# C 2 Research and development[325]

Statistics about expenditure on research and development (R&D) indicate the extent of activities aimed at generating new ideas. R&D intensity – i.e. R&D expenditure as a percentage of gross domestic product (in the case of countries) or turnover (in the case of companies) – provides information on the willingness to invest in R&D; the distribution of R&D expenditure across sectors and industries indicates the main priorities of research and development activity.

R&D intensity (C 2-1) in Germany was 3.13 percent in 2018, compared to 2.62 percent in 2008. It has thus increased by 0.51 percentage points over the past ten years. R&D intensity in China and Switzerland rose to a similar extent in the period 2008 to 2017 (China by 0.71 percentage points, Switzerland by 0.64 percentage points) – no data are yet available for 2018. By far the biggest increase was recorded by South Korea where R&D intensity grew by 1.43 percentage points from 3.12 to 4.55 percent between 2008 and 2017.

Germany's budget estimate for civil R&D (C 2-2) reached an index value of 176 percent in 2018. This means that the amount specified in the German national budget for financing R&D increased by 76 percent between 2008 and 2018. The budget estimate for civil R&D also increased sharply in Sweden, Switzerland and South Korea.

The distribution of gross domestic expenditure on R&D by performing sector (C 2-3) shows that the percentage of R&D expenditure carried out in the public sector declined or stagnated between 2007 and 2017 in all the countries shown. The share of expenditure fell particularly sharply in China (from 19.2 to 15.2 percent) and in France (from 16.4 to 12.7 percent). In Germany, the share of spending on R&D conducted in the public sector fell slightly from 13.9 to 13.5 percent during this period.

The R&D intensity of Germany's Länder (C 2-4) increased markedly between 2007 and 2017 – in all Länder without exception. Baden-Württemberg spent by far the highest percentage of its gross domestic product on R&D. It had already reached an R&D intensity of 4.16 percent in 2007 and increased this to 5.63 percent in 2017 – the highest growth rate of all the Länder.

Internal corporate expenditure on R&D (C2-5) reached €68.8 billion in 2017. Spending in the vehicle construction field alone amounted to €27.4 billion, while the electrical/ electronic and mechanical engineering sectors accounted for €10.4 billion and €7.1 billion respectively.

The indicator 'internal corporate R&D expenditure as a percentage of turnover from the company's own products' (C 2-6) documents an increase in average R&D intensity in the manufacturing sector for 2016, 2017 and 2018. This figure rose from 3.5 percent in 2016 to 3.8 percent in 2018.

## R&D intensity in selected OECD countries and China 2008–2018 as percentages

Fig. C 2-1

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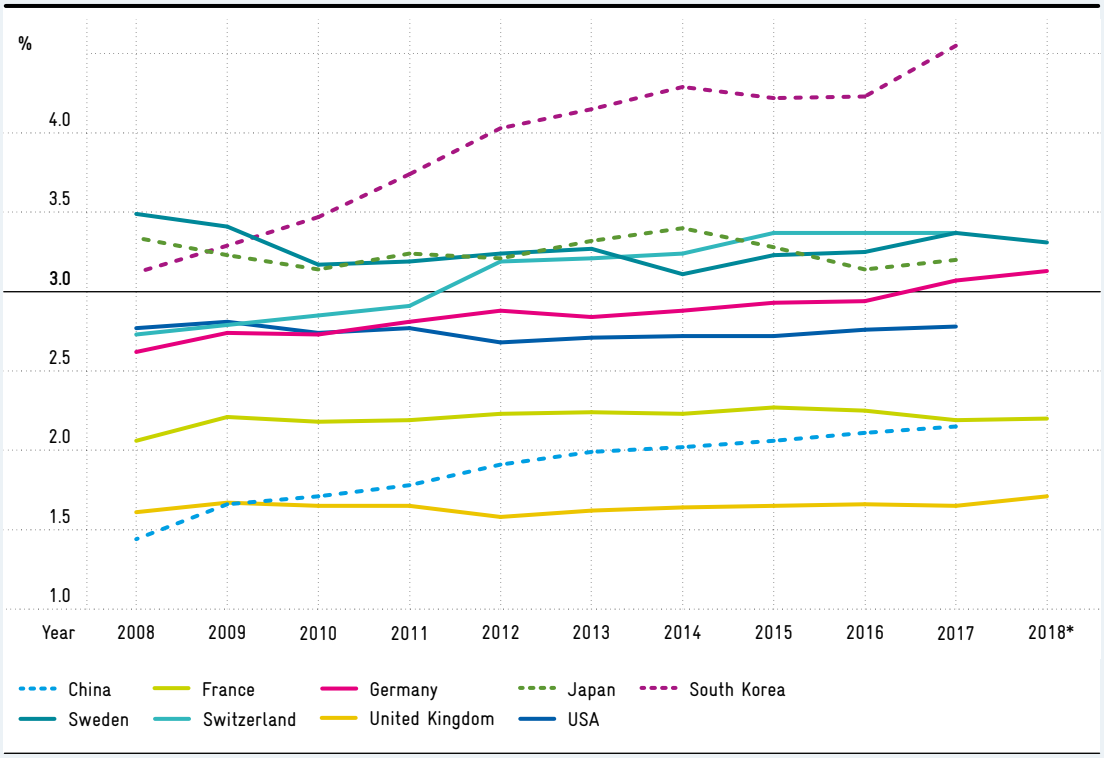
R&D intensity: percentage of an economy's gross domestic product (GDP) spent on research and development.




*Preliminary figures for 2018.

Source: OECD, Eurostat. Calculations and estimates by CWS in Gehrke et al. (2020b).

Fig. C 2-2

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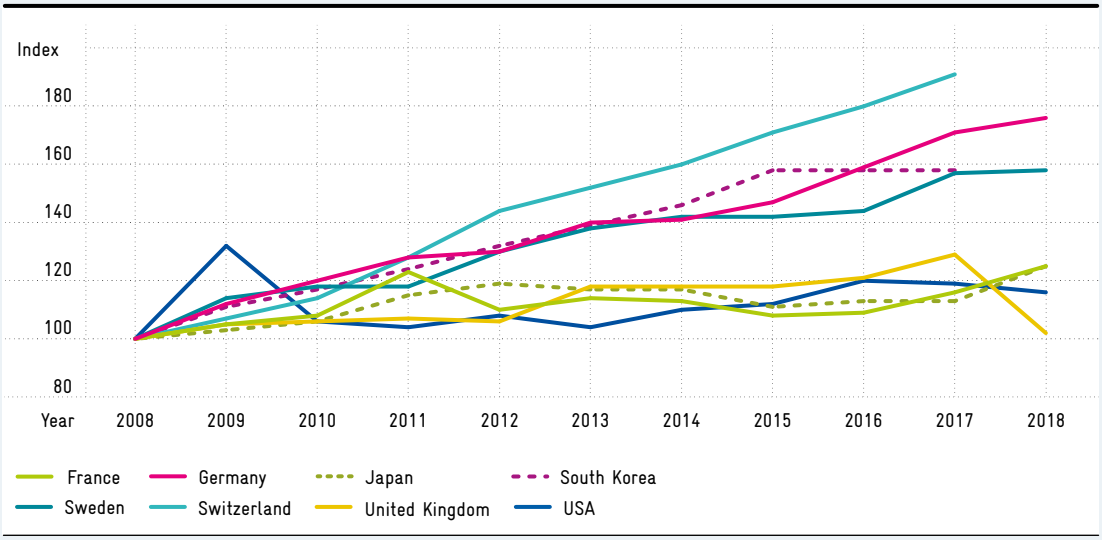
## State budget estimates for civil R&D 2008–2018

R&D budget estimates: the chart shows the amounts set aside in the budget to finance R&D.




Index: 2008 = 100, data partially based on estimates.
Source: OECD, Eurostat. Calculations and estimates by CWS in Gehrke et al. (2020b).


Tab. C 2-3

Download data

## Distribution of gross domestic expenditure on R&D (GERD) by performing sector in selected OECD countries and China in 2007 and 2017

Gross domestic expenditure on R&D (GERD) in the business sector, tertiary education, the public sector and private non-profit organizations.

| | 2007 | | | | | 2017 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | of which (%) carried out by | | | | | of which (%) carried out by | | | |
| Countries | GERD in US$m | Business sector | Tertiary education institutions | Public sector | Private non-profit | GERD in US$m | Business sector | Tertiary education institutions | Public sector | Private non-profit |
| France | 44,179 | 63.0 | 19.5 | 16.4 | 1.2 | 64,672 | 65.0 | 20.7 | 12.7 | 1.7 |
| **Germany** | **73,358** | **70.0** | **16.1** | **13.9** | **-** | **131,339** | **69.1** | **17.4** | **13.5** | **-** |
| Japan | 147,484 | 77.9 | 12.6 | 7.8 | 1.7 | 170,901 | 78.8 | 12.0 | 7.8 | 1.4 |
| South Korea | 40,639 | 76.2 | 10.7 | 11.7 | 1.5 | 90,980 | 79.4 | 8.5 | 10.7 | 1.4 |
| Sweden | 12,089 | 73.0 | 21.9 | 4.9 | 0.2 | 17,201 | 71.3 | 24.9 | 3.6 | 0.1 |
| Switzerland [1)] | 10,017 | 73.6 | 23.8 | 0.8 | 1.7 | 18,738 | 69.4 | 27.6 | 0.8 | 2.2 |
| United Kingdom | 35,211 | 62.5 | 26.1 | 9.2 | 2.2 | 49,345 | 67.6 | 23.7 | 6.5 | 2.2 |
| USA | 380,316 | 70.8 | 13.4 | 11.8 | 4.0 | 543,249 | 73.1 | 13.0 | 9.7 | 4.1 |
| China | 124,199 | 72.3 | 8.5 | 19.2 | - | 495,981 | 77.6 | 7.2 | 15.2 | - |

Data from 09/2019: [1)] 2006 instead of 2007.
Germany and China: private non-profit organizations included under 'public sector'.
Source: OECD, Eurostat. Calculations by CWS in Gehrke et al. (2020b).

## R&D intensity of Germany's Länder in 2007 and 2017 as percentages

Tab. C 2-4

Download data

R&D intensity: Länder expenditure on research and development as a percentage of their gross domestic product, broken down by performing sector.

| | 2007 | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|
| Länder | Total | Business sector | Public sector | Tertiary education institutions | Total | Business sector | Public sector | Tertiary education institutions |
| Baden-Württemberg | 4.16 | 3.38 | 0.37 | 0.40 | 5.63 | 4.71 | 0.41 | 0.51 |
| Bavaria | 2.81 | 2.21 | 0.25 | 0.35 | 3.09 | 2.34 | 0.31 | 0.43 |
| Berlin | 3.02 | 1.25 | 1.00 | 0.77 | 3.40 | 1.37 | 1.19 | 0.84 |
| Brandenburg | 1.22 | 0.32 | 0.64 | 0.26 | 1.68 | 0.57 | 0.74 | 0.37 |
| Bremen | 2.14 | 0.85 | 0.71 | 0.58 | 2.75 | 0.88 | 1.10 | 0.76 |
| Hamburg | 1.80 | 1.07 | 0.40 | 0.33 | 2.14 | 1.24 | 0.38 | 0.53 |
| Hesse | 2.49 | 2.03 | 0.15 | 0.31 | 2.91 | 2.20 | 0.28 | 0.43 |
| Mecklenburg-Western Pomerania | 1.38 | 0.40 | 0.56 | 0.42 | 1.79 | 0.58 | 0.64 | 0.58 |
| Lower Saxony | 2.41 | 1.67 | 0.33 | 0.41 | 3.10 | 2.20 | 0.37 | 0.53 |
| North Rhine-Westphalia | 1.70 | 1.07 | 0.25 | 0.38 | 2.09 | 1.23 | 0.30 | 0.55 |
| Rhineland-Palatinate | 1.78 | 1.32 | 0.14 | 0.32 | 2.43 | 1.78 | 0.18 | 0.47 |
| Saarland | 1.03 | 0.42 | 0.28 | 0.33 | 1.74 | 0.86 | 0.36 | 0.53 |
| Saxony | 2.58 | 1.34 | 0.66 | 0.58 | 2.78 | 1.21 | 0.79 | 0.78 |
| Saxony-Anhalt | 1.17 | 0.35 | 0.42 | 0.40 | 1.49 | 0.41 | 0.51 | 0.57 |
| Schleswig-Holstein | 1.18 | 0.53 | 0.31 | 0.34 | 1.55 | 0.83 | 0.34 | 0.38 |
| Thuringia | 1.87 | 0.96 | 0.43 | 0.48 | 2.19 | 1.10 | 0.48 | 0.61 |
| **Germany** | **2.44** | **1.71** | **0.34** | **0.39** | **3.03** | **2.10** | **0.41** | **0.52** |

Source: SV Wissenschaftsstatistik and statistical offices of the Federal Government and the Länder in Gehrke et al. (2020b).

Tab. C 2-5

Download data

## Internal corporate R&D expenditure by origin of funds, economic sector, company size and technology category in 2017

Internal R&D: R&D that is conducted inside the company, either for the company's own purposes or commissioned by a third party.

| | Internal R&D expenditure | | | | |
|---|---|---|---|---|---|
| | Total | of which funded by | | | |
| | | Business sector | Public sector | Other domestic entities | Foreign entities |
| | in 1,000 Euro | as percentages | | | |
| **All researching companies** | **68,787.323** | **90.4** | **3.2** | **0.1** | **6.3** |
| Manufacturing | 58,493.502 | 91.6 | 1.8 | 0.1 | 6.5 |
| Chemical industry | 4,065.084 | 91.1 | 1.4 | 0.0 | 7.5 |
| Pharmaceutical industry | 4,630.940 | 80.2 | | | 18.9 |
| Plastics, glass and ceramics | 1,468.445 | 94.9 | 2.7 | 0.2 | 2.2 |
| Metal production and processing | 1,499.201 | 80.2 | 8.3 | 0.3 | 11.2 |
| Electrical engineering/electronics | 10,431.420 | 89.7 | 2.7 | 0.0 | 7.6 |
| Mechanical engineering | 7,116.706 | 95.6 | 2.3 | 0.1 | 2.0 |
| Vehicle construction | 27,431.531 | 93.7 | 1.0 | 0.2 | 5.2 |
| Other manufacturing industries | 1,850.175 | 93.0 | 4.3 | 0.1 | 2.6 |
| Remaining sectors | 10,293.822 | 86.1 | 9.5 | 0.1 | 4.2 |
| | | | | | |
| fewer than 100 employees | 3,153.908 | 70.8 | 21.6 | 0.5 | 7.1 |
| 100 to 499 employees | 5,731.228 | 84.5 | 8.0 | 0.2 | 7.3 |
| 500 to 999 employees | 4,098.690 | 88.5 | 6.2 | 0.1 | 5.2 |
| 1,000 employees and more | 55,803.497 | 92.3 | 1.4 | 0.1 | 6.2 |
| | | | | | |
| **Technology categories in industry** | | | | | |
| Cutting-edge technology (> 9 percent of costs/turnover spent on R&D) | 14,263.536 | 84.5 | 3.4 | 0.0 | 12.0 |
| High-value technology (3–9 percent of costs/turnover spent on R&D) | 38,768.519 | 94.3 | 0.9 | 0.1 | 4.6 |

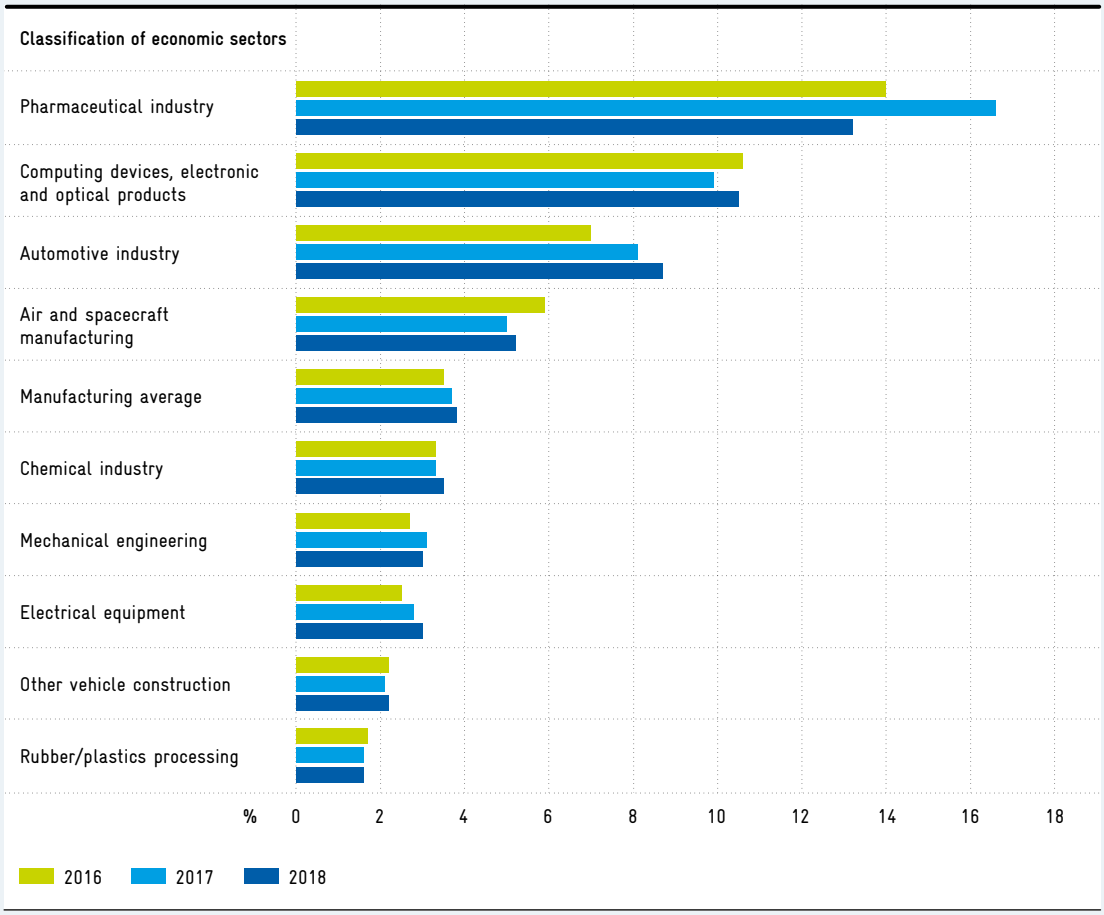
Source: SV Wissenschaftsstatistik in Gehrke et al. (2020b).

Fig. C 2-6

Download data

## Internal corporate R&D expenditure as a percentage of turnover from the company's own products[1] 2016–2018

Internal R&D: R&D conducted inside the company, either for the company's own purposes or commissioned by a third party.




[1] Figures net, without input tax.

Source: SV Wissenschaftsstatistik, Statistisches Bundesamt (Federal Statistical Office), corporate results for Germany. Calculations by CWS in Gehrke et al. (2020b).