Research and Development[327] C 2

Statistics on R&D expenditure indicate the extent to which activities are developed to generate new ideas. R&D intensity, as a share of R&D expenditure in the gross domestic product (for countries) or in turnover (for companies), provides information on the willingness to invest in R&D; the distribution of R&D expenditure across sectors and industries indicates focal points of R&D activity.

R&D intensity (C 2-1) in Germany, i.e., the share of R&D expenditure in the gross domestic product, reached 3.17 percent in 2019, higher than the previous year's figure of 3.13 percent. Germany is thus continuing the trend of increasing R&D intensity. South Korea achieved by far the highest R&D intensity of all the comparative countries with 4.53 percent (2018). Of the EU countries, Sweden had the highest R&D intensity (2019) at 3.39 percent. The USA's increased slightly by 0.02 percentage points to 2.83 percent (2018). China's R&D intensity also grew by 0.02 percentage points, with 2.14 percent of its GDP invested in R&D in 2018.

Germany's budget estimate for civil R&D (C 2-2), i.e., the budget allocated in the national budget for financing R&D, increased again compared to 2018, reaching an index value of 172 percent in 2019. This means that the budget allocated in the German national budget for financing R&D has increased by 72 percent between 2009 and 2019. The budget for civil R&D in Switzerland has increased significantly more; here the increase was 123 percent. Switzerland thus recorded by far the strongest growth of all comparative countries. The weakest development was in the USA, where the budget estimate for civil R&D fell slightly by 1 percent between 2009 and 2019.

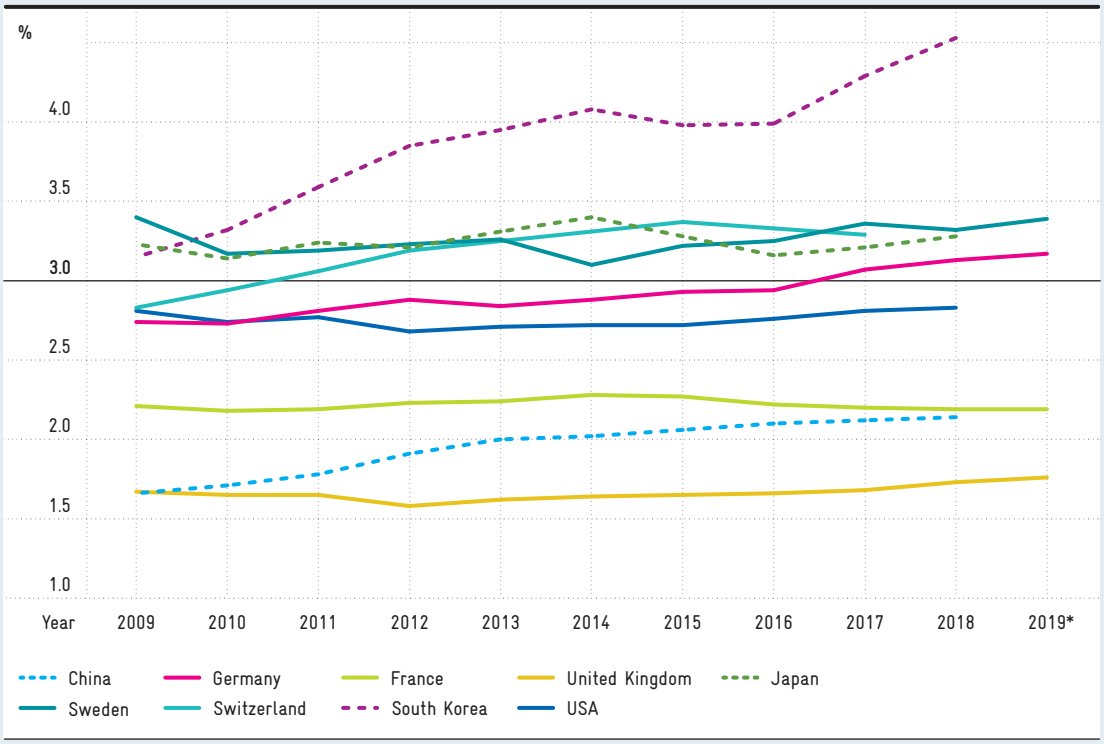
The distribution of gross domestic expenditure on R&D by performing sector (C 2-3) shows that the share of expenditure on R&D performed in the public sector declined between 2008 and 2018 in all countries shown, apart from Switzerland.[328] Expenditure shares for R&D carried out by the business sector declined in Germany, Sweden, and Switzerland during this period, while they increased in the other countries. The shares relating to the higher education sector increased from 2008 to 2018 in Germany, France, Sweden, and Switzerland. In the other countries, these shares decreased. For Germany, however, the changes in these three shares were small in each case.

For the indicators R&D intensity of the Länder (C 2-4), internal R&D expenditure of companies (C 2-5) and internal R&D expenditure as a percentage of turnover from own products (C 2-6), no updated data was available at the editorial deadline. Therefore, the tables and the illustration from the previous year were carried over to be included here.

Fig. C 2-1

Download data

R&D intensity in selected countries 2009–2019 in percent

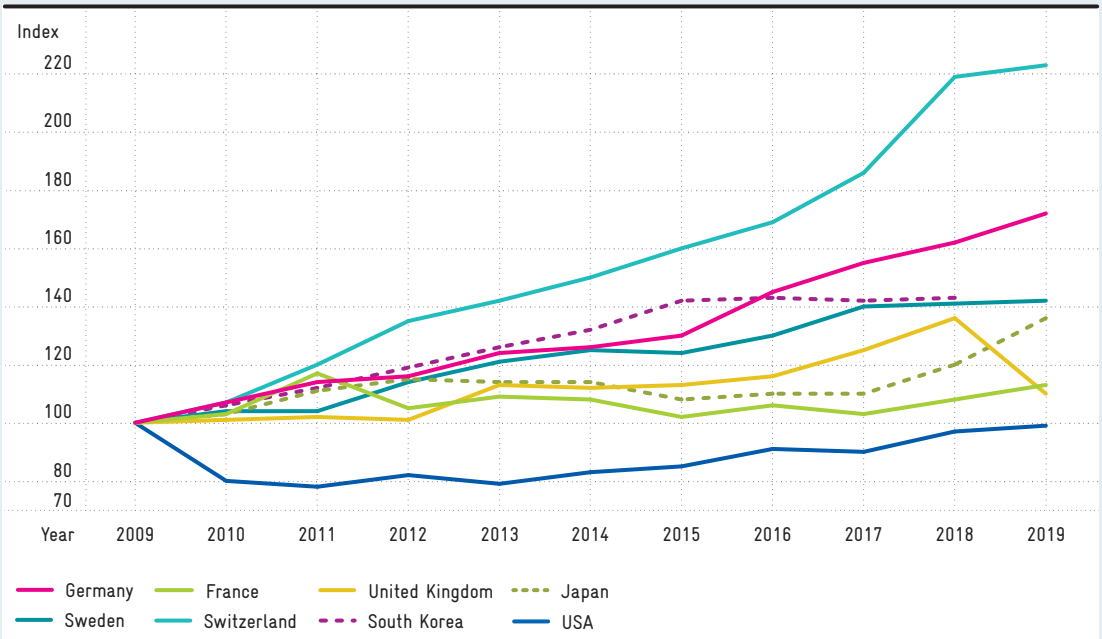


R&D intensity: percentage of an economy's gross domestic product (GDP) spent on research and development.
* Preliminary figures for 2019.
Source: OECD, Eurostat. Calculations and estimates by CWS in Schasse (2021).

State budget estimates for civil R&D in selected countries 2009–2019 (index values)

Fig. C 2-2

Download data



R&D budget estimates: the chart shows the amounts set aside in the budget to finance R&D.
Index: 2009 = 100, data partly based on estimates.
Source: OECD, Eurostat. Calculations and estimates by CWS in Schasse (2021).

Distribution of gross domestic expenditure on R&D (GERD) by performing sector in selected countries in 2008 and 2018

Tab. C 2-3

Download data

	2008					2018				
		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
China	145,071	73.3	8.5	18.3	-	468,062	77.4	7.4	15.2	-
Germany	**81,173**	**69.2**	**16.8**	**14.0**	**-**	**141,300**	**68.9**	**17.6**	**13.5**	**-**
France	46,567	62.7	20.0	16.0	1.2	68,441	65.4	20.5	12.5	1.6
United Kingdom	36,542	62.0	26.5	9.2	2.4	53,953	67.6	23.6	6.6	2.2
Japan	148,719	78.5	11.6	8.3	1.6	171,294	79.4	11.6	7.8	1.3
Sweden	13,487	74.1	21.3	4.4	0.2	18,162	71.0	25.3	3.6	0.1
Switzerland*	10,917	73.5	24.2	0.7	1.6	18,688	71.0	28.2	0.8	2.3
South Korea	43,906	75.4	11.1	12.1	1.4	98,451	80.3	8.2	10.1	1.4
USA	407,238	71.4	13.2	11.3	4.0	581,553	72.6	12.8	10.4	4.2

Data from 09/2020. * 2017 instead of 2018
Germany and China: private non-profit organizations included under 'Public sector'.
Source: OECD, Eurostat. Calculations by CWS in Schasse (2021).

Tab. C 2-4

Download data

R&D intensity of the Länder and Germany in 2007 and 2017 in percent

	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
Lower Saxony	2.41	1.67	0.33	0.41	3.10	2.20	0.37	0.53
Mecklenburg-Western Pomerania	1.38	0.40	0.56	0.42	1.79	0.58	0.64	0.58
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**

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

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

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

Tab. C 2-5

Download data

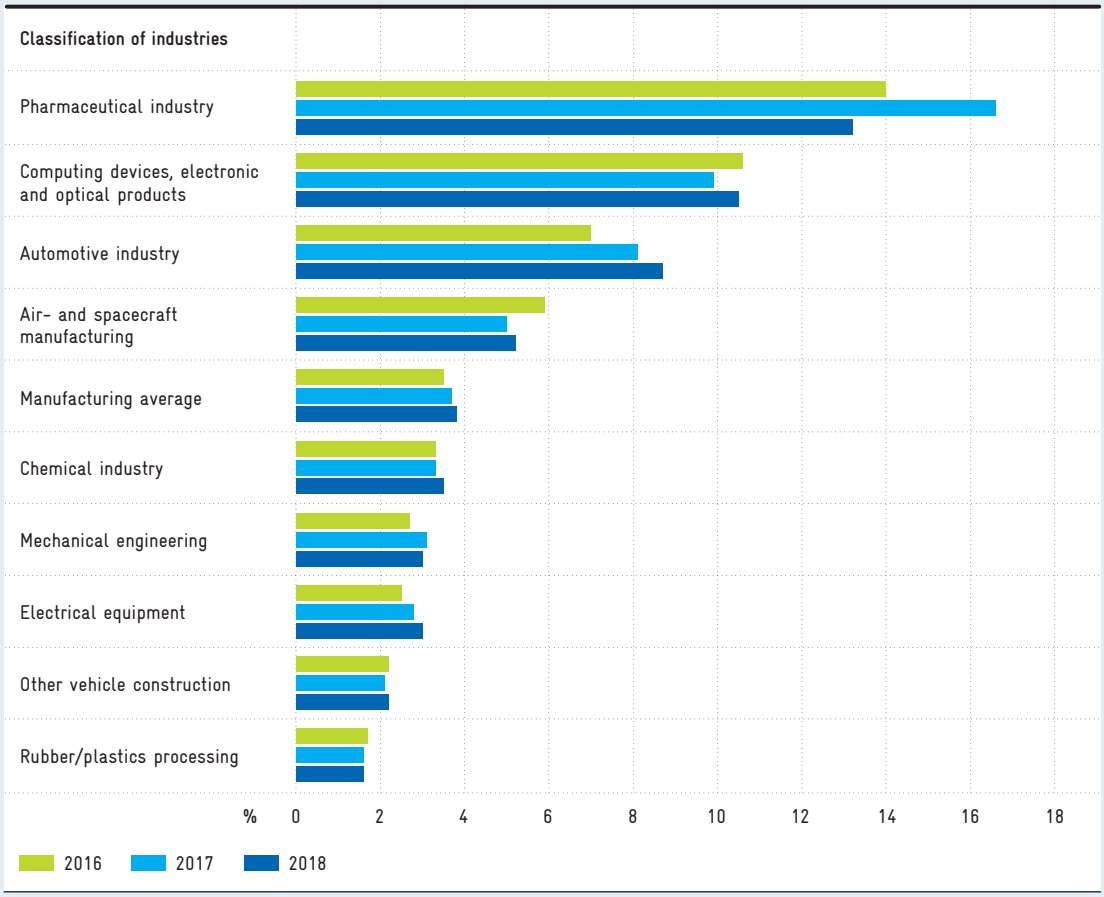
	Internal R&D expenditure				
	Total	of which funded by			
		Business sector	Public sector	Other domestic entities (e.g. universities)	Foreign entities
	in 1,000 euro	in percent			
All researching companies	**68,787,323**	**90.4**	**3.2**	**0.1**	**6.3**
Manufacturing	58,493,502	91.6	1.8	0.1	6.5
Chemical 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
< 100 employees	3,153,908	70.8	21.6	0.5	7.1
100–499 employees	5,731,228	84.5	8.0	0.2	7.3
500–999 employees	4,098,690	88.5	6.2	0.1	5.2
≥ 1,000 employees	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

Internal R&D: R&D that is conducted within the company, either for the company's own purposes or commissioned by a third party.
Source: SV Wissenschaftsstatistik in Gehrke et al. (2020).

Fig. C 2-6

Download data

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



Internal R&D: R&D that is conducted within the company, either for the company's own purposes or commissioned by a third party. Figures net, without input tax.
Source: SV Wissenschaftsstatistik, Federal Statistical Office, corporate results for Germany. Calculations by CWS in Gehrke et al. (2020).