

## A5 INTERNATIONALISATION OF RESEARCH AND DEVELOPMENT

### Current developments of foreign research and development activities by German companies<sup>82</sup>

The internationalisation of research and development (R&D) of German companies has increased significantly in recent years. In 2011, German companies spent a total of EUR 14.8 billion on R&D in other countries. The share of foreign spending in global R&D expenditure thus rose from 27.3 percent to 30.5 percent between 2007 and 2011.

Between 2009 and 2011, German foreign R&D expenditure increased by 15.3 percent per annum. In comparison, domestic R&D expenditure by German companies increased by only 5.7 percent. German R&D activities abroad experienced a particularly strong increase in the automotive industry (an increase of 27.6 percent per annum), in mechanical engineering (25.1 percent per annum) and in the chemical industry (13 percent per annum). However, in contrast to previous years, international activities in the pharmaceutical industry and in electrical engineering increased only slightly.<sup>83</sup>

Data on international R&D activities of German companies are published by the *Stifterverband für die deutsche Wissenschaft* (Donors' Association for the Promotion of Sciences and Humanities in Germany). These data include figures on approximately 100 leading companies active in research. To determine the foreign R&D expenditure of these companies, global R&D expenditures are derived from the annual reports of these companies and compared with existing figures from the survey on domestic R&D expenditure.

The available data can also be analysed according to the industries the companies are active in. The majority of foreign R&D expenditure is attributable to the vehicle construction industry (EUR 5.9 billion, or 40 percent of total foreign R&D expenditure of German companies), followed by the chemical and pharmaceutical industries (EUR 5.0 billion in total, or 34 percent).

However, these data do not provide information on the particular countries in which German companies conduct their R&D activities. To address this issue and other open questions, the Expert Commission conducted a special survey in cooperation with the Stifterverband.

### United States most important target country for German R&D – growing importance of China<sup>84</sup>

The companies participating in the special survey spent a total of EUR 7.2 billion on foreign R&D in 2011.<sup>85</sup> Thus, the survey records about 50 percent of German companies' foreign R&D expenditure. However, the companies included in the survey do not reflect the industry structure as displayed in the Stifterverband's comprehensive data collection: over 70 percent of the foreign R&D expenditure recorded in the survey was attributable to the chemical and pharmaceutical industries, and a mere 19 percent was attributable to the automotive industry and other transport equipment.

While the special survey thus represents only a portion of the overall picture, it allows for additional insights due to the survey's depth and its qualitative components.

Based on the level of expenditure, the United States are the most important target country for German companies' foreign R&D activities. Austria, Switzerland, Japan and France follow at a significant distance, and China and India hold sixth and seventh position respectively. However, the ranking changes when based on the number of times a country is mentioned: while the United States remain the most important target country, China is now in second place.

At 14 to 45 million EUR per company on average, the level of R&D expenditure allocated to highly developed countries such as the United States, France and Japan continues to be significantly higher than that allocated to the BRIC countries.<sup>86</sup> R&D locations established in the BRIC countries still tend to show relatively low investment volumes.

German companies invest an average amount of nine to ten million EUR in China and India, two million EUR in Brazil and substantially smaller amounts in Poland and Russia.

### **The tapping of knowledge and markets as key driving forces for foreign R&D**

The surveyed companies were asked which motives were relevant for their decision to conduct R&D abroad. The tapping of new markets as well as the tapping of specific knowledge or skilled workers in the target country were most frequently considered relevant motives.<sup>87</sup> Lower regulatory requirements in the target country and political requirements set by the target country's government were considered as least relevant.<sup>88</sup>

That said, companies do not consider all of these motives as equally relevant for all target countries or groups of countries. The tapping of new markets proves especially significant for investments in the United States and the BRIC countries: approximately 80 percent of companies conducting R&D in these countries consider this motive as relevant. The proportion is only about half as high for the EU-14<sup>89</sup> and Eastern Europe<sup>90</sup> (43 and 44 percent, respectively). The tapping of specific knowledge or skilled workers in the target country is the most relevant motive for R&D activities in the EU-14 and the United States (61 and 65 percent, respectively). Savings in wages and non-wage labour costs are relevant motives for investments in Eastern Europe: 85 percent of companies conducting R&D activities in this region consider this motive as relevant, and nearly two thirds of companies consider this a relevant motive for R&D activities in the BRIC countries.

The survey also revealed that motives for investing abroad do not only differ according to target country, but also according to industry. Especially in the chemical, pharmaceutical and automotive industries, as well as other transport equipment, engineering and technical services, the tapping of new markets is frequently considered a relevant motive. The tapping of specific knowledge or skilled workers in the target country is by far the most relevant motive for the ICT industries as well as for engineering and technical services.

### **Foreign R&D in the BRIC countries to be further expanded despite restraints**

The surveyed companies were also asked which difficulties and obstacles they face when conducting R&D activities abroad.<sup>91</sup> Overall, the surveyed companies expressed only little concern. Yet, it should be noted that the companies surveyed are not representative in this respect, since nearly all of the companies have been engaged in foreign R&D for at least five consecutive years. This means that the surveyed companies represent a selected group of companies with a successful record of foreign R&D activities.

The obstacles most frequently considered as relevant are cultural or language barriers (27 percent), followed by insufficient training of skilled workers (22 percent) and academics (18 percent).

The surveyed companies also assessed the relevance of obstacles and difficulties differently according to target countries and groups of countries. Obstacles and difficulties in the BRIC countries are most frequently considered as relevant, followed by Eastern Europe. With regard to the EU-14, obstacles and difficulties are considered less significant, and this also applies to locations in the United States. Merely insufficient training of skilled workers is considered to be an issue here. Almost a quarter of German companies conducting R&D in the United States consider this a relevant obstacle. The training of academics, however, was assessed positively throughout.

Finally, businesses were asked about their plans for the next five years. Many of the companies intend to keep their R&D commitments in foreign locations constant (56 percent). According to the companies, activities in 36 percent of foreign R&D locations are to be expanded, and in only 8 percent of cases activities are to be reduced. Companies with R&D commitments in the BRIC countries are more likely to plan an expansion of their respective activities in the future (67 percent of companies). There are hardly any differences to be observed across industry sectors.

## Recommendations

From a research, education and innovation policy perspective, the question arises whether the observed trends in foreign R&D activity are accompanied by a strengthening or weakening of Germany as a research location. An increase in R&D commitments abroad would be an issue if it were accompanied by a drain of domestic knowledge and skills. Analyses to date, however, show that Germany still holds a balanced position overall.<sup>92</sup> In 2011, foreign companies invested even more in R&D in Germany (EUR 16.2 billion) than German companies invested abroad (EUR 14.8 billion).<sup>93</sup> In the view of the Expert Commission, there is no immediate need for action in this field.

It is a cause of concern, however, that in the field of cutting-edge technology German companies increasingly conduct their R&D in other countries. German companies are stepping up their foreign R&D investments especially in the highly dynamic areas of information and communication technologies, biotechnology, genetic engineering and, more recently, medical research. These industries will be analysed in more depth in Chapters B 1 and B 3.

As will be shown in Chapter B 2, Germany is currently losing a considerable number of scientists and inventors in the field of cutting-edge technology to foreign countries. In turn, German businesses, especially in ICT, are relocating their R&D sites to precisely those countries in search of top talent. These developments reinforce each other and permanently weaken Germany as an innovation location. The Expert Commission would like to point to the dangers of a competence trap caused by excessive specialisation in areas that are currently highly competitive – at the expense of areas that might be highly relevant in the future.

The Expert Commission reiterates that it is of central importance for German R&I policy to retain talented innovation professionals, whether it is scientists and inventors, in Germany, or to recover them from abroad, respectively. Measures relating to such efforts (cf. Chapters B 2 and B 3) must be coupled with incentives in order for international companies to become active in the field of cutting-edge technologies in Germany.