This article presents data on research and development (R & D) expenditures within the European Union (EU), according to the sector of performance and the source of funds. The data are obtained through statistical surveys which are regularly conducted at national level covering R & D performing entities in the private and public sectors.

One of the key aims of the EU during the last couple of decades has been to encourage increasing levels of research investment, in order to provide a stimulus to the EU’s competitiveness. The Europe 2020 strategy adopted in 2010 maintains a long-standing objective, namely, for the EU to devote 3.00 % of gross domestic product (GDP) to R & D activities; this is one of the five key targets of the Europe 2020 strategy.

Gross domestic expenditure on R & D

Gross domestic expenditure on R & D (GERD) stood at EUR 317.1 billion in the EU-28 in 2017, which equated to an average of EUR 620 of R & D expenditure per inhabitant. There was an increase of 4.62 % on the year before, and 40.0 % higher than 10 years earlier (in 2007) — note that these rates of change are in current prices and so reflect price changes as well as real changes in the level of expenditure. Aside from a reduction in R & D expenditure in 2009 (during the global financial and economic crisis), the latest annual rate of change was the lowest recorded over the latest 10-year period.

In 2017, the level of expenditure on R & D in the EU-28 was equivalent to three quarters (75.4 %) of that recorded by the United States, more than double the expenditure in Japan, and more than four times as high as in South Korea. Note these figures are based on information in euro terms and that the depreciation of the euro (for example, against the dollar) may explain some of the movements in these ratios over time.

In order to make figures more comparable, GERD is often expressed relative to GDP — see Figure 1 — or in relation to population. The ratio of GERD to GDP, one of five key Europe 2020 strategy indicators, is also known as R & D intensity. This ratio increased modestly in the EU-28 during the period from 2006 to 2012, rising from 1.76 % to 2.01 %. Between 2012 and 2017, it increased more slowly, fluctuating within the range of 2.01 % to 2.06 %. Despite these increases, the EU-28’s R & D expenditure relative to GDP remained well below the corresponding ratios recorded in Japan (3.20 %, 2017 data) and the United States (2.78 %, 2017 data), as has been the case for a lengthy period of time. R & D intensity in China has surpassed that of the EU-28 since 2015, and in 2017 Chinese R & D expenditure was equivalent to 2.13 % of GDP.

Between 2006 and 2017, R & D intensity within the Japanese economy fluctuated, with its ratio of R & D expenditure to GDP starting at 3.28 % in 2006, then in between ranging from 3.14 % (in 2010 and 2016) to 3.40 % (in 2014) and finishing at 3.20 % in 2017. In the United States, the ratio of GERD to GDP grew from 2.55 % in 2006 to a peak of 2.82 % in 2009, a rise of 0.27 percentage points. In 2010, R & D intensity in the United States fell back to 2.74 %, with another reduction in 2012; thereafter, R & D intensity in the United States started to grow again, reaching 2.78 % by 2017. China’s R & D intensity increased more rapidly than the ratios for the EU and the other countries during the period shown in Figure 1, rising from 1.37 % in 2006...
to 2.13 % by 2017, an increase of 0.76 percentage points.

**Figure 1: Gross domestic expenditure on R & D, 2006-2017(%, relative to GDP)**

Among the EU Member States, the highest R & D intensities in 2017 were recorded in Sweden (3.33 %) and Austria (3.16 %), followed by Denmark (3.06 %) and Germany (3.02 %)— see Figure 2. The next highest ratios were recorded in Finland (2.76 %) and Belgium (2.58 %). There were eight Member States that reported R & D expenditure that was below 1.00 % of their GDP in 2017; each of these were Member States that joined the EU in 2004 or more recently, with the lowest R & D intensities recorded in Romania (0.50 %), Latvia (0.51 %) and Malta (0.55 %).

Most EU Member States reported a higher ratio of R & D intensity in 2017 than in 2007: there were six exceptions, including one Member State characterised by high ratios — Finland (-0.59 percentage points) — while the other five Member States with falling ratios recorded R & D intensities that were below the EU-28 average, Luxembourg (-0.33 points), Ireland (-0.18 points), Latvia (-0.04 points), Spain (-0.03 points) and Romania (-0.01). At the other end of the range, the biggest increases in R & D intensity (in percentage point terms) between 2007 and 2017 were recorded in Austria and Belgium (both with 0.74 points), Germany (0.57 points), Greece (0.55 points), Denmark (0.54), Czechia (0.48 points), Poland (0.47) and Slovenia (0.44 points),
R & D expenditure by sector of performance

Figure 3 shows how the EU-28’s R & D intensity grew between 2006 and 2017 and identifies the share of R & D performed in each of four sectors. Throughout this period, the majority of R & D expenditure was in the business enterprise sector, and its R & D expenditure rose from 1.12 % of GDP in 2006 to 1.36 % by 2017, an overall increase of 21.4 %. The second largest sector performing R & D was the higher education sector, whose R & D intensity increased at a slightly faster pace, up overall by 15.3 % between 2006 and 2017, to reach 0.45 % of GDP; note that, although R & D intensity for the higher education sector initially rose at a relatively fast pace, the EU-28 ratio stagnated from 2010 onwards. The R & D intensities of the two other sectors changed little over the period under consideration, and in 2017 the R & D intensities of the government sector (0.23 % of GDP) and the private non-profit sector (0.02 % of GDP) were identical to the ratios recorded some 10 years earlier.
The differences in the relative importance of R & D expenditure between countries are often explained in part by levels of expenditure within the business enterprise sector as can be seen in Figure 4. While R & D expenditure by the EU-28’s business enterprise sector was equivalent to 1.36 % of GDP in 2017, in South Korea this ratio reached 3.62 %, in Japan it was 2.53 %, in Switzerland it was 2.39 % (2015 data) and in the United States it was 2.04 %. The relative importance of R & D expenditure in the government and higher education sectors was broadly similar in the EU-28 and across all of these non-member countries, except for Switzerland where the government sector’s R & D intensity was close to zero and that of the higher education sector was relatively high, while in South Korea the share of the government sector rose to 0.49 % (more than double the EU-28 average in 2017).

An evaluation of the data for the EU Member States also confirms that those which had relatively high ratios of business enterprise expenditure on R & D relative to GDP — namely, Sweden (2.42 %), Austria (2.22 %), Germany (2.09 %), Denmark (1.97 %) and Finland (1.80 %) — also reported relatively high overall R & D intensities. Apart from Germany, the other four of these Member States also featured at the top of the ranking of expenditure by the higher education sector, where the Netherlands and Portugal also had a relatively high ratio of R & D expenditure to GDP. Government R & D expenditure relative to GDP was highest in Germany, Luxembourg and Czechia, while private non-profit sector R & D expenditure relative to GDP was very low in each of the Member States, peaking at 0.07 % in Cyprus.
R & D expenditure by source of funds

An analysis of R & D expenditure by source of funds shows that more than half (56.6 %) of the total expenditure within the EU-28 in 2016 was funded by business enterprises, while almost one third (30.9 %) was funded by government, and a further 10.0 % from abroad (foreign funds). Funding by the higher education and private non-profit sectors was relatively small, 0.9 % and 1.6 % of the total respectively. These shares were relatively stable over time as can be seen from Figure 5. The main developments over the period 2005 to 2016 were a fall in the share of funding by the government sector, with increases for the four other sectors, most notably (in relative terms) for R & D funding from abroad (its share increasing overall by 9.9 %) and for the higher education sector (up overall by 12.5 %).

Figure 4: Gross domestic expenditure on R & D by sector, 2017(%, relative to GDP)Source: Eurostat (rd_e_gerdtot)
In the Asian economies of Japan (78.1 %), China (76.1 %) and South Korea (75.4 %), business-funded R & D accounted for a larger share of total R & D expenditure than in the EU-28, in all Asian economies over three quarters of the total in 2016. In the United States (63.2 %), the share of business-funded R & D was lower than in Asia, but remained higher than the EU-28 average (see Figure 6).

Among the EU Member States in 2016, business-funded R & D accounted for more than three fifths of total R & D expenditure in Slovenia (69.2 %), Germany (65.2 %) and Sweden (57.3 %; 2015 data). By contrast, an important part of the expenditure on R & D made in Greece (42.6 %) and Cyprus (41.1 %) was funded by the government sector. There were also considerable differences in the relative importance of R & D funding from abroad, with relatively high shares in 2016 reported in Bulgaria (34.2 %), Latvia (27.8 %), Czechia (24.0 %), Lithuania (19.2 %), and Slovakia (10.7 %). The higher education sector played a relatively small role in funding R & D expenditure in most Member States, exceeding 4.0 % only in the southern Member States of Croatia (4.8 %), Cyprus (4.6 %), and Spain (4.4 %). Equally, the role of the private non-profit sector was also generally small, exceeding 3.0 % of R & D expenditure in the United Kingdom (5.0 %), Denmark (4.4 % 2015 data) and Sweden (3.3 %; 2015 data).
Figure 6: Gross domestic expenditure on R & D by source of funds, 2016 (% share of total)

Source: Eurostat (rd_e_fundgerd)

Source data for tables and figures (MS Excel)

- R & D expenditure: tables and figures

Data sources


Eurostat’s statistics on R & D expenditure are compiled using guidelines laid out in the Frascati manual, published in 2002 by the OECD. The manual was recently updated with improved guidelines reflecting changes in the way that R & D is funded and carried out in globalised economies, for example, with new sections covering the different aspects of public support for R & D (such as tax incentives) — see the Frascati manual 2015.

R & D expenditure is a basic measure that covers intramural expenditure, in other words, all expenditures for R & D that are performed within a statistical unit or sector of the economy in the EU Member States. The main analysis of R & D statistics is by four institutional sectors of performance. These four sectors are: the business enterprise sector, the government sector, the higher education sector and the private non-profit sector. Gross domestic expenditure on R & D (GERD) is composed of expenditure from each of these four sectors. Expenditure data considers the research performed on the national territory, regardless of the source of funds;
data are usually expressed in relation to GDP and this ratio is often referred to as R & D intensity. Additional analysis of R & D expenditure are available by: source of funds (for which data are also available from a fifth sector, funding from abroad); field of science; type of costs; economic activity (NACE); enterprise size class; type of R & D; socioeconomic objectives; and regions (NUTS).

**Context**

Through its innovation union flagship initiative (which forms part of the Europe 2020 strategy) the European Commission has placed renewed emphasis on the conversion of Europe’s scientific expertise into marketable products and services, through seeking to use public sector intervention to stimulate the private sector and to remove bottlenecks which stop such ideas reaching the market. Furthermore, the latest revision of the integrated economic and employment guidelines (revised in 2015 as part of the Europe 2020 strategy) includes a guideline to optimise support for R & D and innovation, strengthening the knowledge triangle between research, innovation and education; it is hoped that this will provide a stimulus for a further expansion of the digital economy.

The European Commission compiles three levels of indicators to support research and innovation policymaking. These may be grouped together as: the headline indicator; innovation union scoreboard (or core) indicators; and a comprehensive set of other indicators. The headline indicator is the 3.00% target for research intensity to be reached within the EU by 2020; this is one of five headline indicators being tracked within the Europe 2020 strategy. The scoreboard indicators are designed to monitor research and innovation for the Competitiveness Council, while the comprehensive set of other indicators are for in-depth economic analytical purposes and European Commission services to produce an innovation union competitiveness report.

One area that has received considerable attention in recent years is the structural difference in R & D funding between Europe and its main competitors. Policymakers in Europe have tried to increase R & D business expenditure so that it is more in line with relative contributions observed in Japan or the United States. The European Research Area (ERA) is designed to overcome some of the barriers that are thought to have hampered European research efforts, for example, by addressing geographical, institutional, disciplinary and sectoral boundaries.

In December 2008, the Competitiveness Council adopted a vision for the ERA. According to its opening statement, all players should benefit from: the ‘fifth freedom’, introducing the free circulation of researchers, knowledge and technology across the ERA; attractive conditions for carrying out research and investing in R & D intensive sectors; Europe-wide scientific competition, together with the appropriate level of cooperation and coordination. The 2020 vision for the ERA is part of the wider picture of Europe’s 2020 strategy for smart, sustainable and inclusive growth.

In November 2011, the European Commission presented a successor for the 7th framework programme by announcing Horizon 2020, a programme for investing nearly EUR 80 billion in research and innovation, implementing the innovation union. Horizon 2020 focuses on turning scientific breakthroughs into innovative goods and services that have the potential to provide business opportunities and change people’s lives for the better. Running from 2014 to 2020 this programme is part of the EU’s drive to create new growth and jobs in Europe.

**Other articles**

- [R & D personnel](#)

**Main tables**

- [Science and technology (t_scitech)](#), see:

Research and development (t_research)

Statistics on research and development (t_rd)
Research and development expenditure, by sectors of performance (tsc00001)
Intramural R & D expenditure (GERD) by source of funds (tsc00031)

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)
- Government budget appropriations or outlays on R & D (gba)
  - Total GBAORD by NABS 2007 socio-economic objectives (gba_nabsfin07)
  - Total GBAORD by NABS 1992 socio-economic objectives (gba_nabsfin92)
  - Total GBAORD as a % of total general government expenditure (gba_nabste)

Dedicated section
- Science, technology and innovation

Publications
- Science, technology and innovation in Europe (Pocketbook — 2013 edition)
- Science, technology and innovation in Europe (Pocketbook — 2012 edition)
- Science, technology and innovation in Europe (Pocketbook — 2011 edition)
- Science, technology and innovation in Europe (Pocketbook — 2010 edition)
- Science, technology and innovation in Europe (Statistical book — 2010 edition)

Methodology
- Manual on measuring Research and Development in ESA 2010

ESMS metadata
- Government budget appropriations or outlays on R & D (ESMS metadata file — gba_esms)
- Statistics on research and development (ESMS metadata file — rd_esms)

Legislation
- Decision No 1608/2003/EC of 22 July 2003 concerning the production and development of Community statistics on science and technology
- Regulation (EU) No 995/2012 of 26 October 2012 implementing Decision 1608/2003/EC
External links

- European Commission — Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs — European innovation scoreboards
- European Commission — Horizon 2020
- European Commission — Innovation union
- European Commission — Joint Research Centre (JRC) — The EU Industrial R & D Investment Scoreboard
- OECD — Innovation

View this article online at http://ec.europa.eu/eurostat/statistics-explained/index.php/R_D_expenditure