Survey 2017–2018*. (<https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018>)

5.2.3 GERD financed by abroad

GERD: Financed by abroad (% of total GERD) | 2015

Percentage of gross expenditure on R&D financed by abroad—that is, with foreign financing as a percentage of total gross expenditure on R&D in a country.

Source: UNESCO Institute for Statistics, *UIS online database* (2007–17). (<http://data.uis.unesco.org>)

5.2.4 Joint venture/strategic alliance deals

Joint ventures/strategic alliances: Number of deals, fractional counting (per billion PPP\$ GDP)^a | 2017

Thomson Reuters data on joint ventures/strategic alliances deals, per deal, with details on the country of origin of partner firms, among others. The series corresponds to a query on joint venture/strategic alliance deals from 1 January 2017 to 31 December 2017, for a total of 6,896 deals announced in 2017, with firms headquartered in 113 participating economies. Each participating nation of each company in a deal (n countries per deal) gets, per deal, a score equivalent to $1/n$ (with the effect that all country scores add up to 6,896). The data are reported per billion PPP\$ GDP.

Note: Formerly the Intellectual Property and Science business of Thomson Reuters, *Clarivate Analytics* is now an independent company.

Source: Thomson Reuters, *Thomson One Banker Private Equity, SDC Platinum* database; International Monetary Fund

World Economic Outlook Database, October 2017 (PPP\$ GDP). (<http://banker.thomsonib.com>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

5.2.5 Patent families filed in two offices

Number of patent families filed by residents in at least two offices (per billion PPP\$ GDP)^a | 2014

A 'patent family' is a set of interrelated patent applications filed in one or more countries or jurisdictions to protect the same invention. Patent families containing applications filed in at least two different offices is a subset of patent families where protection of the same invention is sought in at least two different countries. In this report, 'patent families data' refers to patent applications filed by residents in at least two IP offices; the data are scaled by PPP\$ GDP (billions). A 'patent' is a set of exclusive rights granted by law to applicants for inventions that are new, non-obvious, and commercially applicable. A patent is valid for a limited period of time (generally 20 years), during which patent holders can commercially exploit their inventions on an exclusive basis. In return, applicants are obliged to disclose their inventions to the public in a manner that enables others, skilled in the art, to replicate the invention. The patent system is designed to encourage innovation by providing innovators with time-limited exclusive legal rights, thus enabling them to appropriate the returns from their innovative activity.

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2014). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

5.3 Knowledge absorption

5.3.1 Intellectual property payments

Charges for use of intellectual property n.i.e., payments (% of total trade)^a | 2016

Charges for the use of intellectual property not included elsewhere payments (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, code SH charges for the use of intellectual property not included elsewhere as a percentage of total trade. 'Total trade' is defined as the sum of total imports code G goods and code SOX commercial services (excluding government goods and services not included elsewhere) plus total exports of code G goods and code SOX commercial services (excluding government goods and services not included elsewhere), divided by 2. According to the sixth edition of the International Monetary Fund's *Balance of Payments Manual*, the item 'Goods' covers general merchandise, net exports of goods under merchanting, and nonmonetary gold. The 'commercial services' category is defined as being equal to 'services' minus 'government goods and services not included elsewhere'. Receipts are between residents and nonresidents for the use of proprietary rights (such as patents, trademarks, copyrights, industrial processes and designs including trade secrets, franchises), and for licenses to reproduce or distribute (or both) intellectual property embodied in produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound

recordings) and related rights (such as for live performances and television, cable, or satellite broadcast).

Source: World Trade Organization, *Trade in Commercial Services* database, based on the sixth (2009) edition of the International Monetary Fund's *Balance of Payments and International Investment Position Manual and Balance of Payments* database (2009–16). (<http://stat.wto.org/StatisticalProgram/WSDStatProgramSeries.aspx>; <http://www.oecd.org/std/its/EBOPS-2010.pdf>)

5.3.2 High-tech imports

High-tech net imports (% of total trade) | 2016

High-technology imports minus re-imports as a percentage of total trade. High-technology exports and imports contain technical products with a high intensity of R&D, defined by the Eurostat classification, which is based on Standard International Trade Classification (SITC) Revision 4 and the Organisation for Economic Co-operation and Development (OECD) definition. Commodities belong to the following sectors: aerospace; computers & office machines; electronics; telecommunications; pharmacy; scientific instruments; electrical machinery; chemistry; non-electrical machinery; and armament.

Source: United Nations, *Comtrade* database; Eurostat, *Annex 5: High-tech aggregation by SITC Rev. 4*, April 2009 (2011–16). (<http://comtrade.un.org/>; http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an5.pdf)

5.3.3 ICT services imports

Telecommunications, computers, and information services imports (% of total trade) | 2016

Telecommunications, computer and information services as a percentage of total trade according to the Organisation for Economic Co-operation and Development (OECD)'s Extended Balance of Payments Services Classification EBOPS 2010, coded SI: Telecommunications, computer and information services. For the definition of total trade see indicator 5.3.1.

Source: World Trade Organization, *Trade in Commercial Services* database, based on the sixth (2009) edition of the International Monetary Fund's *Balance of Payments and International Investment Position Manual and Balance of Payments* database (2009–16). (<http://stat.wto.org/StatisticalProgram/WSDStatProgramSeries.aspx>; <http://www.oecd.org/std/its/EBOPS-2010.pdf>)

5.3.4 Foreign direct investment net inflows

Foreign direct investment (FDI), net inflows (% of GDP, three-year average) | 2016

Foreign direct investment is the average of the most recent three years of net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.

Source: International Monetary Fund, *International Financial Statistics* and *Balance of Payments* databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates; extracted from the World Bank's *World Development Indicators* database (2016). (<http://data.worldbank.org/>)

5.3.5 Research talent in business enterprise

Researchers in business enterprise (%) | 2016

'Full-time equivalent (FTE) researchers in the business enterprise sector' refers to researchers as professionals engaged in the conception or creation of new knowledge, products, processes, methods, and systems, as well as in the management of these projects, broken down by the sectors in which they are employed (business enterprise, government, higher education, and private non-profit organizations). In the context of R&D statistics, the business enterprise sector includes all firms, organizations, and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price, and the private non-profit institutions mainly serving them; the core of this sector is made up of private enterprises. This also includes public enterprises.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–16). (<http://data.uis.unesco.org>)

residence of the first-named applicant. The PCT System facilitates the filing of patent applications worldwide, making it possible to seek patent protection for an invention simultaneously in each of a large number of countries by first filing a single international patent application.

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–17). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

6.1.3 Utility model applications by origin

Number of utility model applications filed by residents at the national patent office (per billion PPP\$ GDP) | 2016

These are the number of resident utility model applications filed at a given national or regional patent office in 2016. A 'resident UM application' refers to an application filed with an IP office of, or an office acting on behalf of, the state or jurisdiction in which the first-named applicant has residence. For example, an application filed with the IP office of Germany by a resident of Germany is considered a resident application for Germany. A 'utility model grant' is a special form of patent right issued by a state or jurisdiction to an inventor or the inventor's assignee for a fixed period of time. The terms and conditions for granting a utility model are slightly different from those for normal patents and include a shorter term of protection and less stringent patentability requirements. A utility model is sometimes referred to in certain countries as 'petty patents', 'short-term patents', or 'innovation patents'.

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–16). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

6.1.4 Scientific and technical publications

Number of scientific and technical journal articles (per billion PPP\$ GDP)^a | 2017

The number of scientific and engineering articles published in those fields, including: agriculture, astronomy, astrophysics, automation control systems, biochemistry molecular biology, biodiversity conservation, biotechnology applied microbiology, cell biology, chemistry, computer science, construction building technology, dentistry oral surgery medicine, engineering, environmental sciences, ecology, evolutionary biology, food science technology, general internal medicine, life sciences biomedicine and other topics, marine freshwater biology, materials science, mathematical computational biology, mathematics, metallurgy and metallurgical engineering, meteorology atmospheric science, microbiology, nuclear science and technology, physics, plant sciences, radiology nuclear medicine medical imaging, reproductive biology, research experimental medicine, science technology and other topics, telecommunications, transportation, and veterinary sciences. Article counts are from a set of journals covered by the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI). Articles are classified by year of publication and assigned to each country/economy on basis of the institutional address(es) listed in the article. Articles are counted on a count basis (rather than a fractional basis)—that is, for articles with collaborating institutions from multiple countries/economies, each country/economy receives credit on the basis of its participating institutions. The data are reported per billion PPP\$ GDP.

6 Knowledge and technology outputs

6.1 Knowledge creation

6.1.1 Patent applications by origin

Number of resident patent applications filed at a given national or regional patent office (per billion PPP\$ GDP)^a | 2016

'Patent' is defined in the description of indicator 5.2.5. A 'resident patent application' refers to an application filed with an IP office or an office acting on behalf of the state or jurisdiction in which the first-named applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with the European Patent Office (EPO) by an applicant who resides in any of the EPO member states, for example Germany, is considered a resident application for that member state (Germany).

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–16). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

6.1.2 PCT international applications by origin

Number of international patent applications filed by residents at the Patent Cooperation Treaty (per billion PPP\$ GDP)^a | 2017

These are the number of Patent Cooperation Treaty (PCT) international patent applications filed through the WIPO-administered Patent Cooperation Treaty in 2017. A 'PCT international application' refers to a patent application filed through the WIPO-administered Patent Cooperation Treaty (PCT) during the international phase outlined by the PCT System. The origin of PCT applications are defined by the

Note: Formerly the Intellectual Property and Science business of Thomson Reuters, *Clarivate Analytics* is now an independent company.

Source: *Clarivate Analytics*, special tabulations from Thomson Reuters, Web of Science, Science Citation Index (SCI), and Social Sciences Citation Index (SSCI); International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2017). (<https://apps.whoofknowledge.com>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

6.1.5 Citable documents H index

The H index is the economy's number of published articles (H) that have received at least H citations^a | 2017

The H index expresses the journal's number of articles (H) that have received at least H citations. It quantifies both journal scientific productivity and scientific impact, and is also applicable to scientists, journals, and so on. The H index is tabulated from the number of citations received in subsequent years by articles published in a given year, divided by the number of articles published that year.

Source: SCImago (2018) SJR—SCImago Journal & Country Rank. Retrieved February 2018. (<http://www.scimagojr.com>)

6.2 Knowledge impact

6.2.1 Growth rate of GDP per person engaged

Growth rate of GDP per person engaged (constant 2011 PPP\$) | 2016

Growth of gross domestic product (GDP) per person engaged provides a measure of labour productivity (defined as output per unit of labour input). GDP per person employed is GDP divided by total employment in the economy. PPP\$ GDP is at the 2016 price level with updated 2011 PPPs. As in previous years, the Conference Board no longer uses GDP converted to 1990 US\$, converted at Geary Khamis PPPs. This difference affects only levels of GDP and does not change the growth rates.

Source: The Conference Board Total Economy Database™ Output, Labor and Labor Productivity, 1950–2017, March 2017. (<https://www.conference-board.org/data/economydatabase/>)

6.2.2 New business density

New business density (new registrations per thousand population 15–64 years old)^a | 2016

Number of new firms, defined as firms registered in the current year of reporting, per thousand population aged 15–64 years old.

Source: World Bank, *Doing Business 2018, Entrepreneurship* (2008–16). (<http://www.doingbusiness.org/data/exploretopics/entrepreneurship>)

6.2.3 Total computer software spending

Total computer software spending (% of GDP)^a | 2017

Computer software spending includes the total value of purchased or leased packaged software such as operating systems, database systems, programming tools, utilities, and applications. It excludes expenditures for internal software development and outsourced custom software development.

The data are a combination of actual figures and estimates. Data are reported as a percentage of GDP.

Source: IHS Global Insight, *Information and Communication Technology Database*. (<https://www.ihs.com/index.html>)

6.2.4 ISO 9001 quality certificates

ISO 9001 Quality management systems—Requirements: Number of certificates issued (per billion PPP\$ GDP)^a | 2016

ISO 9001:2016 specifies requirements for a quality management system when an organization needs to demonstrate its ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements, and aims to enhance customer satisfaction through the effective application of the system, including processes for improving the system and assuring conformity to customer and applicable statutory and regulatory requirements. All the requirements of ISO 9001:2016 are generic and are intended to be applicable to any organization, regardless of its type or size, or the products and services it provides. The data are reported per billion PPP\$ GDP. Refer to indicator 3.3.3 for more details.

Source: International Organization for Standardization (ISO), *The ISO Survey of Management System Standard Certifications, 1993–2016*; International Monetary Fund, *World Economic Outlook* database, October 2017 (PPP\$ GDP) (2016). (<http://www.iso.org>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

6.2.5 High-tech and medium-high-tech output

High-tech and medium-high-tech output (% of total manufactures output)^a | 2015

High-tech and medium-high-tech output as a percentage of total manufactures output, on the basis of the Organisation for Economic Co-operation and Development (OECD) classification of Technology Intensity Definition, itself based on International Standard Industrial Classification ISIC Revision 4 and ISIC Revision 3. ISIC Revision 4 data were preferred; when not available or not reported for a given country, ISIC Revision 3 data were used. For all ISIC three-digit classification codes included in the definition of high-tech and medium-high-tech output reported as missing for a given country, but for which four-digit level data were available, the three-digit values were calculated as the sum of all four-digit codes that were available. No data were available for Botswana or Lebanon.

Source: United Nations Industrial Development Organization (UNIDO), *Industrial Statistics Database*, 3- and 4-digit level of International Standard Industrial Classification ISIC Revision 4 and Revision 3 (INDSTAT4 2018); OECD, Directorate for Science, Technology and Industry, Economic Analysis and Statistics Division, 'ISIC Rev. 3 and Rev. 4 Technology Intensity Definition: Classification of Manufacturing Industries into Categories Based on R&D Intensities' (2008–15). (<http://www.unido.org/statistics.html>; <http://stat.unido.org/content/focus/classification-of-manufacturing-sectors-by-technological-intensity-%2528isic-revision-4%2529;jsessionid=4DB1A3A5812144CACC956F4B8137C1CF>; <http://www.oecd.org/sti/ind/48350231.pdf>)

6.3 Knowledge diffusion

6.3.1 Intellectual property receipts

Charges for use of intellectual property n.i.e., receipts (% of total trade)^a | 2016

Charges for the use of intellectual property not included elsewhere receipts (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, code SH charges for the use of intellectual property not included elsewhere as a percentage of total trade. Receipts are between residents and non-residents for the use of proprietary rights (such as patents, trademarks, copyrights, industrial processes, and designs including trade secrets, franchises), and for licenses to reproduce or distribute (or both) intellectual property embodied in produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable, or satellite broadcast). For definition of total trade see indicator 5.3.1.

Source: World Trade Organization, *Trade in Commercial Services* database, based on the sixth (2009) edition of the International Monetary Fund's *Balance of Payments and International Investment Position Manual* and *Balance of Payments* database (2007–16). (<http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx>; <http://www.oecd.org/std/its/EBOPS-2010.pdf>)

6.3.2 High-tech exports

High-tech net exports (% of total trade)^a | 2016

High-technology exports minus re-exports (% of total trade). See indicator 5.3.2 for details.

Source: United Nations, *Comtrade* database; Eurostat, *Annex 5: High-tech aggregation by SITC Rev. 4*, April 2009 (2011–16). (<http://comtrade.un.org/>; http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an5.pdf)

6.3.3 ICT services exports

Telecommunications, computers, and information services exports (% of total trade)^a | 2016

Telecommunications, computer and information services (% of total trade) according to the Extended Balance of Payments Services Classification EBOPS 2010, coded SI: Telecommunications, computer and information services.

Source: World Trade Organization, *Trade in Commercial Services* database, based on the sixth (2009) edition of the International Monetary Fund's *Balance of Payments and International Investment Position Manual* and *Balance of Payments* database (2009–16). (<http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx>; <http://www.oecd.org/std/its/EBOPS-2010.pdf>)

6.3.4 Foreign direct investment net outflows

Foreign direct investment (FDI), net outflows (% of GDP, three-year average) | 2016

'Foreign direct investment' refers to the average of the most recent three years of direct investment equity flows in an economy. It is the sum of equity capital, reinvestment of earnings, and other capital. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 percent or more of the

ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship. This series shows net outflows of investment from the reporting economy to the rest of the world, and is divided by GDP.

Source: International Monetary Fund, *International Financial Statistics* and *Balance of Payments* databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates; extracted from the World Bank's *World Development Indicators* database (2015–16). (<http://data.worldbank.org/>)

7 Creative outputs

7.1 Intangible assets

7.1.1 Trademark application class count by origin

Number of trademark applications issued to residents at a given national or regional office (per billion PPP\$ GDP) | 2016

The count of trademark applications is based on the total number of goods and services classes specified in resident trademark applications filed at a given national or regional office in 2016. Data refer to trademark application class counts—the number of classes specified in resident trademark applications—and include those filed at both the national office and the regional office, where applicable. Data are scaled by PPP\$ GDP (billions). A 'trademark' is a sign used by the owner of certain products or provider of certain services to distinguish them from the products or services of other companies. A trademark can consist of words and/or combinations of words, such as slogans, names, logos, figures and images, letters, numbers, sounds and moving images, or a combination thereof. The procedures for registering trademarks are governed by the legislation and procedures of national and regional IP offices. Trademark rights are limited to the jurisdiction of the IP office that registers the trademark. Trademarks can be registered by filing an application at the relevant national or regional office(s) or by filing an international application through the Madrid System. A resident trademark application is one that is filed with an IP office or an office acting on behalf of the state or jurisdiction in which the applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with the Office for Harmonization in the Internal Market (OHIM) by an applicant who resides in any of the EU member states, such as France, is considered a resident application for that member state (France).

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–16). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

7.1.2 Industrial designs by origin

Number of designs contained in industrial design applications filed at a given national or regional office (per billion PPP\$ GDP)^a | 2016

This indicator refers to the number of designs contained in industrial design applications filed at a given national or regional office in 2016. Data refer to industrial design

application counts—the number of designs contained in applications—and include designs contained in resident industrial design applications filed at both the national office and at the regional office, where applicable. ‘Resident design counts’ refers to the number of designs contained in applications filed with the IP office of or at an office acting on behalf of the state or jurisdiction in which the applicant has residence. For example, an application filed with the Japan Patent Office (JPO) by a resident of Japan is considered a resident application for Japan. Similarly, an application filed with the Office for Harmonization in the Internal Market (OHIM) by an applicant who resides in any of the OHIM member states, such as Italy, is considered as a resident application for that member state (Italy).

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–16). (<http://www.wipo.int/ipstats/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)

7.1.3 ICTs and business model creation

Average answer to the question: In your country, to what extent do ICTs enable new business models? [1 = not at all; 7 = to a great extent]* | 2017

Source: World Economic Forum, *Executive Opinion Survey 2017–2018*. (Forthcoming at <https://www.weforum.org>)

7.1.4 ICTs and organizational model creation

Average answer to the question: In your country, to what extent do ICTs enable new organizational models (e.g., virtual teams, remote working, telecommuting) within companies? [1 = not at all; 7 = to a great extent]* | 2017

Source: World Economic Forum, *Executive Opinion Survey 2017–2018*. (Forthcoming at <https://www.weforum.org>)

7.2 Creative goods and services

7.2.1 Cultural and creative services exports

Cultural and creative services exports (% of total trade)^a | 2016

Creative services exports (% of total exports) according to the Extended Balance of Payments Services Classification EBOPS 2010—that is, EBOPS code SI3 Information services; code SJ22 Advertising, market research, and public opinion polling services; code SK1 Audiovisual and related services; and code SK24 Other personal cultural and recreational services as a percentage of total trade. See 5.3.1 for a full definition of total trade. On the score for the United States of America (U.S.), this includes SI3 Information services; the category Movies & TV programming from Table 2.1 (U.S. Trade in Services, BEA) is used in the absence of available data for code SK1 Audiovisual and related services (the category Movies & TV programming is specific to the U.S. in BPM6 statistics and does not have a code); the category Sports and performing arts (U.S. Trade in Services, BEA) is used instead of code SK24; the category Advertising (U.S. Trade in Services, BEA) is used instead of code SJ22.

Source: World Trade Organization, *Trade in Commercial Services* database, based on the sixth (2009) edition of the International Monetary Fund’s *Balance of Payments and International Investment Position Manual* and *Balance of Payments* database; Bureau of Economic Analysis (BEA) released October 2017 (2007–16). (<http://stat.wto.org/>)

StatisticalProgram/WSDBStatProgramSeries.aspx; <http://www.oecd.org/std/its/EBOPS-2010.pdf>; <https://www.bea.gov/iTable/iTable.cfm>)

7.2.2 National feature films produced

Number of national feature films produced (per million population 15–69 years old)^a | 2015

A film with a running time of 60 minutes or longer. It includes works of fiction, animation, and documentaries. It is intended for commercial exhibition in cinemas. Feature films produced exclusively for television broadcasting, as well as newsreels and advertising films, are excluded. Data are reported per million population 15–69 years old. For Cambodia, Cameroon, Madagascar, and Nigeria, this indicator covers only feature films in video format.

Source: UNESCO Institute for Statistics, *UIS online database*; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision* (population) (2008–15). (<http://data.uis.unesco.org>; <http://esa.un.org/unpd/wpp/>)

7.2.3 Entertainment and media market

Entertainment and media market (per thousand population 15–69 years old)^{a*} | 2016

The Global entertainment and media outlook (the Outlook) provides a single comparable source of five-year forecast and five-year historic consumer and advertiser spending data and commentary for 17 entertainment and media segments, across 64 countries. The components covered in this year’s Outlook are newly expanded and otherwise enhanced from the previous year’s 13-segment format. Internet video has been broken out from TV and video, reflecting the growing importance of video on demand in the TV sphere. TV and video has been renamed ‘Traditional TV and home video’. Data consumption by device is now being measured over 19 countries, up from the previous 10. The devices measured have been expanded to include fixed broadband. Two brand new areas have been introduced. The first of these is VR, with forecasts for both revenues and headset take-up. The second area, E-sports, covers data and forecasts across the consumer and advertising aspects of this area. Finally, two segments now have expanded data sets. The Box office segment now carries data on screens, with splits for digital and non-digital, 2D and 3D, and IMAX screens. Furthermore, the Music segment now carries information on performance rights and synchronization, completing the picture of recorded music revenue. A total of 64 countries are represented within the Outlook spread across North America, Western Europe, Central Europe, the Middle East and North Africa, Latin America, and Asia Pacific. The score and rankings for the Global Media Expenditures for the 64 countries considered in the Outlook report are based on advertising and consumer digital and non-digital data in US\$ millions at average 2016 exchange rates for the year 2016. These results are reported normalized per thousand population, 15–69 years old, for the year 2016. The figures for Algeria, Bahrain, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, the Islamic Republic of Iran, Malta, Tunisia, and Yemen were estimated from a total corresponding to Middle East and North Africa (MENA) countries using a breakdown of total GDP (current US\$) for the above-mentioned countries to define referential percentages.

Source: Calculations were derived from PwC’s *Global Entertainment and Media Outlook, 2017–2021*; United Nations, Department of Economic and Social Affairs,

Population Division, *World Population Prospects: The 2017 Revision* (population); *World Economic Outlook Database*, October 2017 (current US\$ GDP); Middle East & North Africa in the World Bank's *DataBank*. (2017). (<http://www.pwc.com/outlook>; <http://esa.un.org/unpd/wpp/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>; <http://data.worldbank.org/region/middle-east-and-north-africa>)

7.2.4 Printing publications and other media output

Printing publications and other media (% of manufactures total output) | 2015

Printing, and reproduction of recorded media output (ISIC Revision 4 Division 18, group 181 with class 1811 and 1812 and group 182 with class 1820) as a percentage of total manufacturing output (ISIC Revision 4, section C). Where data for ISIC Revision 4 were not available, data from ISIC Revision 3 were used (ISIC Revision 3 group 222, classes 2221, 2222, and 2230).

Source: United Nations Industrial Development Organization, *Industrial Statistics Database*; 4-digit level of International Standard Industrial Classification ISIC Revision 4 (INDSTAT4 2018) and ISIC Revision 3 (INDSTAT2 2018) (2008–15). (<http://www.unido.org/statistics.html>; <http://unstats.un.org/unsd/cr/registry/regcst.asp?cl=2>)

7.2.5 Creative goods exports

Creative goods exports (% of total trade) | 2016

Total value of creative goods exports, net of re-exports (current US\$) over total trade. 'Total trade' is defined as the sum of total imports code G goods and code SOX commercial services (excluding government goods and services not included elsewhere) plus total exports of code G goods and code SOX commercial services (excluding government goods and services not included elsewhere), divided by 2. According to the sixth edition of the International Monetary Fund's *Balance of Payments Manual*, the item 'Goods' covers general merchandise, net exports of goods under merchanting and nonmonetary gold. The 'commercial services' category is defined as being equal to 'services' minus 'government goods and services not included elsewhere'.

Source: United Nations, *Comtrade* database; 2009 UNESCO Framework for Cultural Statistics, Table 3, *International trade of cultural goods and services based on the 2007 Harmonised System (HS 2007)*; World Trade Organization, *Trade in Commercial Services* database, itself based on the sixth (2009) edition of the International Monetary Fund's *Balance of Payments and International Investment Position Manual* and *Balance of Payments* database (2011–16). (<http://comtrade.un.org/>; <http://www.uis.unesco.org/culture/Documents/framework-cultural-statistics-culture-2009-en.pdf>; <http://stat.wto.org/StatisticalProgram/WSDStatProgramSeries.aspx>; <http://www.oecd.org/std/its/EBOPS-2010.pdf>)

7.3 Online creativity

7.3.1 Generic top-level domains (gTLDs)

Generic top-level domains (gTLDs) (per thousand population 15–69 years old) | 2017

A generic top-level domain (gTLD) is one of the categories of top-level domains (TLDs) maintained by the Internet Assigned Numbers Authority (IANA) for use in the Internet.

Generic TLDs can be unrestricted (.com, .info, .net, and .org) or restricted—that is, used on the basis of fulfilling eligibility criteria (.biz, .name, and .pro). Of these, the statistic covers the five generic domains .biz, .info, .org, .net, and .com. Generic domains .name and .pro, and sponsored domains (.arpa, .aero, .asia, .cat, .coop, .edu, .gov, .int, .jobs, .mil, .museum, .tel, .travel, and .xxx) are not included. Neither are country-code top-level domains (refer to indicator 7.3.2). The statistic represents the total number of registered domains (i.e., net totals by December 2017, existing domains + new registrations – expired domains). Data are collected on the basis of a 4% random sample of the total population of domains drawn from the root zone files (a complete listing of active domains) for each TLD. The geographic location of a domain is determined by the registration address for the domain name registrant that is returned from a whois query. These registration data are parsed by country and postal code and then aggregated to any number of geographic levels such as county, city, or country/economy. The original hard data were scaled by thousand population 15–69 years old. For confidentiality reasons, only normalized values are reported; while relative positions are preserved, magnitudes are not.

Source: ZookNIC Inc; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2017 Revision* (population). (<http://www.zooknic.com>; <http://esa.un.org/unpd/wpp/>)

7.3.2 Country-code top-level domains (ccTLDs)

Country-code top-level domains (ccTLDs) (per thousand population 15–69 years old) | 2017

A country-code top-level domain (ccTLD) is one of the categories of top-level domains (TLDs) maintained by the Internet Assigned Numbers Authority (IANA) for use in the Internet. Country-code TLDs are two-letter domains especially designated for a particular economy, country, or autonomous territory (there are 255 ccTLDs, in various alphabets/characters). The statistic represents the total number of registered domains (i.e., net totals by December 2017, existing domains + new registrations – expired domains). Data are collected from the registry responsible for each ccTLD and represent the total number of domain registrations in the ccTLD. Each ccTLD is assigned to the country with which it is associated rather than based on the registration address of the registrant. ZookNIC reports that, for the ccTLDs it covers, 85–100% of domains that are registered in the same country; the only exceptions are the ccTLDs that have been licensed for commercial worldwide use. Of this year's GII sample of countries, this is the case for the ccTLDs of the following economies: Armenia am, Austria at, Belarus by, Belgium be, Canada ca, Colombia co, Estonia ee, Finland fi, Guatemala gt, Iceland is, India in, Islamic Republic of Iran ir, Liechtenstein li, Italy it, Latvia lv, Mauritius mu, Moldova md, Mongolia mn, Montenegro me, Nicaragua ni, Serbia rs, Slovenia si, Spain es, Switzerland ch, (this list is based on www.wikipedia.org). Data are reported per thousand population 15–69 years old. For confidentiality reasons, only normalized values are reported; while relative positions are preserved, magnitudes are not.

Source: ZookNIC Inc; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2017 Revision* (population). (<http://www.zooknic.com>; <https://esa.un.org/unpd/wpp/>)

7.3.3 Wikipedia yearly edits

Wikipedia yearly edits by country (per million population 15–69 years old) | 2017

Data extracted from Wikimedia Foundation's internal data sources. For every country with more than 100,000 edit counts in 2017, the data from 2017 are used; otherwise, for every country with more than 100,000 edit counts in 2016, the data from 2016 are used. For all other countries, the data from 2014 are used. The data exclude both contributions to the extent that is identifiable in the data sources. Data are reported per million population 15–69 years old.

Source: Wikimedia Foundation; United Nations, Department of Economic and Social Affairs, Population Division (2014–17). *World Population Prospects: The 2017 Revision* (population). (<https://wikimediafoundation.org>; <https://esa.un.org/unpd/wpp/>)

7.3.4 Mobile app creation

Global downloads of mobile apps (scaled by per billion PPP \$ GDP) | 2017

Global downloads of mobile apps, by origin of the headquarters of the developer/firm, scaled by PPP\$ GDP (billions). Global downloads are compiled by App Annie Intelligence, public data sources, and the company's proprietary forecast model based on data from Google play store and iOS App store in each country between 1 January 2017 and 31 December 2017. Since data for China are not available for Google play store and only for iOS App store, data from China are treated as missing and considered 'n/a'.

Source: App Annie Intelligence; International Monetary Fund, *World Economic Outlook Database*, October 2017 (PPP\$ GDP) (2010–17). (<https://www.appannie.com/en/>; <https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx>)