The EU in the world - research and information society

Statistics Explained

Data extracted in April 2018.
No planned article update.

" The highest research and development intensity in 2015 among the G20 members was in South Korea. "

" By 2016, all G20 members registered at least 80 mobile telephone subscriptions per 100 inhabitants. "

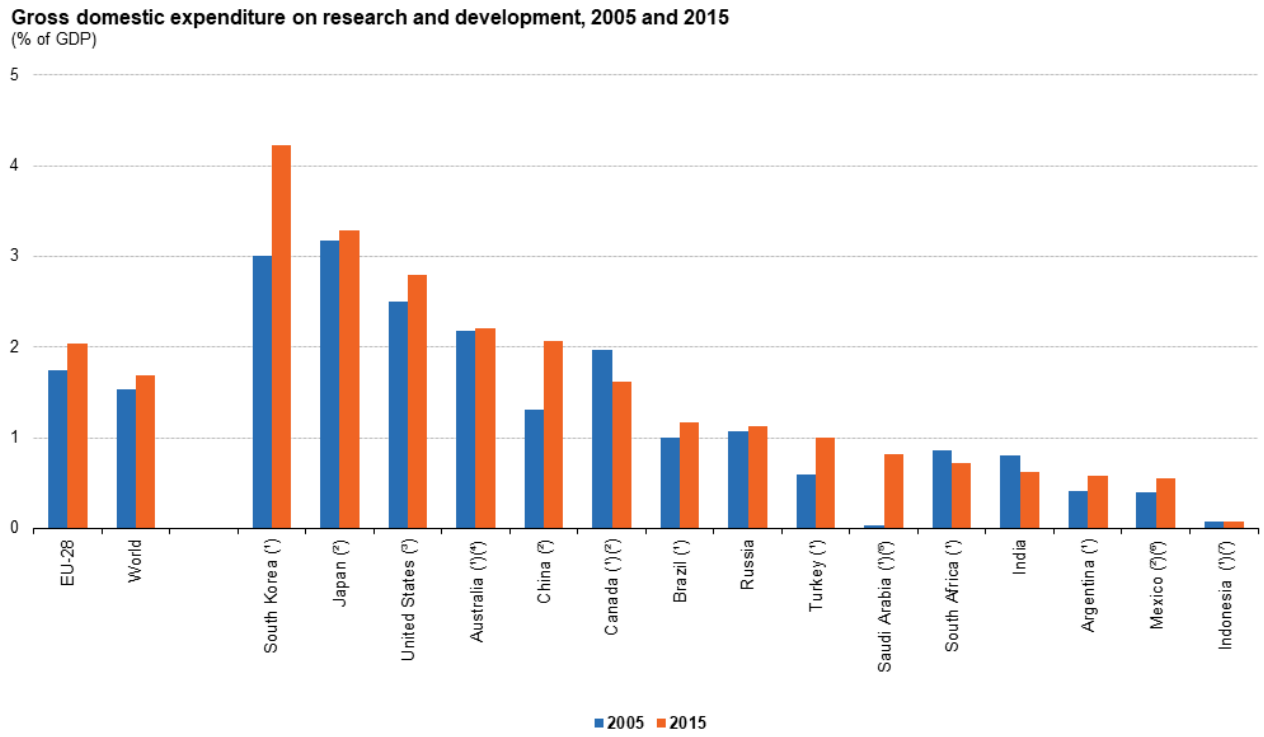
This article is part of a set of statistical articles based on Eurostat's publication *The EU in the world 2018* . This article focuses on science and technology and the digital society in the European Union (EU) and the 15 non-EU members of the Group of Twenty (G20) . It covers a range of statistics on research and development (R & D) expenditure and personnel , and the use of information and communication technologies. It gives an insight into the EU's economy in comparison with the major economies across the rest of the world, such as the EU's counterparts in the so-called Triad — Japan and the United States — and the BRICS composed of Brazil, Russia, India, China and South Africa.

R & D expenditure

Research and development (R & D) includes creative work carried out on a systematic basis in order to increase the stock of knowledge of man, culture and society, and the use of this knowledge to devise new applications. Gross domestic expenditure on research and development (GERD) is a key measure of the level of R & D activity performed in an economy. It includes R & D that is funded from abroad , but excludes payments made abroad.

The highest R & D intensity in 2015 among the G20 members was in South Korea

GERD in the EU-28 was just over EUR 300 billion in 2015. The relation between the level of GERD and gross domestic product (GDP) is known as R & D intensity (see Figure 1), and in 2015 it stood at 2.04 % in the EU-28. By far the highest R & D intensity among the G20 members was in South Korea, where GERD was equivalent to 4.23 % of GDP in 2015. The latest data for Japan, the United States, Australia (2013 data) and China show that they also recorded relatively high R & D intensities, all above the EU-28 average and between 2.0 and 3.5 %. Indonesia recorded by far the lowest R & D intensity among the G20 members, with GERD equivalent to less than 0.10 % (2013 data) of GDP.



(1) Australia: 2006 instead of 2005. South Korea: 2007 instead of 2005. Indonesia: 2009 instead of 2005. Australia, Indonesia, Saudi Arabia and South Africa: 2013 instead of 2015. Argentina, Brazil, Canada and Turkey: 2014 instead of 2015.
(2) Break in series.
(3) Excluding most or all capital expenditure.
(4) 2013: estimate.
(5) Based on R&D budget, not expenditure.
(6) 2015: estimate.
(7) Estimates.
Source: Eurostat (online data code: rd_e_gerdtot) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

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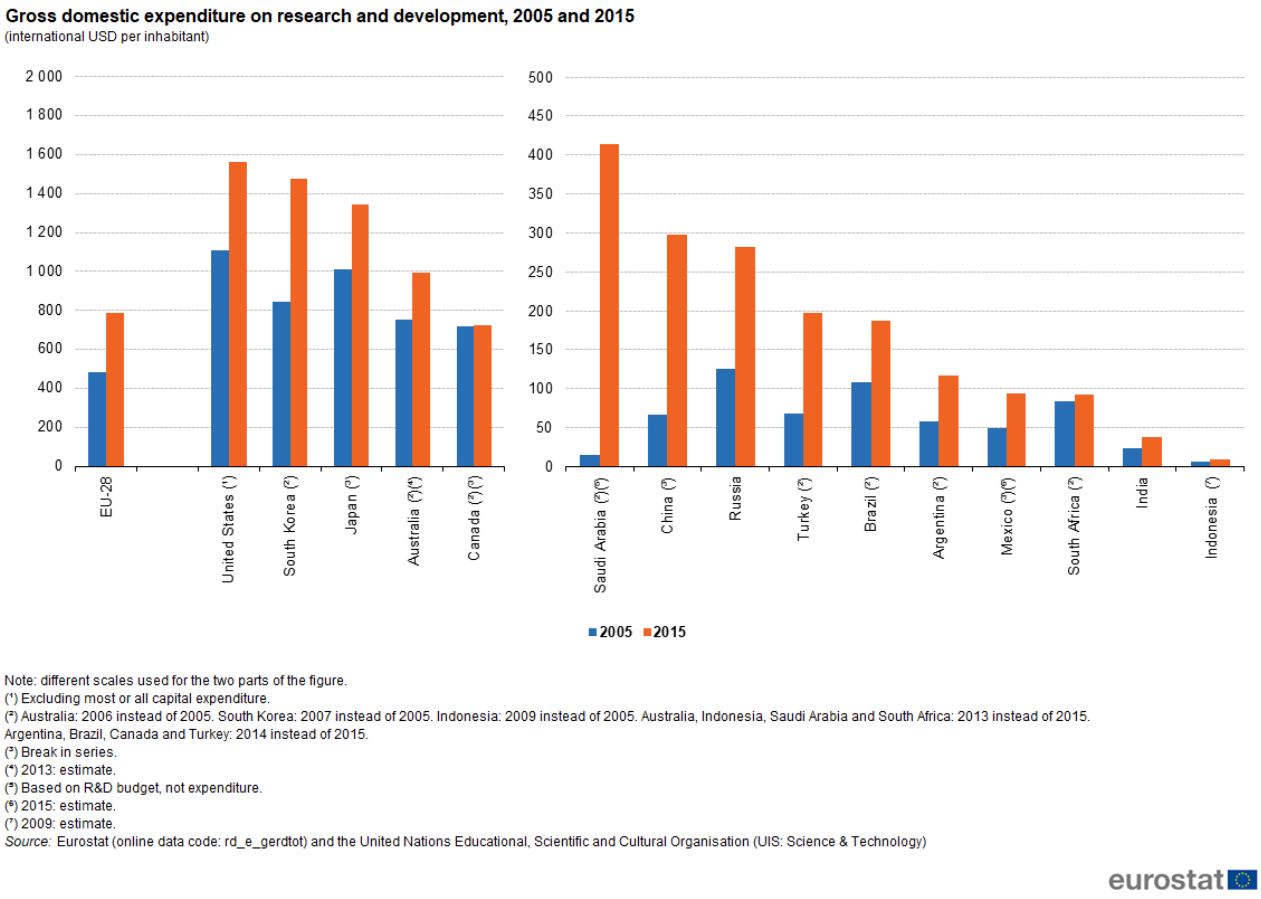
Figure 1: Gross domestic expenditure on research and development, 2005 and 2015 (% of GDP) Source: Eurostat (rd_e_gerdtot) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

Between 2005 and 2015, R & D intensity increased worldwide by 0.16 % of GDP and in the EU-28 by 0.30 %. The largest increases among the G20 members were observed for South Korea (1.22 %; 2007-2015), Saudi Arabia (0.78 %; 2005-2013; based on the R & D budget rather than actual expenditure) and China (0.76 %; note that there is a break in series). The only declines shown in Figure 1 were in South Africa, India and Canada; note that there is a break in series for Canada.

An alternative calculation based on R & D expenditure can be seen in Figure 2, namely the level of GERD relative to population size. For this indicator GERD is presented in a common currency (United States dollars) using purchasing power parities (PPPs) rather than market exchange rates: PPPs are indicators of price level differences across countries. The resulting ratio per inhabitant provides a very clear distinction between G20 members. The United States, South Korea and Japan stand out with GERD per inhabitant in excess of USD 1 300. Australia (2013 data), the EU-28 and Canada (2014 data) completed the group of G20 members with relatively high GERD per inhabitant, all in the range of USD 700-1 000. Among the other G20 members, only Saudi Arabia (2013 data), China and Russia recorded GERD in excess of USD 200 per inhabitant, while this indicator was below USD 10 per inhabitant in Indonesia (2013 data).



Note: different scales used for the two parts of the figure.
(1) Excluding most or all capital expenditure.
(2) Australia: 2006 instead of 2005. South Korea: 2007 instead of 2005. Indonesia: 2009 instead of 2005. Australia, Indonesia, Saudi Arabia and South Africa: 2013 instead of 2015. Argentina, Brazil, Canada and Turkey: 2014 instead of 2015.
(3) Break in series.
(4) 2013: estimate.
(5) Based on R&D budget, not expenditure.
(6) 2015: estimate.
(7) 2009: estimate.
Source: Eurostat (online data code: rd_e_gerdtot) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

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Figure 2: Gross domestic expenditure on research and development, 2005 and 2015 (international USD per inhabitant) Source: Eurostat (rd_e_gerdtot) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

R & D personnel

The number of people working in R & D in the EU-28 in 2015 was 2.9 million full-time equivalents

R & D personnel include all individuals employed directly in the field of R & D, covering not only researchers , but also technicians and equivalent staff as well as supporting staff (such as managers, administrators and clerical staff). Among the G20 members shown in Figure 3, China had the largest R & D workforce, numbering 3.8 million full-time equivalents in 2015, followed by the EU-28 with an R & D workforce of 2.9 million; note that the United States is among the G20 members for which data are not available. The third and fourth largest R & D workforces were in Japan and Russia, each less than a quarter of the size of the workforce in China and less than a third of that in the EU-28. A full-time equivalent is a unit to measure employed persons or students in a way that makes them comparable although they may work or study a different number of hours per week. The unit is obtained by comparing the number of hours worked or studied by a person with the average number of hours of a full-time worker or student. A full-time person is therefore counted as one unit, while a part-time person gets a score in proportion to the hours they work or study.

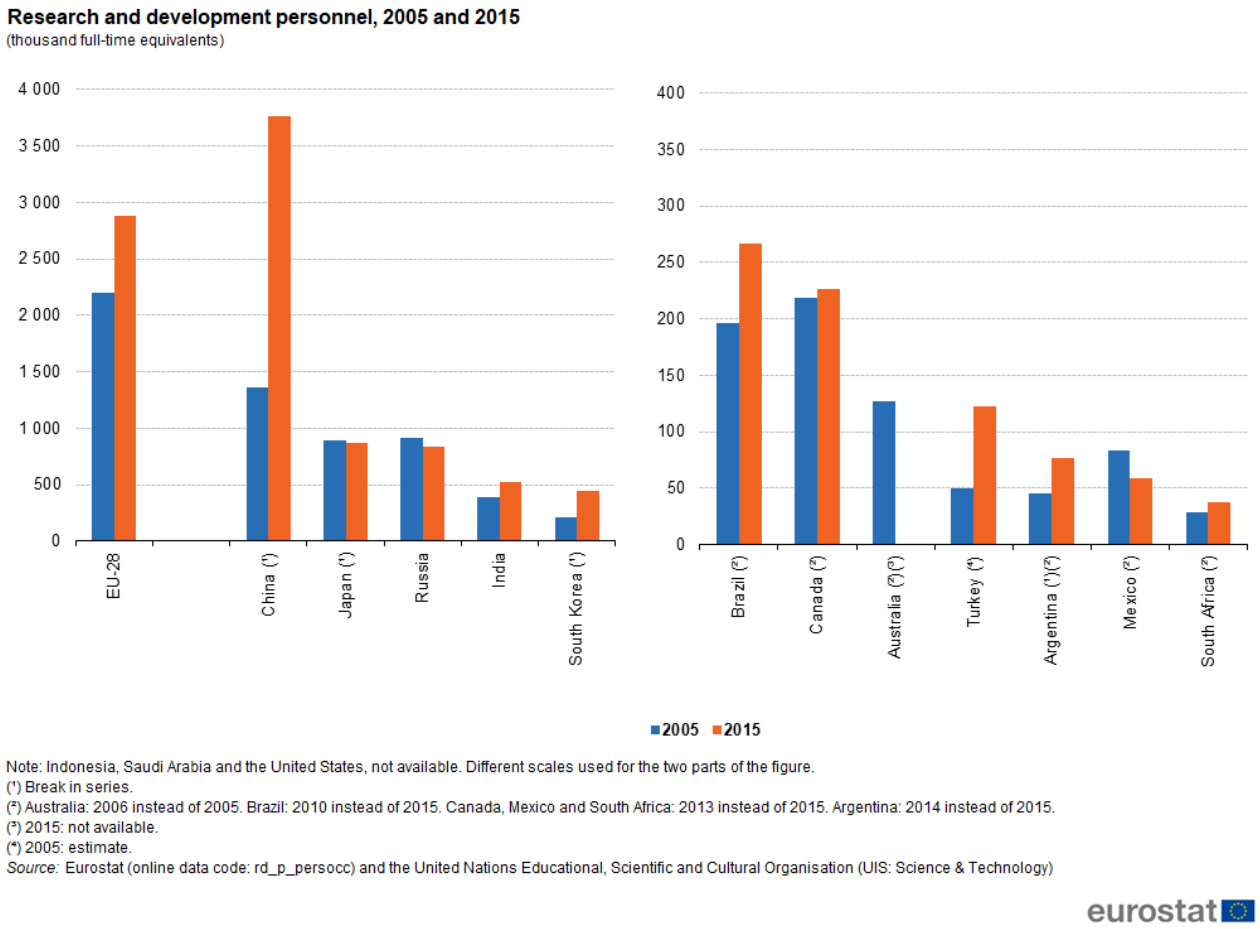
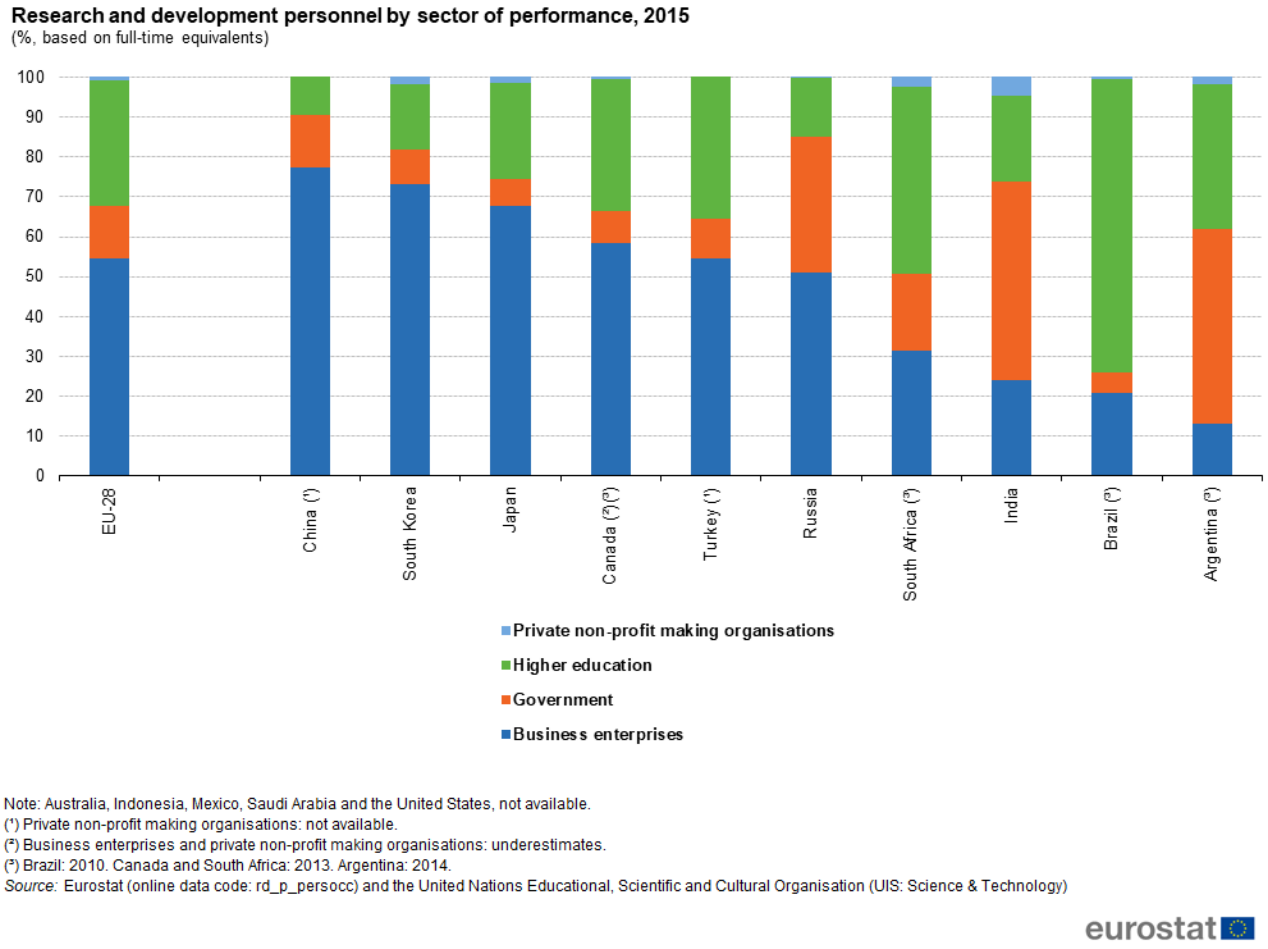


Figure 3: Research and development personnel, 2005 and 2015 (thousand full-time equivalents) Source: Eurostat (rd_p_persocc) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

The number of R & D personnel in China nearly trebled between 2005 and 2015, although a break in series should be noted, while the R & D workforces of Turkey and South Korea (also a break in series) also more than doubled; in the EU-28 the number of R & D personnel increased by 31 %. Japan, Russia and Mexico (2005-2013) were the only G20 members to record a fall in their number of R & D personnel during the period under consideration.

R & D personnel can be classified to the following sectors: business , government , higher education institutions , and private non-profit making organisations . More than half (55 %) of all R & D personnel in the EU-28 were employed in the business enterprise sector in 2015, around one third (32 %) in higher education and most of the remainder in the government sector (13 %) — see Figure 4. The share of R & D personnel in the business enterprise sector peaked at 77 % in China and was around 70 % in South Korea and Japan. By contrast, less than one third of R & D personnel were in the business enterprise sector in South Africa (2013 data), India, Brazil (2010 data) and Argentina (2014 data). In Brazil, the higher education sector was the dominant employer, with 73 % of the total; South Africa was the only other G20 member where the share of R & D personnel in this sector exceeded two fifths. In India and Argentina, the government sector employed around half of all R & D personnel. The share of R & D personnel in the private non-profit making sector was generally small, peaking at 5 % in India.



Note: Australia, Indonesia, Mexico, Saudi Arabia and the United States, not available.
(1) Private non-profit making organisations: not available.
(2) Business enterprises and private non-profit making organisations: underestimates.
(3) Brazil: 2010. Canada and South Africa: 2013. Argentina: 2014.
Source: Eurostat (online data code: rd_p_persocc) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

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Figure 4: Research and development personnel by sector of performance, 2015 (%, based on full-time equivalents) Source: Eurostat (rd_p_persocc) and the United Nations Educational, Scientific and Cultural Organisation (UIS: Science & Technology)

Telecommunications

Telecommunication networks and services are the backbone of the digital society. Individuals, enterprises and public organisations alike depend increasingly on convenient, reliable and high-speed telecommunication networks and services. A shift in the importance of various services can be noted, from wired to wireless networks and from voice to data services.

The number of fixed telephone subscriptions relative to the size of the population increased between 2006 and 2016 in just two of the G20 members (see Figure 5), up by 20 % in South Korea and by 15 % in Japan. Elsewhere, the decreases ranged from less than 20 % in Brazil, Argentina, Mexico, the EU-28 and South Africa, through the world average of 29 %, to closer to 50 % in China, India (both 47 %) and Turkey (49 %).

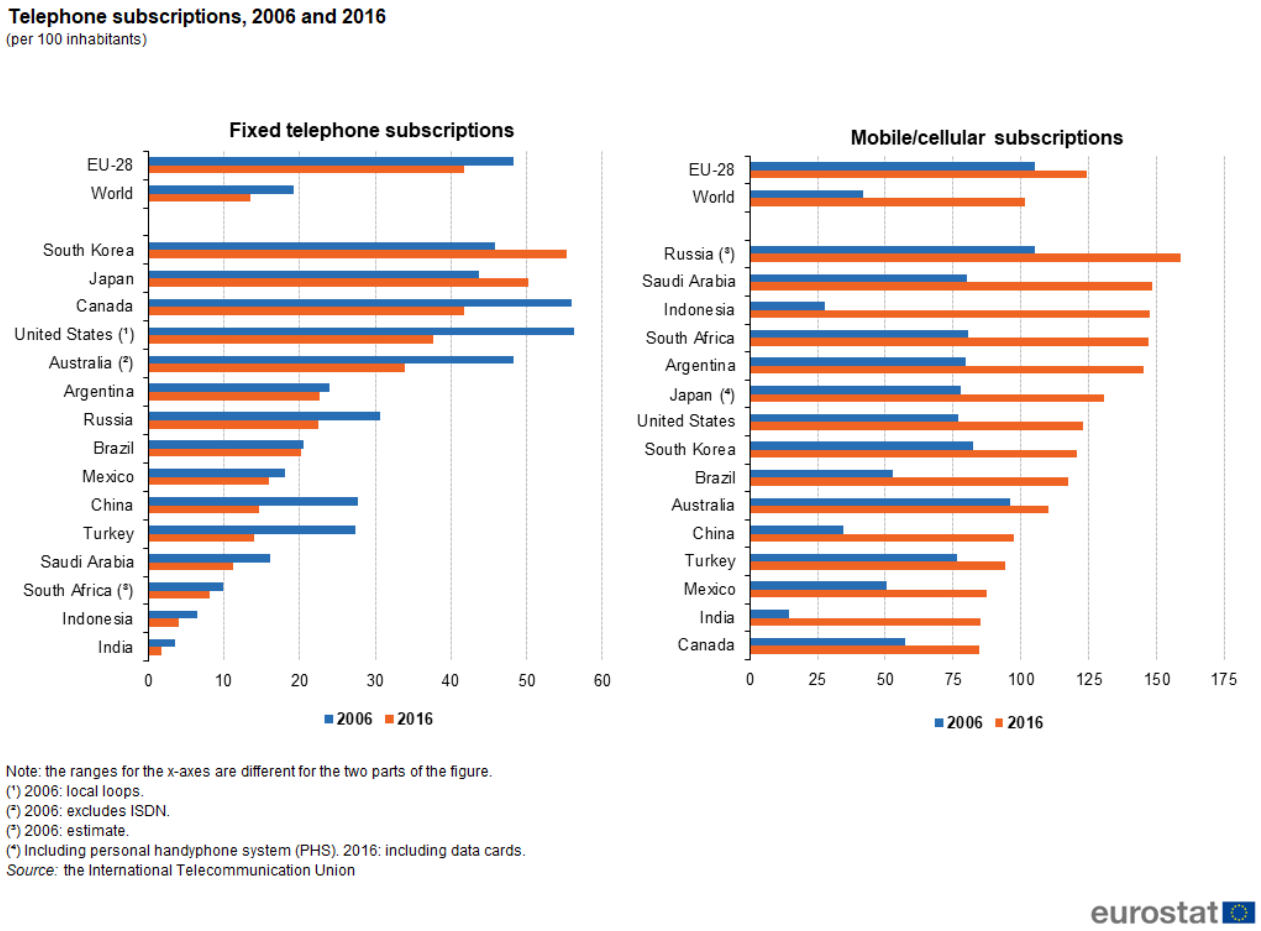
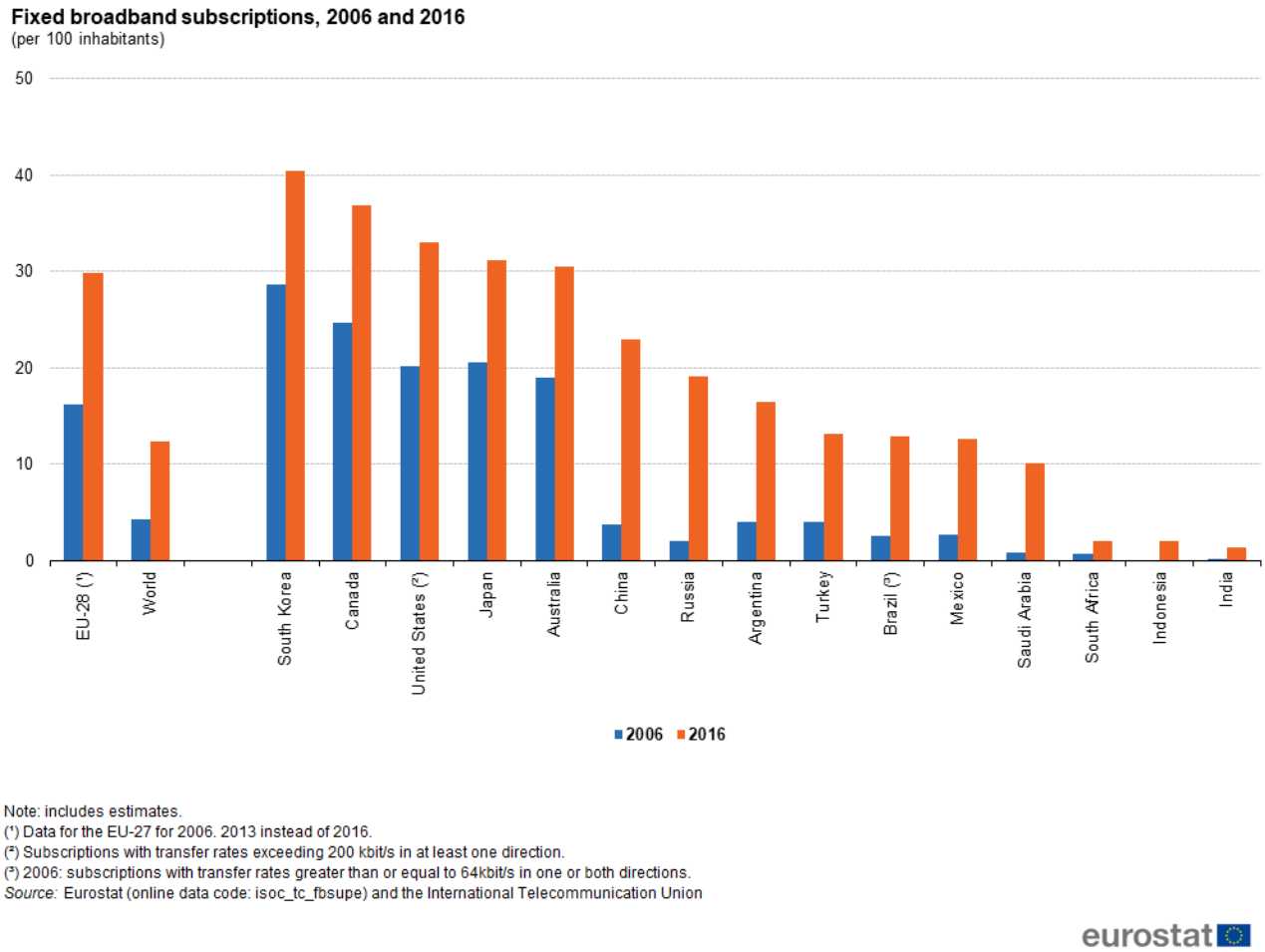


Figure 5: Telephone subscriptions, 2006 and 2016 (per 100 inhabitants) Source: the International Telecommunication Union

By 2016, all of the G20 members registered at least 80 mobile telephone subscriptions per 100 inhabitants

A mobile phone subscription refers to the use of public mobile telecommunication systems (also called mobiles or cellphones) using cellular technology. Active pre-paid cards are treated as subscriptions and people may have more than one subscription. In all G20 members, the number of mobile subscriptions relative to population size increased between 2006 and 2016 (see Figure 6). Indonesia experienced by far the strongest absolute growth, from 28 mobile subscriptions per 100 inhabitants in 2006 to 148 per 100 inhabitants in 2016, an increase of 120 per 100 inhabitants, which was double the average for the world as a whole, (up from 42 to 102 per 100 inhabitants). India reported the second largest increase in absolute terms, up 71 per 100 inhabitants to reach 85 mobile subscriptions per 100 inhabitants in 2016, moving it from last place in the rankings in 2006 to second last in 2016, overtaking Canada (also 85 per 100 inhabitants in 2016). As such, all of the G20 members registered at least 80 mobile subscriptions per 100 inhabitants in 2016, with Mexico, Turkey and China the only other G20 members alongside Canada and India where there were fewer mobile subscriptions than inhabitants.



Note: includes estimates.
(1) Data for the EU-27 for 2006. 2013 instead of 2016.
(2) Subscriptions with transfer rates exceeding 200 kbit/s in at least one direction.
(3) 2006: subscriptions with transfer rates greater than or equal to 64kbit/s in one or both directions.
Source: Eurostat (online data code: isoc_tc_fbsupe) and the International Telecommunication Union

eurostat

Figure 6: Fixed broadband subscriptions, 2006 and 2016 (per 100 inhabitants) Source: Eurostat (isoc_tc_fbsupe) and the International Telecommunication Union

Broadband refers to telecommunications in which a wide band of frequencies is available to send data. Broadband telecommunication lines or connections transport data at high speeds. The technologies most widely used for fixed broadband internet access are digital subscriber line (DSL) and its variations (xDSL), or cable modem (connection to a local television line). Like the number of fixed telephone lines in general, relative to population size the number of fixed broadband subscriptions among the G20 members was much more diverse than was the case for mobile subscriptions. South Korea had 40 subscriptions per 100 inhabitants in 2016 while several other G20 members — Canada, the United States, Japan, Australia and the EU-28 (2013 data) — reported between 30 and 37 subscriptions per 100 inhabitants. At the other end of the ranking, Saudi Arabia (10 subscriptions per 100 inhabitants) had a fixed broadband subscription rate that was below the world average (12 per 100 inhabitants) while South Africa, Indonesia and India had 1 or 2 subscriptions per 100 inhabitants. Between 2006 and 2016, all G20 members reported growth in fixed broadband subscriptions relative to population size, with the strongest growth in absolute terms reported for China (an extra 19 subscriptions per 100 inhabitants) and Russia (17 subscriptions per 100 inhabitants more).

Source data for tables and graphs

- Research and development and the digital society: tables and figures

Data sources

The statistical data in this article were extracted during April 2018.

The indicators are often compiled according to international — sometimes worldwide — standards. Although most data are based on international concepts and definitions there may be certain discrepancies in the methods used to compile the data.

EU data

All of the indicators presented for the EU have been drawn from Eurobase, Eurostat's online database. Eurobase is updated regularly, so there may be differences between data appearing in this article and data that is subsequently downloaded.

G20 members from the rest of the world

For the 15 non-EU G20 members, the data presented have been compiled by the International Telecommunication Union and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) , supplemented by data from the World Bank . For some of the indicators shown a range of international statistical sources are available, each with their own policies and practices concerning data management (for example, concerning data validation, correction of errors, estimation of missing data, and frequency of updating). In general, attempts have been made to use only one source for each indicator in order to provide a comparable dataset for the members.

Context

Practical applications of science are integrated in almost every moment of our lives, for example, in household appliances, medicine and healthcare, transport, communications and entertainment. R & D and innovation underlie such applications and are often considered as some of the primary driving forces behind competitiveness, economic growth and job creation.

Other articles

- All articles on science, technology and digital society
- All articles on the non-EU countries
- Other articles from *The EU in the world*

Publications

- The EU in the world 2018
- The European Union and the African Union — A statistical portrait — 2018 edition ;
- Sustainable Development in the European Union — Monitoring report on progress towards the SDGs in an EU context
- Smarter, greener, more inclusive ? Indicators to support the Europe 2020 strategy — 2017 edition
- Globalisation patterns in EU trade and investment
- 40 years of EU-ASEAN cooperation — 2017 edition
- Key figures on the enlargement countries — 2017 edition
- Asia-Europe Meeting (ASEM) — A statistical portrait — 2016 edition
- Euro-Mediterranean statistics — 2015 edition

- The European Union and the BRIC countries
- The European Union and the Republic of Korea — 2012
- Key data on education in Europe 2012

Database

- Science and technology (scitech) , see:

Research and development (research)

Statistics on research and development (rd)

R&D expenditure at national and regional level (rd_e)

Intramural R&D expenditure (GERD) by sectors of performance (rd_e_gerdtot)

R&D personnel at national and regional level (rd_p)

Total R&D personnel by sectors of performance, occupation and sex (rd_p_persocc)

- Digital economy and society (isoc) , see:

Digital economy and society - historical data (isoc_h)

Telecommunication services (isoc_tc)

Fixed broadband - subscriptions and penetration (isoc_tc_fbsupe)

Fixed telephony - main telephone lines (isoc_tc_ftteli)

Mobile communications - subscriptions and penetration (isoc_tc_mcsupe)

- Exchange rates (ert) , see:

Bilateral exchange rates (ert_bil)

Euro/ECU exchange rates (ert_bil_eur)

Euro/ECU exchange rates - annual data (ert_bil_eur_a)

Dedicated section

- Digital economy and society
- Science, technology and innovation

External links

- International Telecommunication Union ITU

- ICT Statistics
- United Nations Educational, Scientific and Cultural Organisation — Institute for Statistics

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