# Companies with R&D abroad make Germany a strong research location

By Heike Belitz

In recent years, German companies have invested more in research and development (R&D) abroad. After a prolonged plateau period, the proportion of investment abroad rose to around 35 percent; concurrently R&D expenditure in Germany has continued to rise sharply. Growth abroad did not occur at the expense of domestic research. Foreign companies in Germany have also invested more in R&D recently but have not yet topped the 2011 record high. Measured by stocks of foreign direct investment, they should still have some potential for higher expenditure in R&D. In international comparison, the growth in private R&D investment in Germany in recent years was high. This was mainly driven by German companies with R&D abroad.

The globalization of research and development (R&D) has made rapid progress in the top R&D investing multinational corporations. They are headquartered in a few industrialized countries, among them Germany. The target regions for their international R&D activities are: the US, Western Europe, Japan, and increasingly China.[1] Research locations can benefit from globalization if they are connected via knowledge transfer to research units of multinational corporations in foreign countries, such that the knowledge also benefits local companies.[2] The scope and growth of the R&D activities of foreign companies are often used as an indicator of the attractiveness of the research conditions in the country.

In conjunction with foreign owners' takeover of corporations conducting research, however, there is also the fear of foreign countries draining Germany of its technological knowledge and hollowing out the domestic research location.[3] In the home countries of multinational corporations, R&D investments in foreign countries are often interpreted as outsourcing capacity that is then lost to the domestic location. However, the key motives for globalization are market- and technology-based, not cost driven. Multinational corporations have to develop their products and processes further in their target markets and/or adapt them to local conditions and customer requirements. Establishing in-house research laboratories abroad is also a means of acquiring new technological knowledge from competitors, universities, and research institutes. After all, the use of qualified research personnel in the host country is a key motive for conduct-

**1** In 2013, the R&D expenditure of foreign corporation in the US was estimated at just under 40 billion euros; in the EU (ignoring inter-European globalization) the estimate was around 28 billion euros; and in China it was around 4.3 billion euros. See Eric Iverson et al., "Internationalisation of business investments in research and development and analysis of their economic impact (BERD Flows)," European Commission, Brussels, 2017 (online available).

**2** See Heike Belitz and Florian Mölders, "International Knowledge Spillovers Through High-Tech Imports and R&D of Foreign-Owned Firms," *The Journal of International Trade & Economic Development* 25 (4) (2016): 590–613.

**3** For example, the public expressed concern that key technological know-how could drain to China when Midea, a Chinese corporation, took over Kuka, the German robot manufacturer.

Box 1

### Data on the globalization of private R&D

Since the mid-1990s, the science statistics company at *Stifterverband*, an association of companies and foundations with an interest in civil society, has collected and evaluated the R&D data of companies according to the ownership principle for Germany every two years. The results of its special evaluations have been published in Stifterverband's own publications[1] and made available to international organizations such as the OECD as well as academia, science, and politics since 2003.[2]

Stifterverband determines the R&D expenditure of German companies abroad by subtracting their expenditure in Germany from the total global R&D expenditure of the 100 companies most highly active in research (including the money invested in Germany).

The extent of foreign companies' R&D expenditure in Germany is determined as part of the national R&D survey of responding companies that conduct research. With the assistance of an external database, it is allocated to the ultimate owner.

The database for measuring the globalization of R&D in companies is poorly developed in many countries.[3] Information is woefully lacking on R&D expenditure abroad. The OECD (AMNE—Activity of Multinational Enterprises database) and Eurostat (FATS—Foreign AffiliaTes Statistics) compile the available data from national sources for international comparison.

**1** Most recently in Verena Eckl et al., "a:rən'di: Zahlenwerk 2017 und Entwicklung in der Wirtschaft," SV Gesellschaft für Wissenschaftsstatistik mbH, Essen, 2015 (online available).

**2** They are also prepared for studies on the German innovation system for the German government's independent Commission of Experts for Research and Innovation (*Expertenkommission Forschung und Innovation*), most recently in Heike Belitz, "Internationalisierung privater Forschung und Entwicklung im Ländervergleich," *Studien zum deutschen Innovationssystem* 12-2017 (online available).

**3** OECD, *Science, Technology and Industry Scoreboard.* Paris: OECD Publishing, 2015 (online available).

ing R&D abroad. Based on current data (Box 1), in this section we examine the globalization of German companies' R&D efforts abroad as well as those of foreign companies in Germany and compare Germany to other industrialized countries.

## German companies' R&D abroad

At 24 billion euros, the R&D expenditures of German companies abroad reached a record high in 2015.[4] The foreign share was 35 percent, the same as it was in 2001. After 2001 it fell but turned around starting in 2007 (Table 1).

Between 2003 and 2015, the annual global R&D expenditure of international German companies active in research grew from 36 billion euros to around 69 billion euros. Nominally, it almost doubled. In comparison to 2003, 60 percent of the 32.5 billion euros in growth was attributable to locations in Germany and 40 percent to those abroad. Domestically, motor vehicles fueled the dynamic, as the sector received 80 percent of multinational corporations' R&D expenditures. The share abroad was 42 percent. The pharmaceutical industry also expanded abroad substantially and was responsible for a further 32 percent of the growth in German companies' R&D expenditure abroad after 2003. But German pharmaceutical companies also expanded their domestic R&D (Figure 1). In sum, the majority of R&D abroad flowed into motor vehicles and the pharmaceutical industry. Pharmaceutical companies invested more than half of their R&D expenditure abroad. German finance and insurance service providers had an even higher share abroad: at 1.5 billion euros, they invested 88 percent of their worldwide R&D expenditure abroad. But the proportion of foreign R&D has not increased in all sectors recently (Table 2). For example, it remained fairly constant in the computer and electrical engineering sectors and even fell in the chemicals sector.

The growth of R&D expenditure at home and abroad was broadly parallel in these sectors. Domestic rises or declines in R&D often went hand in hand with similar changes abroad (Figure 2). The expansion in German companies' R&D activities abroad was primarily driven by companies that also expanded their R&D at home (car manufacturers and pharmaceutical companies). In German computer and electrical engineering companies, as well as in the chemicals sector, the R&D expenditure plateaued both at home and abroad or even declined. Only

**4** See Verena Eckl et al., "a:rən'di: Zahlenwerk 2017 – Forschung und Entwicklung in der Wirtschaft," SV Gesellschaft für Wissenschaftsstatistik mbH, Essen, 2015 (online available).

the mechanical engineering companies expanded their R&D abroad and, as of 2009, spent less at home.

## R&D abroad in international comparison

An analysis of companies' investment in R&D abroad must take place within the context of investment in the domestic location. However, data on R&D expenditure at home and abroad are only available for German, US, and Swedish companies. In the companies from these three countries, expenditures have moved in parallel in the period since 1997 (Figure 3). For Swiss companies highly active in international research, information is only available for investment abroad. Their expenditure abroad is higher than the total domestic expenditure for companies in Switzerland,[5] but between 1992 and 2012 it did not grow faster than the latter.

The growth in the R&D expenditures of domestic companies at home and abroad can also be estimated approximately using patent data (Box 2).[6] We did this for Germany and seven other industrialized countries in which a particularly large number of top R&D investing companies are headquartered (France, Great Britain, Japan, Sweden, Switzerland, South Korea, and the US).

The proportions of patent applications submitted by domestic applicants with inventions made abroad varied considerably from country to country (Figure 4). Switzerland and Sweden had high proportions of inventors abroad, indicating extensive foreign R&D activity. In relatively small countries, their multinational corporations must conduct more of their research abroad because capacity at home is limited. Companies from France, Great Britain, Germany, and the US had intermediate globalization levels of research. The lowest proportions of inventors abroad were in South Korea and Japan. In most countries, the degree of corporate globalization rose between 2000 and 2014, but in South Korea and Japan it declined slightly. The number of patent applications by domestic applicants with inventors at domestic and foreign research locations varied largely in a parallel manner (Figure 5). The expansion and contraction of the number of patents at domestic locations led to similarly aligned changes abroad. This indicates that as a rule, companies view research abroad as a supplement to their domestic activity and not as a replacement for it.

Table 1

**Global R&D expenditure of German companies 1995–2015**

| | 1995 | 2001 | 2003 | 2007 | 2013 | 2015 |
|---|---|---|---|---|---|---|
| | *In billion euros* | | | | | |
| Global | 22.1 | 34.4 | 36.3 | 38.6 | 55.3 | 68.9 |
| Thereunder abroad | 5.1 | 11.9 | 10.9 | 9.4 | 17.3 | 24.0 |
| | *In percent* | | | | | |
| Share | 23 | 35 | 30 | 24 | 31 | 35 |

*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*

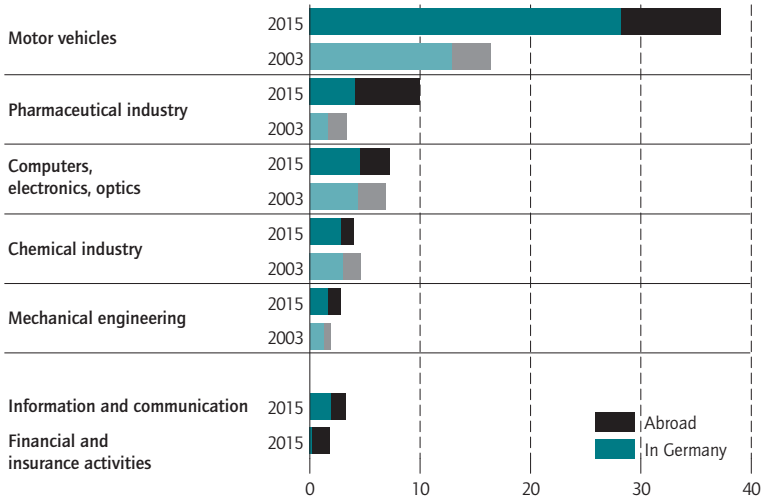


The foreign proportion of R&D expenditure was 35 percent in both 2015 and 2001.

Figure 1

**R&D Expenditure of German companies of selected industries at home and abroad, 2003 and 2015**

In billion euros




*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*



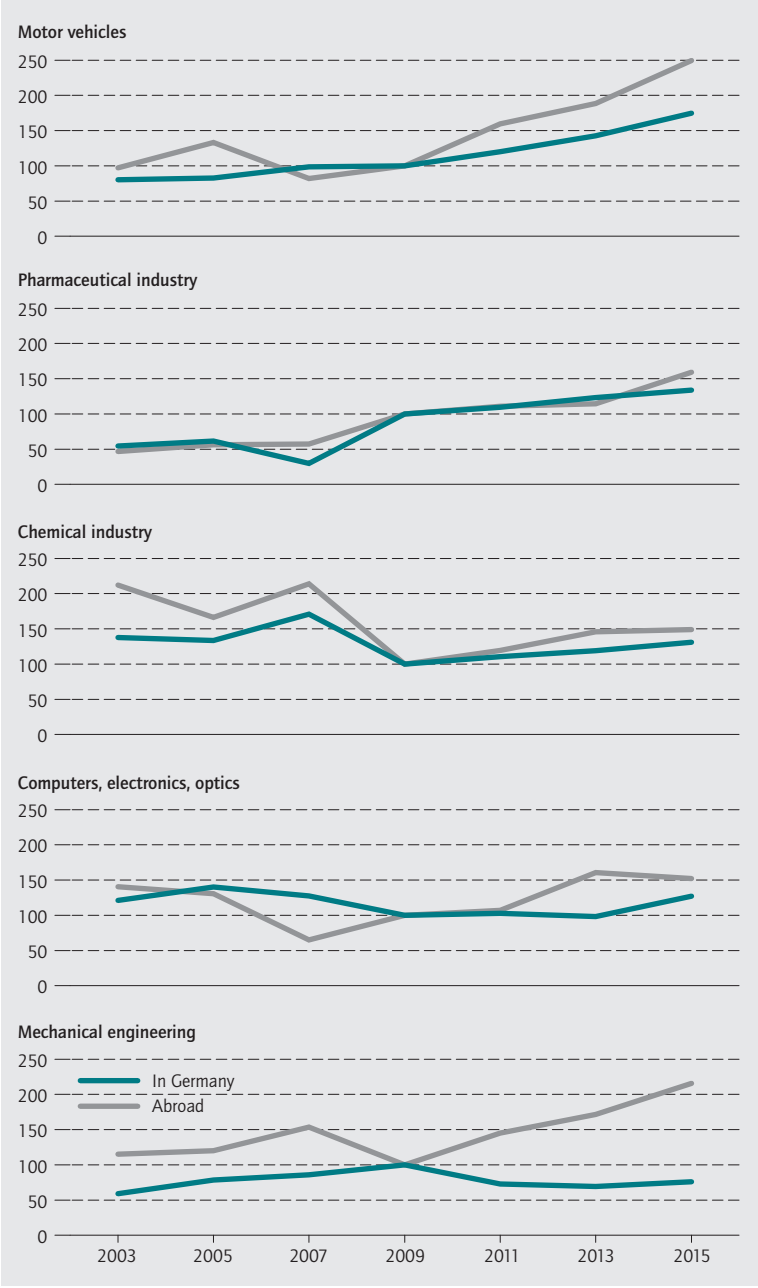
R&D abroad grew most rapidly among motor vehicles and pharmaceutical companies, which also increased their domestic investment.

**5** In addition to Swiss majority-owned companies with R&D abroad, the group also included foreign and Swiss companies that do not conduct international research.

**6** In research in this field, the number of patent applications is often used as a measure of R&D investment. But it must be accepted that R&D with non-patentable results is not included and is contingent upon deviations in both indicators as a result of different propensities to patent in various sectors.

Figure 2

**R&D expenditure of German companies at home and abroad, 2003–2015**
Index 2009=100




*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*



In almost all sectors, the R&D expenditure of German companies experienced parallel growth at home and abroad.

Table 2

**Share of R&D expenditure of German companies abroad in selected industries, 2003 and 2015**
In percent

| | 2003 | 2015 |
|---|---|---|
| Chemical industry | 34 | 28 |
| Pharmaceutical industry | 50 | 58 |
| Mechanical engineering | 32 | 41 |
| Computers, electronics, optics | 37 | 37 |
| Motor vehicles | 21 | 24 |
| Information and communication | – | 40 |
| Financial and insurance activities | – | 88 |

*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*



German financial service providers and pharmaceutical companies invest in more R&D abroad than in Germany.

## Foreign companies' R&D investment in Germany

According to information from the *Stifterverband*, all foreign companies in Germany had a total internal R&D expenditure of 13.1 billion euros in 2015.[7] They spent more than they did in 2013 (11.9 billion euros) but could not match the record high of 13.2 billion euros in 2011. Measured by full-time equivalents, around 90,000 persons were employed in R&D in foreign companies in 2015 just as in 2011. At 22 percent, the proportion of R&D personnel in foreign companies was at its lowest since 2001 (Table 3). However, it recently declined in most sectors of the economy. There were only slight increases in mechanical engineering, metal production and processing, and in research and development services, which together accounted for less than one-fifth of R&D employees in foreign companies (Table 4).

Foreign companies also had particularly high proportions of R&D personnel in aerospace engineering (78 percent) and the pharmaceutical industry (36 percent). Foreign companies are more highly committed to these and other cutting-edge industrial technology sectors that are highly promising for future technological development.[8] These fields were the recipients of 39 percent of the total R&D expenditure, while in German companies the total is only 17 percent. However, companies in other European countries invested more than half of their R&D

**7** See Verena Eckl et al., "a:rən'di: Zahlenwerk 2017."

**8** Per definition, the cutting-edge industrial technology sectors have R&D expenditures of more than nine percent in relation to revenue. In the high-quality technology sectors, the figure is three to nine percent. See Verena Eckl et al., "a:rən'di: Zahlenwerk 2017."

in Germany in its cutting-edge technology sectors. At 23 percent, US companies are less active in this field (Table 5). German companies' low level of commitment to cutting-edge technologies is, however, also a result of their strength in the field of high- technology, including motor vehicles, which is responsible for 39 percent of their total intramural R&D expenditure alone. Further, at 14 percent, the overall share of German companies' R&D expenditure invested in research-intensive services was twice that of foreign companies.

## R&D investment in international comparison

In Belgium, Ireland, the Czech Republic, Great Britain, Austria, and Poland foreign companies recently invest around 50 percent or more of the private R&D expenditure. (Table 6). Among the industrialized countries that are highly active in R&D, at six percent Japan had the lowest proportion of foreigners in private R&D expenditure, followed by Finland with just below 15 percent, and the US at 16 percent. At 22 percent, the proportion in Germany is only slightly higher, approaching the values of Italy, France, and Switzerland. In recent years, the contribution of foreign companies to R&D rose significantly in some countries, including: Poland, the Czech Republic, Spain, Norway, and Belgium. In ten of the 17 countries for which we had data as of 2003, it only rose slightly or even declined, for example in Ireland, Germany, Sweden, Italy, and France. Hence the speed of globalization in private R&D in the industrialized countries was only moderate in recent years.

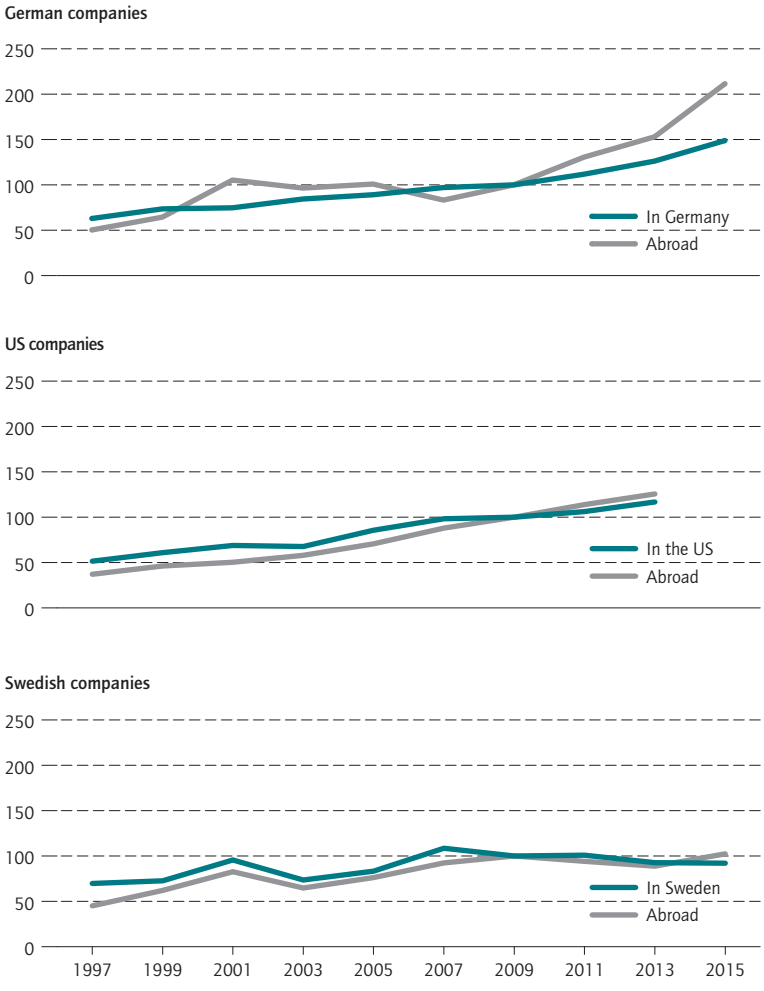
Foreign companies are responsible for a comparatively low share of R&D expenditure among all companies in Germany, which at two percent is, however, high in relation to the German GDP (Figure 6). France had significantly lower R&D intensity with a similar contribution from foreign companies, and Great Britain's lower R&D intensity was accompanied by a significantly higher contribution of foreign companies. Alongside Germany, Austria, Japan, and the US recorded strong growth in private R&D intensity. In Germany, Japan, and the US, domestic companies drove all or most of the R&D intensification in the economy. Foreign and domestic companies both contributed to R&D intensification to the same extent. Our international comparison shows that the higher share of foreign companies in R&D investment did not parallel higher R&D intensity and is, therefore, not necessarily proof that a country has attractive research conditions.

It is obvious that the shares of foreign companies in R&D relate to their proportions of production and employment. Since relevant data are not available for many countries, we used the stocks of foreign direct investment in relation to GDP as an indicator of the signifi-

Figure 3

**R&D expenditure of German, US and Swedish companies at home and abroad, 1997–2015**

Index 2009=100




*Sources: SV-Wissenschaftsstatistik; Bureau of Economic Analysis (BEA) / U.S. Department of Commerce; Swedish Agency for Growth Policy Analysis; authors' own calculations.*



The R&D of German, US, and Swedish companies grew at virtually the same rate at home and abroad.

Box 2

### Measurement of corporate research globalization with patent data on applicants' and inventors' place of residence

The OECD provides data on applications for international patents (including those of PCT patents, see below) in which at least one inventor abroad participated. The relevant indicator, "domestic ownership of inventions made abroad," reflects the extent to which the companies in a country control inventions based on R&D in subsidiaries in another respective country. Evaluations of the data on patent applications are based on the assumption that the vast majority of the international patents used are from companies, and only a small portion of them are applied for by research institutes or the inventors themselves. The proportion of patent applications from domestic applicants (companies) with foreign inventors is therefore approximately equal to the proportion of inventors abroad. The indicator supplements the R&D data for the subsidiaries of domestic companies abroad.[1]

In contrast, from the viewpoint of the target countries the globalization of R&D can be measured by the number of patent applications from foreign applicants with domestic inventors (foreign ownership of domestic inventions).

Based on these data, it is possible to estimate the patent applications of domestic companies in their homelands by subtracting the patents of foreign applicants with inventors in the relevant country from the total number of patents. To smooth the fluctuation in the annual application numbers in small countries, the sum of the patent applications of the current and previous year was used to calculate all indicators.

#### PCT patents

In order to receive patent protection abroad, applicants must submit a separate application to each national patent office. Since the procedure is complex and expensive, the international Patent Cooperation Treaty (PCT)[2] was created to provide the option of submitting a single (international) application to replace individual national applications in all signatory nations.[3] After submitting an application, applicants have up to 18 months to decide whether or not to pursue the patent application in other countries. An international treaty among more than 150 countries, the PCT is managed by the World Intellectual Property Organization (WIPO). However, national or regional patent offices are still responsible for the grant of the patent proper during the national phase of the process.

Due to the international orientation of the procedure and the high quality of the research on the patentability of an invention, PCT applications are more likely to reflect equivalent inventions than the patents of the various national patent offices.

1 Pluvia Zuniga, Dominique Guellec et al., *OECD Patent Statistics Manual.* Paris: OECD Publishing, 2009 (online available).

2 Available online.

3 Also see information on PCT applications (available online).

cance of foreign companies. As expected, we found a positive relationship between the proportions of foreign-controlled companies in R&D and production. Yet it is rather weak (Figure 7). In Israel, Belgium, the Czech Republic, Great Britain, Austria, and Poland, considerably higher R&D expenditures attract foreign companies more than the stocksof foreign direct investment there would lead one to expect. Conversely, in Switzerland, the US, and Japan—and to a lesser extent in Finland, the Netherlands, Germany, and France—the R&D shares of foreign companies are rather low in relation to the stocks of foreign direct investment (Figure 7). These countries also home countries of many multinational corporations that are highly active in R&D. In these countries in particular, measured by the stocks of foreign direct investment, there is additional potential for foreign companies to commit to R&D. It could be more difficult for them to gain footholds in countries with R&D in which they would encounter established competitors. Domestic companies employ the majority of R&D personnel there and maintain mature cooperative partnerships with each other, state research facilities, and universities. Further, they are probably also the primary beneficiaries of government R&D commissions and the most important funding recipients. However, there is a lack of sufficient information on the possible existence of access barriers to the research landscape for foreign companies in Germany and other countries.

## Conclusions

After an extended period of stagnation German companies R&D abroad gained momentum in 2009. By the year 2015, the annual total R&D expenditure of German com-

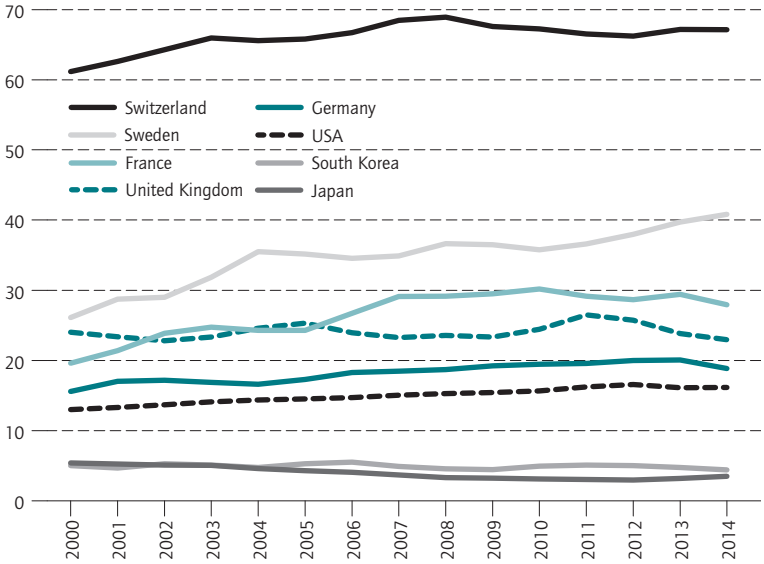
panies with international R&D activity at home rose by just below 50 percent and more than doubled abroad. At 14.7 billion euros at home in contrast to 12.7 billion euros abroad, domestic growth in R&D expenditure was higher. During the same period, foreign companies increased their R&D investment in Germany by only around ten percent (1.5 billion euros). This puts Germany among the countries with the lowest growth in R&D among foreign companies in recent years. However, the R&D expenditure of all companies in Germany rose to two percent of GDP, putting it at the same level as the US and significantly higher than that of France and Great Britain, for example. German multinational corporations with international R&D activity drove this positive development.

In those companies and their most important global competitors, the majority of investment in R&D at home and abroad developed in parallel. The companies that expanded their domestic investment were primarily the ones that invested abroad. This contradicts the assumption that R&D investment takes place abroad at the cost of domestic investment.

Alongside Japan, the US, and Switzerland, Germany is one of the countries in which the R&D activity of foreign companies is lower than expected based on the stocks of foreign direct investment. These countries have many of their own multinational corporations with strong research departments that traditionally conduct R&D at their home location. Because they employ most of the domestic pool of skilled personnel and take full advantage of the research landscape and funding opportunities, this may make it difficult for new foreign investors to gain access to the research location. Research policy makers should confirm whether or not there are barriers to accessing the research landscape for foreign companies in general or in specific sectors. In the field of cutting-edge technology, where foreign companies are particularly active, and beyond, eliminating them could contribute to intensifying the global transfer of knowledge.

Figure 4

**Share of patent applications with inventors abroad, 2000–2014[1]**
In percent




*1 Calculated with PCT applications of the current and the previous year.*

*Sources: OECD; authors' own calculations.*



There was moderate growth in the proportions of inventors in companies abroad.

Table 3

**Foreign companies' share of R&D in Germany 1995–2015**
In percent

| | 1995 | 2001 | 2007 | 2013 | 2015 |
|---|---|---|---|---|---|
| Industry total | | | | | |
| R&D personnel | 15.7 | 24.2 | 25.8 | 22.8 | 22.4 |
| Internal R&D expenditure | 16.1 | 24.8 | 27.3 | 22.6 | 21.5 |
| Manufacturing industry | | | | | |
| R&D personnel | 15.9 | 25.2 | 26.8 | 23.8 | 24.5 |
| Internal R&D expenditure | 16.4 | 25.6 | 27.6 | 23.1 | 22.7 |

*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*



In 2015, the proportion of R&D in foreign companies in Germany was at its lowest level since 2001.

Figure 5

**Patent applications of selected countries with inventors at home and abroad**
Index 2009=100[1]


*1 Calculated with PCT applications of the current and the previous year.*

*Sources: OECD; authors' own calculations.*



Parallel change in the number of inventors at home and abroad.

Table 4

**Share of R&D Personnel in Foreign companies, 2009 and 2015**
In percent

| | 2009 | 2015 |
|---|---|---|
| Manufacturing industry | 26.8 | 24.5 |
| Chemical industry | 17.5 | 15.0 |
| Pharmaceutical industry | 44.0 | 35.7 |
| Rubber, plastics, non-metallic mineral products | 34.3 | 26.7 |
| Metal production and processing, and manufacture of metallic products | 21.0 | 28.2 |
| Mechanical engineering | 20.8 | 23.6 |
| Computers, electronics, optics | 29.5 | 27.5 |
| Electrical equipment | 26.6 | 21.0 |
| Motor vehicles | 19.2 | 17.1 |
| Aerospace engineering | 87.4 | 78.4 |
| Information and communication | 22.6 | 11.8 |
| Financial and insurance activities | 16.2 | 2.7 |
| Professional, scientific and technical activities | 6.8 | 4.6 |
| Architectural and engineering activities and related technical consultancy | 16.7 | 19.0 |
| Scientific research and development | | |
| Total | 24.3 | 22.4 |

*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*



The proportion of foreign companies with R&D personnel decreased in most sectors.

Table 5

**Share of R&D-intensive industries in R&D expenditure of foreign and indigenous companies in Germany, 2013 and 2015**
In percent

| | Indigenous companies | | Foreign companies | | Thereunder from | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Europe | | USA | |
| | 2013 | 2015 | 2013 | 2015 | 2013 | 2015 | 2013 | 2015 |
| R&D-intensive industries | 75.6 | 74.7 | 76.6 | 78.1 | 74.8 | 78.5 | 79.9 | 80.4 |
| Cutting-edge technologies | 20.8 | 17.4 | 37.2 | 39.2 | 46.1 | 51.1 | 23.8 | 22.9 |
| Cutting-edge technologies | 54.8 | 57.3 | 39.3 | 38.8 | 28.7 | 27.4 | 56.1 | 57.5 |
| R&D-intensive services | 11.4 | 13.7 | 5.5 | 5.7 | 5.4 | 5.2 | 5.2 | 5.7 |
| Miscellaneous | 13.0 | 11.6 | 18.0 | 16.2 | 19.8 | 16.3 | 14.9 | 13.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*Sources: SV-Wissenschaftsstatistik; authors' own calculations.*

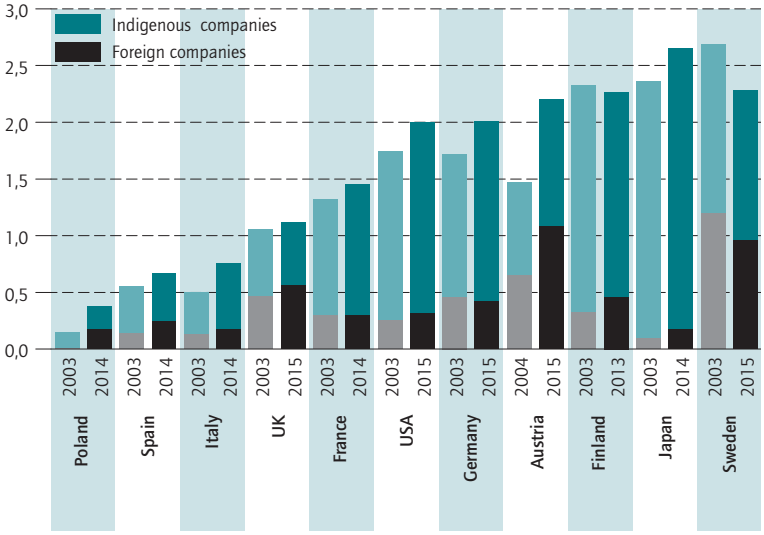


Foreign companies are more likely to concentrate their R&D in cutting-edge industrial technology sectors.

Figure 6

## R&D expenditure of indigenous and foreign companies in percent of GDP 2003/04 and 2014/15

In percent




*Sources: OECD and national data; authors' own calculations.*



Higher contributions of foreign companies to R&D do not go hand in hand with higher R&D intensity.

Table 6

## Share of R&D expenditure in foreign companies in selected countries, 2003 and 2015

| | 2003 | Last available year | change | Last available year |
|---|---|---|---|---|
| | *In percent* | | *In percentage points* | |
| Belgium | 57.1 | 66.0 | 8.9 | 2011 |
| Ireland | 70.2 | 65.2 | –5.0 | 2013 |
| Czech Republic | 46.6 | 62.8 | 16.1 | 2013 |
| United Kingdom | 43.9 | 50.9 | 6.9 | 2015 |
| Austria | 47.7 | 49.4 | 1.6 | 2015 |
| Poland | 9.3 | 47.0 | 37.7 | 2013 |
| Sweden | 45.2 | 42.1 | –3.1 | 2015 |
| Spain | 26.2 | 37.0 | 10.8 | 2013 |
| Canada | 31.8 | 35.5 | 3.8 | 2013 |
| The Netherlands | 25.4 | 33.5 | 8.1 | 2014 |
| Norvay | 20.9 | 31.6 | 10.7 | 2012 |
| Italy | 26.3 | 23.9 | –2.4 | 2014 |
| Germany | 25.2 | 21.5 | –3.7 | 2015 |
| France | 22.6 | 21.0 | –1.6 | 2014 |
| USA | 14.8 | 15.8 | 0.9 | 2015 |
| Finland | 14.0 | 14.8 | 0.8 | 2013 |
| Japan | 4.3 | 6.6 | 2.4 | 2013 |

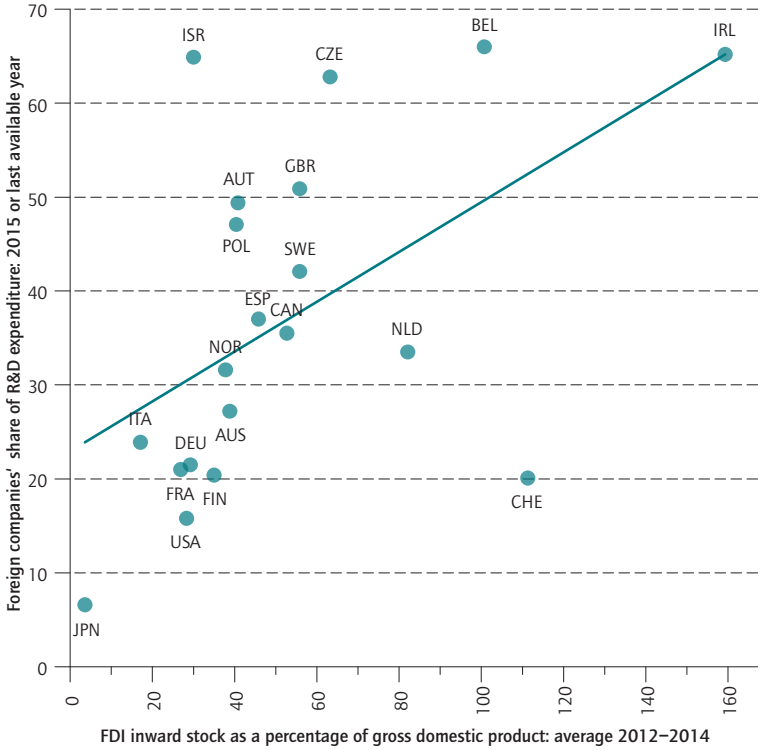
*Sources: OECD, national data; authors' own calculations.*



In ten out of 17 countries, the proportion of foreign companies involved in R&D rose slightly or even fell.

Figure 7

## FDI inward stock and foreign companies' share in R&D in selected countries




*Simplified the relation between foreign companies share of R&D (y) and the FDI inward stock as percentage of GDP (x) can be represented as a linear function: y= 0,2563x + 23,59, R2=0,2635.*

*Sources: OECD; UNCTAD; authors' own calculations.*



Measured by their foreign direct investment stocks, foreign companies have a low share of R&D in Germany.

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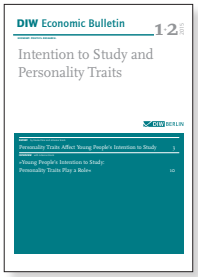


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