SOURCES AND DEFINITIONS

This appendix complements the country/economy profiles and the online data tables by providing, for each of the 80 indicators included in the Global Innovation Index (GII) this year, its title, description, definition, and source.

For all 129 economies in the GII in 2019, the most recent values, within the period 2009 to 2018, were used for each indicator with a few noted exceptions (see Appendix IV). The year provided next to the indicator description corresponds to the year when data were most frequently available for economies. When more than one year is considered, the period is indicated at the end of the indicators source in parentheses.

Of the 80 indicators, 57 variables are hard data, 18 are composite indicators from third party data providers, marked with (∗), and 5 are survey questions from the World Economic Forum's Executive Opinion Survey (EOS), marked with (†). In some cases, additional markings are provided at the end of the indictor description. Instances marked with "[a]" signal indicators that were assigned half weights and those marked "[b]" are indicators where higher scores indicate poorer outcomes, commonly known as "bads". Details on the computation can be found in Appendix IV.

Some indicators received special treatment by way of scaling during computation to be comparable across economies. Scaling of indicators by other comparable indicators or through division by gross domestic product (GDP) in current U.S. dollars, purchasing power parity GDP in international dollars (PPP$ GDP), population, total exports, total trade, and so on. Details are provided in this appendix. In all cases, the scaling factor used was the value that corresponded to the same year of the indicator.

1 Institutions

1.1 Political environment

1.1.1 Political and operational stability
Political, legal, operational or security risk index[*ab] | 2018

Index that measures the likelihood and severity of political, legal, operational or security risks impacting business operations. Scores are annualized and standardized.

Source: IHS Markit, *Country Risk Scores*, aggregated for end Q1, Q2, Q3, and Q4 2018. (https://ihsmarkit.com/industry/economics-country-risk.html).

1.1.2 Government effectiveness
Government effectiveness index[*] | 2017

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*, 2018 update. (http://info.worldbank.org/governance/wgi/#home).

1.2 Regulatory environment

1.2.1 Regulatory quality
Regulatory quality index[*a] | 2017

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,* 2018 update. (http://info.worldbank.org/governance/wgi/#home).

1.2.2 Rule of law
Rule of law index*[a] | 2017

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,* 2018 update. (http://info.worldbank.org/governance/wgi/#home).

1.2.3 Cost of redundancy dismissal
Sum of notice period and severance pay for redundancy dismissal (salary in weeks, averages for workers with 1, 5, and 10 years of tenure, with a minimum threshold of 8 weeks)[b] | 2018

Redundancy costs measure 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, *Doing Business 2019: Training for Reform*, 2019. (http://www.doingbusiness.org/en/reports/global-reports/doing-business-2019).

1.3 Business environment

1.3.1 Ease of starting a business
Ease of starting a business (score)* | 2018

The ranking of economies on the ease of starting a business is determined by sorting their scores. These scores are the simple average of the scores for each of the component indicators. The World Banks 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, namely Bangladesh, Brazil, China, India, Indonesia, Japan,

Mexico, Nigeria, Pakistan, the Russian Federation, and the United States, the data are also collected for the second-largest business city.

Source: World Bank, *Doing Business 2019: Training for Reform*, 2019. (http://www.doingbusiness.org/en/reports/global-reports/doing-business-2019).

1.3.2 Ease of resolving insolvency
Ease of resolving insolvency (score)* | 2018

The ranking of economies on the ease of resolving insolvency is determined by sorting their scores. These scores are the simple average of the 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 "zero". on the strength of the insolvency framework index even if its legal framework includes provisions related to insolvency proceedings (liquidation or reorganization). The strength of the 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.

Source: World Bank, *Doing Business 2019: Training for Reform*, 2019. (http://www.doingbusiness.org/en/reports/global-reports/doing-business-2019).

2 Human capital and research

2.1 Education

2.1.1 Expenditure on education
Government expenditure on education (% of GDP) | 2015

Total general (local, regional and central) government expenditure on education (current, capital, and transfers), expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. Algeria Egypt, Saudi Arabia, Yemen, and Zambia use data for 2008.

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

2.1.2 Government funding per secondary student
Government funding per secondary student (% of GDP per capita) | 2015

Total general (local, regional and central, current and capital) initial government funding of education per student, which includes transfers paid (such as scholarships to students), but excludes transfers received, in this case international transfers to government for education (when foreign donors provide education sector budget support or other support integrated in the government budget). This is then expressed as a share of GDP per capita, in US$.

Source: UNESCO Institute for Statistics, *UIS online database* (2009-17). (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. Botswana and Cambodia use data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–18). (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. FYROM refers to North 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 of 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] | 2017

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. Argentina uses data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database* (2008–18). (http://data.uis.unesco.org).

2.2 Tertiary education

2.2.1 Tertiary enrolment
School enrolment, tertiary (% gross)[a] | 2017

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* (2010–18). (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* (2010–18). (http://data.uis.unesco.org).

2.2.3 Tertiary inbound mobility
Tertiary 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. Philippines uses data from 2008.

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 2.3.1 Researchers FTE
Researchers, full-time equivalent (FTE) (per million population) | 2017

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. Special tabulation based on UNESCO, Eurostat, and OECD data. Albania and Zambia use data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database*; Eurostat, Eurostat data base, 2019; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–17). (http://data.uis.unesco.org; https://ec.europa. eu/eurostat/data/database; https://stats.oecd.org/Index. aspx?DataSetCode=MSTI_PUB).

2.3.2 Gross expenditure on R&D (GERD)
Gross expenditure on R&D (% of GDP) | 2017

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. Special tabulation based on UNESCO, Eurostat, and OECD data. Albania and Zambia use data for 2008

Source: UNESCO Institute for Statistics, *UIS online database;* Eurostat, *Eurostat data base, 2019*; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–17). (http://data.uis.unesco.org; https://ec.europa.eu/eurostat/ data/database; https://stats.oecd.org/Index.aspx?DataSet-Code=MSTI_PUB).

2.3.3 Global R&D companies, average expenditure, top 3
Average expenditure of the top 3 global companies by R&D, mn US$* | 2018

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 2018. (http://iri.jrc.ec.europa.eu/scoreboard18.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* | 2018

Average score of the top three universities per country. If fewer than three universities are listed in the QS ranking of the global top 1000 universities, the sum of the scores of the listed universities is divided by three, thus implying a score of zero for the non-listed universities.

Source: QS Quacquarelli Symonds Ltd, *QS World University Ranking 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* | 2018

The ICT access index, previously part of the ITU ICT Development 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.

Source: GII calculations based on the World Telecommunication/ICT Indicators Database(Released January 18, 2019) following the methodology of the International Telecommunication Union, ICT Development Index 2017. (http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx).

3.1.2 ICT use
ICT use index* | 2018

The ICT use index, previously part of the ITU ICT Development 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.

Source: GII calculations based on the World Telecommunication/ICT Indicators Database (Released January 18, 2019) following the methodology of the International Telecommunication Union, ICT Development Index 2017. (http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx).

3.1.3 Government's online service
Government's online service index* | 2018

The Online Services Index component of the E-Government Development Index is a composite indicator measuring the use of ICTs by governments in delivering public services at the national level. The 2018 Online Service Questionnaire (OSQ) consists of a list of 140 questions. To arrive at a set of Online Service Index values for 2018, a total of 206 online United Nations Volunteer (UNV) researchers from 89 countries covering 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 total number of points scored by each country is normalized to a range of 0 to 1. The online index value for a given country is equal to the actual total score less the lowest total score divided by the range of total score values for all countries.

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 https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018_Annexes.pdf .

Source: United Nations Public Administration Network, *e-Government Survey 2018*. (https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index).

3.1.4 Online e-participation
E-Participation Index* | 2018

The E-Participation Index (EPI) is derived as a supplementary index to the United Nations E-Government Survey. It extends the dimension of the Survey by focusing on the government use of online services in providing information to its citizens or "e-information sharing", interacting with stakeholders or "e-consultation" and engaging in decision-making processes or "e-decision-making." A country's EPI reflects the 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 specific practice, but rather to offer insight into how different countries are using online tools in promoting interaction between the government and its citizens, as well as among the citizens, for the benefit of all. As 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 only serves as an indicator of the broad trends in promoting citizen engagement. As with the EGDI, the EPI is not intended as an absolute measurement of e-participation, but rather, as an attempt to capture the e-participation performance of counties relative to one another at a point in time. The index ranges from 0 to 1, with 1 showing greater e-participation. Mathematically,

the EPI is normalized by taking the total score value for a given country, subtracting the lowest total score for any country in the Survey and dividing by the range of total score values for all countries.

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 https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018_Annexes.pdf.

Source: United Nations Public Administration Network, *e-Government Survey 2018*. (https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018).

3.2   General infrastructure

3.2.1   Electricity output
Electricity output (kWh per mn population)[a] 2016

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, 2018 edition* (2016–17). (http://www.iea.org/statistics/).

3.2.2   Logistics performance
Logistics Performance Index[*a] | 2018

A multidimensional assessment of logistics performance, the Logistics Performance Index (LPI) ranks 160 countries combining data on six core performance components into a single aggregate measure—including customs performance, infrastructure quality, and timeliness of shipments. The data used in the ranking comes from a survey of logistics professionals who are asked questions about the foreign countries in which they operate. The LPI's six components are: (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 ("International shipments"); (4) the competence and quality of logistics services ("Services Quality"); (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 consists therefore of both qualitative and quantitative measures and helps build profiles of logistics friendliness for these countries.

Source: World Bank and Turku School of Economics, *Logistics Performance Index 2018*; Arvis et al., 2018, *Connecting to Compete 2018: Trade Logistics in the Global Economy—The Logistics Performance Index and its Indicators*. (https://openknowledge.worldbank.org/bitstream/handle/10986/29971/LPI2018.pdf).

3.2.3   Gross capital formation
Gross capital formation (% of GDP) | 2018

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 2018* (PPP$ GDP). (https://www.imf.org/external/pubs/ft/weo/2018/02/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) | 2016

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* (2016–17). (http://www.iea.org/statistics/).

3.3.2   Environmental performance
Environmental Performance Index* | 2018

The 2018 Environmental Performance Index (EPI) ranks 180 countries on 24 performance indicators across ten issue categories covering environmental health and ecosystem vitality. These metrics provide a gauge at a national scale of how close countries are to established environmental policy goals. The EPI thus offers a scorecard that highlights leaders and laggards in environmental performance, gives insight on best practices, and provides guidance for countries that aspire to be leaders in sustainability. 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] | 2017

ISO 14001:2015 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, fulfillment 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 of certifications to management system standards, 2017;* International Monetary Fund, *World Economic Outlook Database, October 2018* (PPP$ GDP) (https://www.iso.org/the-iso-survey.html ; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

4 Market sophistication

4.1 Credit

4.1.1 Ease of getting credit
Ease of getting credit* | 2018

The ranking of economies on the ease of getting credit is determined by sorting their scores for getting credit. These scores are the 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.

Source: World Bank, *Doing Business 2019: Training for Reform*. (http://www.doingbusiness.org/en/reports/global-reports/doing-business-2019).

4.1.2 Domestic credit to private sector
Domestic credit to private sector (% of GDP) | 2017

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

Source: International Monetary Fund, International Financial Statistics and data files; and World Bank and OECD GDP estimates; extracted from the World Bank's *World Development Indicators* database (2013-2017). (http://data.worldbank.org/).

4.1.3 Microfinance institutions gross loan portfolio
Microfinance institutions: Gross loan portfolio (% of GDP) | 2017

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 2018* (current US$ GDP) (2011-2018). (https://reports.themix.org/; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

4.2 Investment

4.2.1 Ease of protecting minority investors
Ease of protecting minority investors* | 2018

This ranking is the simple average of the 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 (ease of shareholder suits index). 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.

Source: World Bank, *Doing Business 2019: Training for Reform*. (http://www.doingbusiness.org/en/reports/global-reports/doing-business-2019).

4.2.2 Market capitalization
Market capitalization of listed domestic companies (% of GDP, three-year average)[a] | 2017

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 with the exception of Jamaica (averages for two years: 2010 and 2011); Ukraine (2010, 2011), and Zambia (2011)

Source: World Federation of Exchanges database; extracted from the World Bank's *World Development Indicators* database (2011–17). (http://data.worldbank.org/).

4.2.3 Venture capital deals
Venture capital per investment location: Number of deals (per billion PPP$ GDP)[a] | 2018

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 January 1, 2018 to December 31, 2018, with the data collected by investment location, for a total of 14,856 deals in 78 countries in 2018. The data are reported per billion PPP$ GDP.

Source: Thomson Reuters, *Thomson One Banker Private Equity* database; International Monetary Fund, *World Economic Outlook Database* October 2018 (PPP$ GDP). (https://www.thomsonone.com); https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

4.3 Trade, competition, and market scale

4.3.1 Applied tariff rate, weighted average
Tariff rate, applied, weighted average, all products (%)[a,b] | 2017

"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. 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 (2011–17). (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] | 2018

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

4.3.3 Domestic market scale
Domestic market scale as measured by GDP, bn PPP$ | 2018

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 2018 (PPP$ GDP). (https://www.imf.org/external/pubs/ft/weo/2018/02/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) | 2017

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 2009–18). 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 (2009–18). Nigeria uses data from 2013.

Source: International Labour Organization *ILOSTAT Database of Labour Statistics* (2009–18). (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* (2009–17). (http://www.enterprisesurveys.org/).

5.1.3 GERD performed by business enterprise
GERD: Performed by business enterprise
(% of total GDP)[a] | 2017

Gross expenditure on R&D performed by business enterprise as a percentage of GDP. For the definition of GERD see indicator 2.3.2. Islamic Republic of Iran and Zambia use data for 2008.

Source: UNESCO Institute for Statistics*, UIS online database*; Eurostat, *Eurostat database, 2019*; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–17). (http://data.uis.unesco.org; https://ec.europa.eu/eurostat/data/database; https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).

5.1.4 GERD financed by business enterprise
GERD: Financed by business enterprise
(% of total GERD)[a] | 2016

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. Albania, Australia, Islamic Republic of Iran, and Zambia use data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database*; Eurostat, *Eurostat database, 2019*; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–17). (http://data.uis.unesco.org; https://ec.europa.eu/eurostat/data/database; https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).

5.1.5 Females employed with advanced degrees
Females employed with advanced degrees, % total employed (25+ years old)[a] | 2017

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 14-10-0020-01 of the country's Labour Force Survey estimates.

Source: International Labour Organization, *ILOSTAT Annual Indicators;* Statistics Canada. Table 14-10-0020-01 Unemployment rate, participation rate and employment rate by educational attainment, annual (x 1,000), accessed February 21, 2019 (2009–18). (http://www.ilo.org/ilostat/; 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] | 2018

Source: World Economic Forum, *Executive Opinion Survey 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 = non-existent; 7 = widespread in many fields][†] | 2018

Source: World Economic Forum, *Executive Opinion Survey 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) | 2016

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. For the definition of GERD see indicator 2.3.2. Albania, Australia, Burundi, and Zambia use data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database*; Eurostat, *Eurostat database, 2019*; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–18). (http://data.uis.unesco.org; https://ec.europa.eu/eurostat/data/database; https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).

5.2.4 Joint venture/strategic alliance deals
Joint ventures/strategic alliances: Number of deals, fractional counting (per billion PPP$ GDP)[a] | 2018

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 January 1, 2018 to December 31, 2018, for a total of 6,880 deals announced in 2017, with firms headquartered in 110 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 6,880). The data are reported per billion PPP$ GDP.

Source: Thomson Reuters, *Thomson One Banker Private Equity, SDC Platinum* database; International Monetary Fund *World Economic Outlook Database*, October 2018 (PPP$ GDP). (http://banker.thomsonib.com; https://www.imf.org/external/pubs/ft/weo/2018/02/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) | 2015

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 2018 (PPP$ GDP). (http://www.wipo.int//ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

5.3 Knowledge absorption

5.3.1 Intellectual property payments
Charges for use of intellectual property i.e., payments (%, total trade, three-year average)[a] | 2017

Charges for the use of intellectual property not included elsewhere payments (% of total trade), average of three most recent years or available data. Value 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 non-monetary 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 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). Data for Armenia is for (2012-14), Azerbaijan and Guinea (2011, 2012, 2015), Islamic Republic of Iran (2013-15), Niger (2009, 2014-15), and Rwanda (2008).

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 (2009–17). (http://stat.wto.org/StatisticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf).

5.3.2 High-tech imports
High-tech imports (% of total trade) | 2017

High-technology 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: World Trade Organization, United Nations, *Comtrade database*; Eurostat, *Annex 5: High-tech aggregation by SITC Rev. 4*, April 2009 (2015-2017). (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) | 2017

Telecommunications, computer and information services as a percentage of total trade according to the Organisation for Economic Co-operation and Development (OECD)'s Main 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 (2015-17). (http://stat.wto.org/Statis-ticalProgram/WSDBStatProgramSeries.aspx; http://www.oecd.org/std/its/EBOPS-2010.pdf).

5.3.4 Foreign direct investment net inflows
Foreign direct investment (FDI), net inflows (% of GDP, three-year average) | 2017

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, 2019. (http://data.worldbank.org/).

5.3.5 Research talent in business enterprise
Researchers in business enterprise per thousand population (%) | 2017

"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. Oman uses data for 2015.

Source: UNESCO Institute for Statistics, *UIS online database*; Eurostat, *Eurostat database, 2019*; OECD, *Main Science and Technology Indicators MSTI database, 2019* (2008–17). (http://data.uis.unesco.org; https://ec.europa.eu/eurostat/data/database; https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).

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] | 2017

"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 2018 (PPP$ GDP) (2010–17). (http://www.wipo.int/ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/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] | 2018

These are the number of Patent Cooperation Treaty (PCT) international patent applications filed through the WIPO-administered Patent Cooperation Treaty in 2018. A "PCT international application" refers to a patent application filed through the WIPO-administered Patent Cooperation Treaty (PCT) during the international phase outlined by the PCT System. The origin of PCT applications are defined by the residence of the first-named applicant. The PCT System facilitates the filing of patent applications worldwide, making it possible to seek patent protection for an invention simultaneously in each of a large number of countries by first filing a single international patent application. Data is available only for those economies adhered to PCT.

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database,* October 2018 (PPP$ GDP). (http://www.wipo.int/ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

6.1.3 Utility models by origin

Number of utility model applications filed by residents at the national patent office (per billion PPP$ GDP) | 2017

These are the number of resident utility model applications iled at a given national or regional patent office in 2017 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". Data is available only for those economies with a utility models system.

Source: World Intellectual Property Organization, *Intellectual Property Statistics*; International Monetary Fund, *World Economic Outlook Database*, October 2018 (PPP$ GDP) (2010–17). (http://www.wipo.int/ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx).

6.1.4 Scientific and technical publications

Number of scientific and technical journal articles (per billion PPP$ GDP)[a] | 2018

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.

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 2018 (PPP$ GDP). (https://apps.webofknowledge.com; https://www.imf.org/external/pubs/ft/weo/2018/02/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 | 2018

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 (2019) SJR—SCImago Journal & Country Rank. Retrieved February 2019. (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 (%, three-year average) | 2018

Growth rate of real GDP per person employed (constant 1990 PPP$), average of three last available years. Growth of gross domestic product (GDP) per person engaged provides a measure of labour productivity (defined as output per unit of labour input). GDP per person employed is GDP divided by total employment in the economy. PPP$ GDP is Constant 1990 in US dollar, expressed in 1990 GK PPP, Millions. While this is a relatively robust measure, it does not correct for part-time jobs as it merely counts people who are employed. Hence, GDP per person employed is somewhat underestimated in countries with a higher share of part-time workers, which are mostly OECD countries.

Source: The Conference Board Total Economy Database™ Output, Labor and Labor Productivity, 1950–2018, November 2018. (https://www.confer-ence-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. Kenya used data for 2008

Source: World Bank, *Doing Business 2018, Entrepreneurship* (2008–16). (http://www.doingbusiness.org/data/exploreto-pics/entrepreneurship).

6.2.3 Total computer software spending
Total computer software spending (% of GDP)[a] | 2018

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 Markit, *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] | 2017

ISO 9001:2015 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 9001:2015 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 certifications to management system standards, 2017*; International Monetary Fund, *World Economic Outlook* database, October 2018 (PPP$ GDP). (http://www.iso.org; https://www.imf.org/external/pubs/ft/weo/2018/02/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] | 2016

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. Cameroon uses data for 2008.

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" (2008–16). (http://www.unido.org/statistics.html; http://stat.unido.org/content/focus/classification-of-manufacturing-sectors-by-technologi-cal-intensity-%2528isic-revision-4%2529;jsessionid=4D-B1A3A5812144CACC956F4B8137C1CF; http://www.oecd.org/sti/ind/48350231.pdf).

6.3 Knowledge diffusion

6.3.1 Intellectual property receipts
Charges for use of intellectual property i.e., receipts
(% total trade, three-year average)[a] | 2017

Charges for the use of intellectual property not included
elsewhere receipts (% of total trade), average of three
most recent years or available data. Value 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. Data for
Armenia is for (2015), Azerbaijan (2011-12, 2014), Benin
(2014-16), Burundi (2014-15, 2017), Côte d'Ivoire (2014-16),
Guinea (2013), Islamic Republic of Iran (2013-15), Mali
(2011-12, 2017), Mozambique (2009, 2011 -12), Niger (2015-
16), Rwanda (2009), Tajikistan (2009, 2014), Togo (2010),
Turkey (2017), and Yemen (2009, 2016).

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 (2009–17). (http://stat.wto.org/Statis-
ticalProgram/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] | 2017

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

Source: World Trade Organization, United Nations,
Comtrade database; Eurostat, *Annex 5: High-tech
aggregation by SITC Rev. 4*, April 2009 (2015–17). (http://
comtrade.un.org/; https://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] | 2017

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 (2015-17). (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)[a] | 2017

"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. The two extreme
bottom outliers in Malta and Iceland were given n/a due to
a verified low quality of their time series for that indicator.

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 (2016–17).
(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) | 2017

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 2017. 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 2018 (PPP$ GDP) (2010–17). (http://www.wipo.int//ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/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] | 2017

This indicator refers to the number of designs contained in industrial design applications filed at a given national or regional office in 2017. 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 2018 (PPP$ GDP) (2010–17). (http://www.wipo.int//ipstats/; https://www.imf.org/external/pubs/ft/weo/2018/02/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][†] | 2018

Source: World Economic Forum, *Executive Opinion Survey 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][†] | 2018

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

7.2 Creative goods and services[a]

7.2.1 Cultural and creative services exports

Cultural and creative services exports (% of total trade)[a] | 2017

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. Costa Rica, Cyprus, Ecuador, Guinea, Malta, Mexico, Togo show values used in the GII 2018. Due to quality considerations data for the United Arab Emirates is not considered.

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. (2016-2017). (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] | 2017

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. El Salvador uses data for 2008.

Source: UNESCO Institute for Statistics, *UIS online database*; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2017 Revision* (population) (2008-2017). (http://data.uis.unesco.org; http://esa.un.org/unpd/wpp/).

7.2.3 Entertainment and media market
Global entertainment and media market (per thousand population 15–69 years old)[*a] | 2017

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 63 countries. Two new datasets have been added to this year's Outlook. Podcasts are covered for the first time, with data for both monthly listeners and advertising revenue for 20 markets. Additionally, the E-sports dataset has been deepened with the addition of E-sports media rights, providing a richer picture of this fast-emerging market. A number of changes have also been made to the segmentation of the Outlook to better reflect the shape of the modern entertainment and media market. The Music and Radio segments have been merged along with the new Podcasts data to create the new Music, Radio and Podcasts segment, reflecting the growing interconnectedness of the audio entertainment market. And the Video games segment has been merged with E-sports to create the new Video games and e-sports segment, capturing the close relationship between the two markets. The names of a number of segments have also been changed: OOH advertising is now simply OOH, and Internet video is now OTT video. None of the data contained in these segments has been affected. Finally, Venezuela has been removed from the Outlook for this year due to the difficulty of accurately measuring the entertainment and media market in that country given its current political and economic environment.

A total of 63 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 63 countries considered in the Outlook report are based on advertising and consumer digital and non-digital data in US$ millions at average 2018 exchange rates for the year 2018. These results are reported normalized per thousand population, 15–69 years old, for the year 2018. 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, 2018–2022*; United Nations, Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2017 Revision* (population); *World Economic Outlook Database,* October 2018 (current US$ GDP); Middle East & North Africa in the World Bank's *DataBank*. (http://www.pwc.com/outlook ; http://esa.un.org/unpd/wpp/ ; https://www.imf.org/external/pubs/ft/weo/2018/02/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) | 2016

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). For a more robust coverage data for Argentina (2002), Ghana (2003), Trinidad and Tobago (2006), Pakistan (2006), Madagascar (2006), and Lebanon (2007) is used from years prior to 2008. Chile used data for 2015.

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). (2002–17). (http://www.unido.org/statistics.html; http://data.un.org/).

7.2.5 Creative goods exports
Creative goods exports (% of total trade) | 2017

Total value of creative goods exports, net of re-exports (current US$) over total trade. Creative goods as defined in 2009 UNESCO Framework for Cultural Statistics, Table 3, *International trade of cultural goods and services based on the 2007 Harmonised System (HS 2007)*. For the definition of total trade see indicator 5.3.1.

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 (2013–17). (http://comtrade.un.org/; http://www.uis.unesco.org/culture/Documents/framework-cultural-statistics-culture-2009-en.pdf; http://stat.wto.org/Statistical-Program/WSDBStatProgramSeries.aspx; http://www.oecd.org/sdd/its/EBOPS-2010.pdf).

7.3 Online creativity[a]

7.3.1 Generic top-level domains (gTLDs)
Generic top-level domains (gTLDs) (per thousand population 15–69 years old) | 2018

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 2018, 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) | 2018

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 2018, 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. 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; http://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 apps creation
Global downloads of mobile apps (scaled by per billion PPP $ GDP) | 2018

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 January 1, 2018 and December 31, 2018. 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: Source: App Annie Intelligence; International Monetary Fund, *World Economic Outlook Database*, October 2018 (PPP$ GDP) (2010–17). (https://www.appannie.com/en/; https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx)