B 3-4 Internationalisation of R&D

Determinants of the internationalisation of R&D

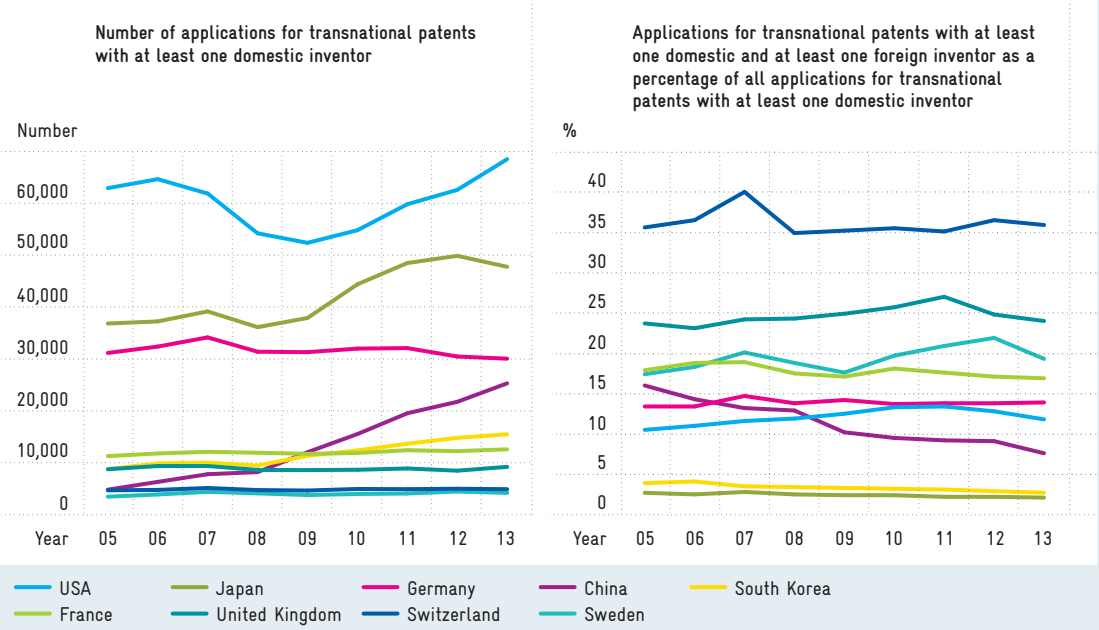
Just like production and sales, research and development (R&D) are becoming increasingly involved in global value chains. Cross-national R&D activities facilitate access to knowledge and to sales markets in other locations.[178] Important factors determining the choice of R&D location include local public goods, the availability of access infrastructure such as airports, a highly efficient digital infrastructure, and the quality of local university research.[179] Further factors that make a location attractive for the R&D activities of multinational enterprises (MNEs) are a research-friendly state regulation of the product and labour markets, comprehensive protection of property rights, a low corporate tax burden, or the public promotion of international R&D cooperation with the participation of local companies.[180]

However, state intervention can also distort international competition for R&D locations.[181] For example, in recent years several BRIC states have gone over to demanding that MNEs get involved in local R&D as a condition for allowing them access to their markets.[182] The Commission of Experts also regards so-called Patent Boxes as a distorting element in international competition for locations.[183]

Fig. B 3-4-1

Download data

Transnational patents for selected countries, 2005 to 2013

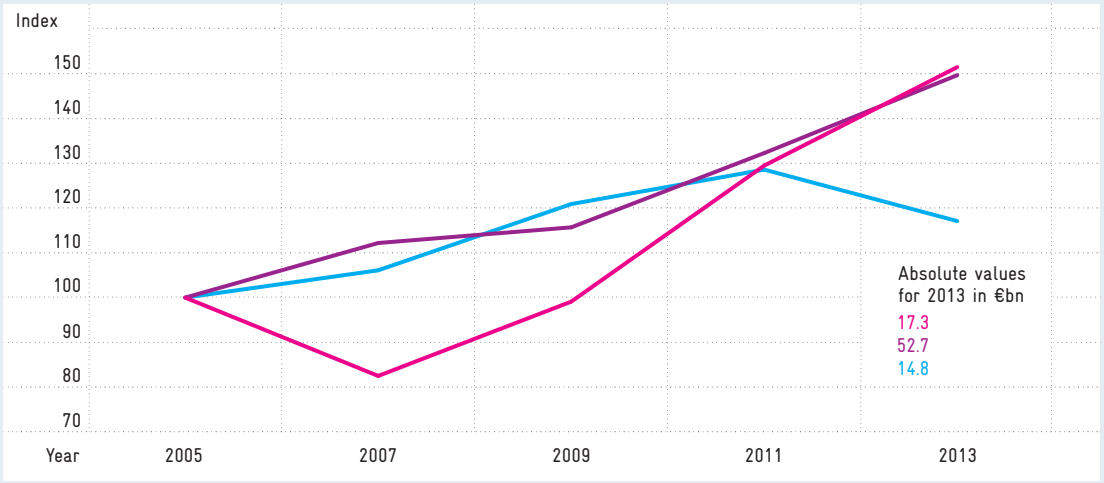


Source: own diagram based on data from Fraunhofer ISI.

Fig. B 3-4-2

Download data

R&D expenditure within and outside Germany classified by location of company headquarters, 2005 to 2013



Index 2005 = 100
* By the approximately 100 German corporate groups with the strongest research divisions according to the European R&D Scoreboard.
Note: the sharp fall in R&D expenditure abroad by corporate groups headquartered in Germany between 2005 and 2007 can be attributed to the separation of Daimler and Chrysler.
Data for 2015 were not available by the editorial deadline.
Source: Own calculations and diagram based on data from SV Wissenschaftsstatistik.

In the early 2000s, there was a marked increase in international R&D expenditure in the Asian region, especially in the agglomerations of Beijing, Bangalore, Shanghai and Singapore.[184] However, this development has slowed down considerably in the meantime, and, most recently, established locations such as the USA, the United Kingdom and Germany have become attractive again for MNEs' R&D investment.[185] This strengthening of the 'classical' global research locations can also be explained by the fact that India and China no longer act only as target countries, but also increasingly as countries of origin for international R&D.[186]

R&D internationalisation trends worldwide

Cooperation between domestic inventors and those from other countries is seen as an indicator of the globalisation of knowledge formation.[187] Figure B 3-4-1 (right panel) looks at the frequency of such international co-inventions regarding transnational patent applications with at least one domestic inventor.[188] The number of transnational patent applications with at least one domestic inventor remained almost constant in Germany between 2005 and 2013 (left panel). A comparison with the other countries reveals above all the striking five-fold increase in application figures from China. At the same time, the number of transnational patent applications with at least one domestic and at least one foreign inventor as a share of the total number of all transnational patent applications with at least one domestic inventor fell considerably there in the period under review. This development can be explained by the country's strengthening innovative capacity combined with the availability of qualified human capital.

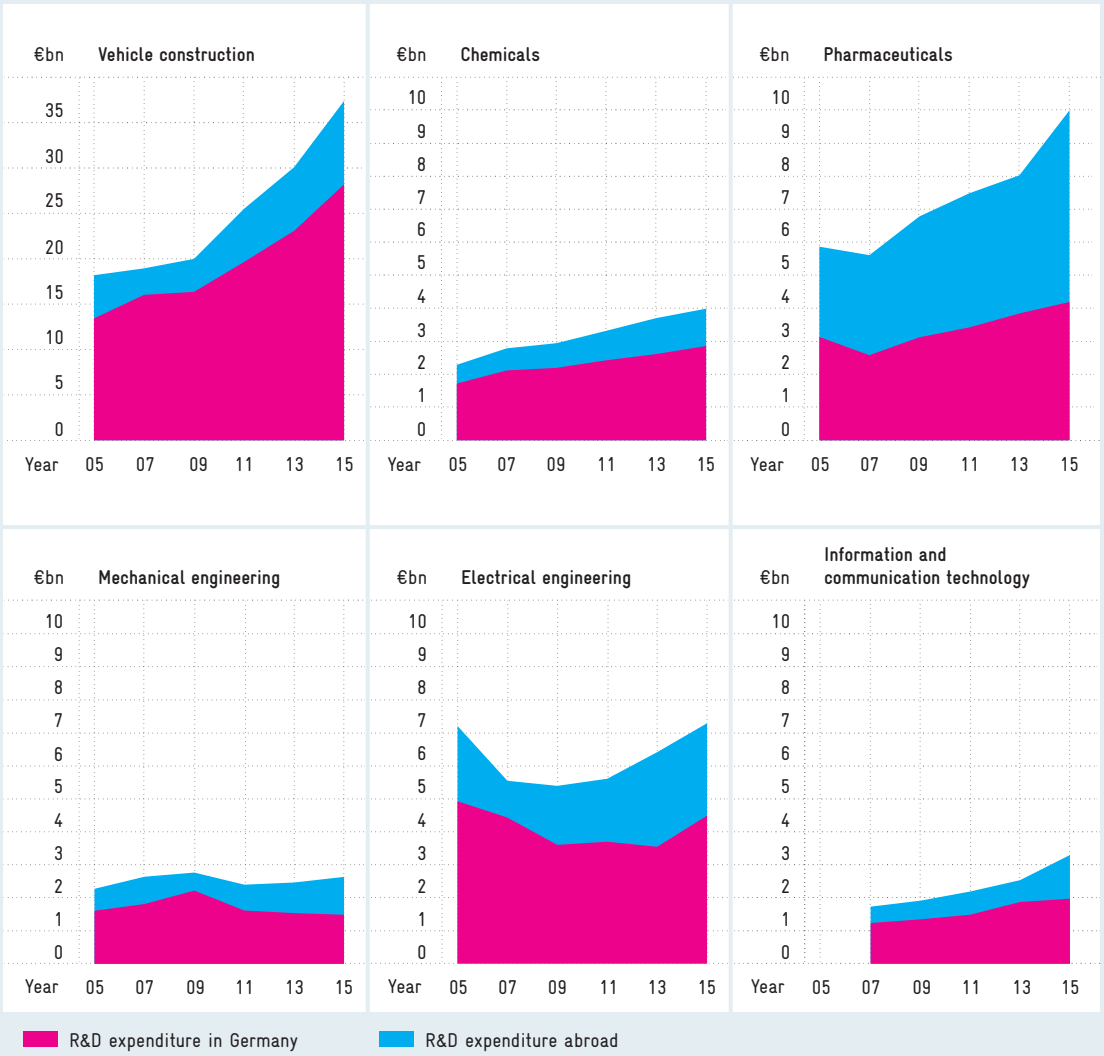
R&D internationalisation trends in Germany: R&D expenditure

From Germany's perspective, the inward and outward internationalisation of R&D has developed as follows (cf. Figure B 3-4-2): between 2005 and 2013, the degree of involvement of foreign companies in R&D in Germany showed little dynamics; between 2011 and 2013 there was even a slight decrease. It

Fig. B 3-4-3

Download data

Dynamics of total worldwide R&D expenditure by the 100 German corporate groups* with the strongest research divisions in selected industries, 2005 to 2015



* Identification is carried out according to the respective European R&D Scoreboard; the exact number of corporate groups varies slightly between observations.
Figures in billions of euros, stacked areas. Figures for 2015 are provisional.
Source: own diagram based on data from SV Wissenschaftsstatistik.

remains to be seen whether this negative development continues over the next few years.[189] On the other hand, companies domiciled in Germany have systematically expanded their R&D expenditure both domestically and abroad during the period under review. R&D expenditure abroad by corporate groups headquartered in Germany have even increased disproportionately since 2007. The sharp fall between 2005 and 2007 can be attributed to the separation of Daimler and Chrysler.[190]

R&D internationalisation trends in Germany: industries

German companies' R&D activities abroad are dominated by MNEs in the manufacturing sector (cf. Figure B 3-4-3).[191] An analysis of the approximately 100 German corporate groups with the strongest research budgets[192] for 2015 shows that in pharmaceuticals 58.1 percent of R&D expenditure flowed abroad (52.1 percent in 2013). In vehicle construc-

tion, by contrast, the foreign share was only 24.6 percent in 2015 (23.3 percent in 2013).[193]

The internal R&D expenditure invested by foreign companies in Germany[194] – totalling 11.9 billion euros in 2013 – also went mainly to those industries that can be considered as Germany's innovation system's strengths. For example, vehicle construction alone accounted for 33.9 percent, pharmaceuticals for only 10.0 percent.[195]

High concentration of domestic and foreign R&D in vehicle construction

Over the past decade, R&D spending by German companies has increased in almost all branches of industry, both in Germany and abroad. The sharp increase in private R&D spending by German companies over the last ten years is a remarkable development.

At the same time, the fact that the R&D activities are highly concentrated in a few core industries is a cause for concern. Vehicle construction alone accounted for more than a third of Germany's internal R&D expenditure in 2015.[196] The R&D activities of foreign companies in Germany reinforce this concentration. This is also reflected in the international mobility of skilled personnel and patent-active inventors.[197]