

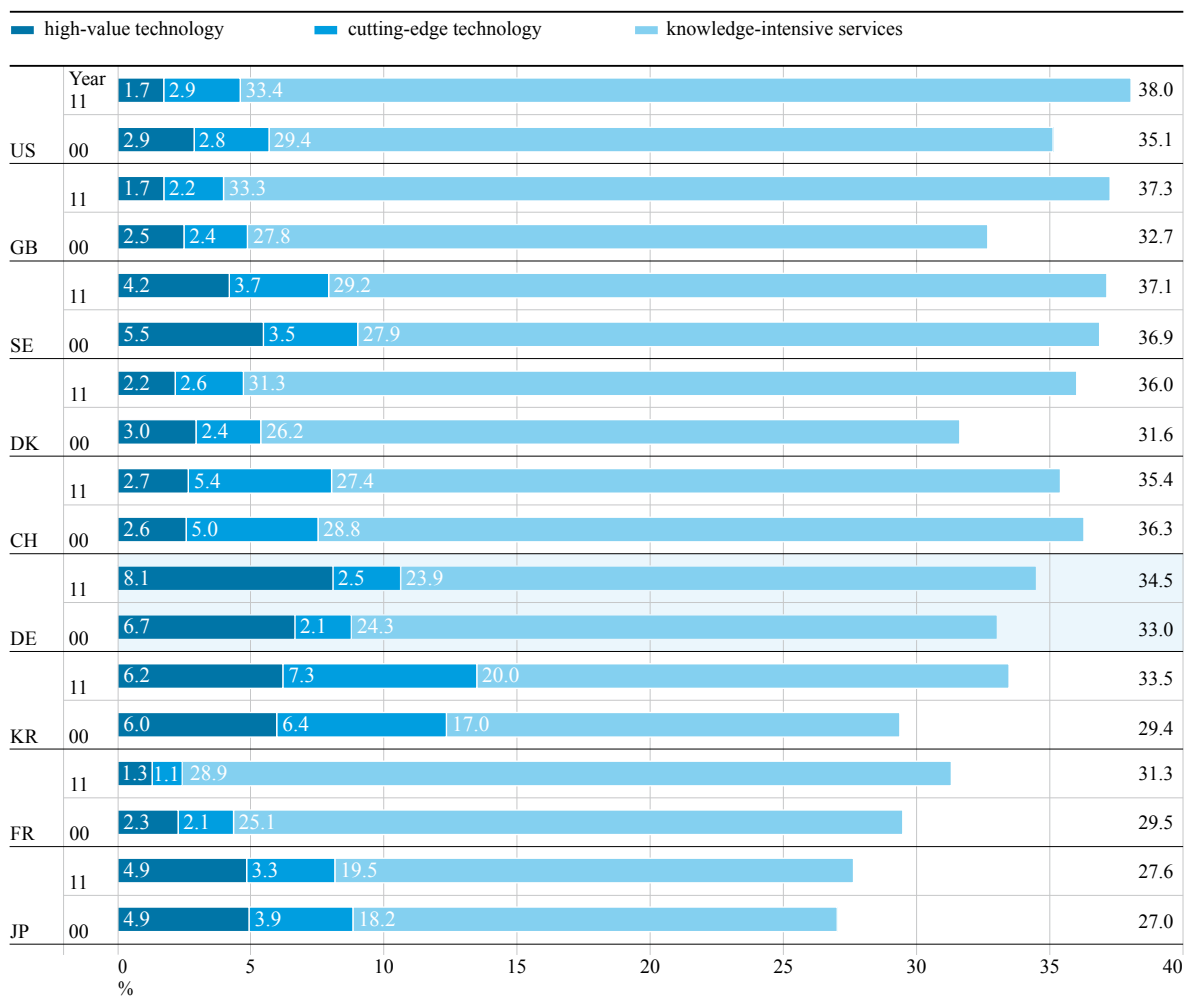
## A 4 STRUCTURE AND DEVELOPMENT OF THE KNOWLEDGE ECONOMY

Growth and employment in highly developed and relatively expensive business locations can only be secured through continuous innovation. First and foremost, this can be achieved in the knowledge economy, i.e. in research-intensive industries and knowledge-intensive services. This is the reason why many countries focus on generating an increasing share of value added in the knowledge economy.<sup>75</sup>

The Expert Commission regularly commissions studies on the German innovation system to determine the state of development of Germany's knowledge economy and to compare the sector's relevance and efficiency with that of important competitor countries. On average, the surveyed countries' share of the knowledge economy in total economic value added increased from 32 percent in 2000 to 34 percent in 2011. That said, there are particularly highly-developed countries (hereafter referred to as leaders in

**FIG 02 Share of research-intensive industries and knowledge-intensive services in value added between 2000 and 2011 (figures in percent)**

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Source: OECD STAN (2013), Eurostat (2013), EUKLEMS (2013, 2007), BEA (2013), BOK (2013), Statistics Bureau - Ministry of Internal Affairs and Communications Japan (2013); calculations and estimates by DIW Berlin.

modernisation) that are characterised by a particularly rapid transition towards the knowledge economy. In these countries, the current share of the knowledge economy in total value added amounts to 37 to 38 percent. When it comes to developing the different segments of the knowledge economy, the surveyed countries also display differing development patterns. These differences are described in further detail below.

Figure 2 shows the ranking of countries, measured by the knowledge economy's share in national value added for the year 2011. Changes in this indicator and its main components are illustrated for the 2000 to 2011 period. With a share of 38 percent in value added, the United States are pioneering in expanding the knowledge economy; closely followed by Great Britain and Sweden (both at 37 percent), Denmark (36 percent) and Switzerland (35 percent). Germany has a 34.5 percent share in value added and has steadily increased the knowledge economy's share since 2000, albeit with different focal areas than the comparison countries.

Global economic momentum is characterised by the fact that also emerging economies are increasingly focussing on expanding their knowledge economies. Over the last decade, a consistent development towards the knowledge economy has taken place particularly in Korea, China, Brazil, Mexico and Russia, as well as Hungary, the Czech Republic and Poland. An increasingly large number of emerging economies are focussing on developing research-intensive industries and knowledge-intensive services as part of their development strategies.

Also in future, structural change will be characterised by the growing importance of the knowledge economy – both in highly developed countries and in emerging economies. Germany's success in securing growth and employment essentially depends on its ability to retain its position in the interplay of forces between highly developed leaders in modernisation and ambitious emerging economies. For Germany, it will not suffice to solely rely on proven strengths in R&D-intensive manufacturing industries. The following analysis demonstrates that Germany will have to step up its efforts particularly in the field of knowledge-intensive services.

### **R&D-intensive industries in international comparison**

Germany still maintains its position in the knowledge economy, which is largely owing to industry, a sector that remains to be strong. The industry sector was further advanced between 2000 and 2011, partially at the expense of the knowledge-intensive services' share in value added (cf. Figure 2). In Germany, the share of R&D-intensive industries in national value added amounts to 10.6 percent and is thus significantly higher than in the United States, Great Britain, France and the Scandinavian countries.<sup>76</sup> That said, Germany concentrated its efforts on selected fields from among the R&D-intensive industries. Thus, the German economy continues to be particularly strong in high-value technology, as illustrated by the dark blue bar on the left in Figure 2. The share of this manufacturing industry segment once again significantly increased between 2000 and 2011, which contrasts with developments in the other countries surveyed. With its 8.1 percent share of high-value technology in national value added, Germany claims an impressive top position. Other countries reduced their shares of high-value technology in the surveyed period and tend to show significantly lower values in this respect: the share of high-value technology in value added amounts to only 1.7 percent in the United States and in Great Britain, 1.3 percent in France and 4.9 percent in Japan.

Germany's existing strengths in the area of high-value technologies stand in contrast to its shortcomings in the area of cutting-edge technology (as illustrated by the central bar in Figure 2). Here, Germany plays a subordinate role, while many other countries have in fact strengthened their efforts in developing cutting-edge technology in recent years. Only a 2.5 percent share in Germany's value added is attributable to cutting-edge technologies, in marked contrast to e.g. Korea (7.3 percent), Switzerland (5.4 percent) and Sweden (3.7 percent). Deficits in the field of cutting-edge technologies can also be observed in other large EU countries. Thus, the share of high technology in Great Britain's value added stands at only 2.2 percent, and 1.1 percent in France. The European Union as a whole also shows significant deficits in this area.<sup>77</sup>

### **Knowledge-intensive services**

In nearly all of the countries surveyed, knowledge-intensive services make up the largest share of the knowledge economy. These include know-how-intensive services in the area of IT, finance, healthcare, and business services. Many countries have been concentrating their development strategies on expanding these sectors, especially the United States, where knowledge-intensive services now account for 33.4 percent of value added. The relevance of knowledge-intensive services is also relatively high in Great Britain (33.3 percent), Denmark (31.3 percent), the Netherlands (30.1 percent) and France (28.9 percent). With a share of 23.9 percent, knowledge-intensive services in Germany are still significantly underrepresented when compared with the above countries. What is more, the share of knowledge-intensive services in value added declined in Germany between 2000 and 2011, in stark contrast to the development in many of the surveyed countries. Germany's future competitiveness depends crucially on also further expanding the knowledge-intensive services sector.

Productivity development in international comparison  
A favourable position in international competition is the main prerequisite for securing and increasing prosperity in Germany. This is largely driven by the development of productivity. Over the past decade, key leaders in modernisation have increased their productivity, especially in the knowledge economy. These countries have also benefitted from spillover effects from the knowledge economy, which has led to strong productivity gains in downstream sectors of the economy. In terms of productivity development, the period between 1995 and 2006 displays significant differences between Europe and the United States. This is largely attributable to the fact that the United States considerably expanded their knowledge economy, and particularly in the ICT industries.<sup>78</sup>

### **Development of labour productivity in research-intensive industries**

Figure 3 shows that labour productivity in research-intensive industries increased particularly sharply in the United States and in Sweden (between 2000 and 2011), as well as in Japan (up to 2008). Germany, Great Britain, France and Switzerland recorded relatively smaller increases in labour productivity in the

same period, which, in Germany, was mainly caused by productivity losses during the financial crisis in 2008/2009.

### **Development of labour productivity in knowledge-intensive services**

Also in the area of knowledge-intensive services, productivity developments differed considerably between European countries and non-European leaders in modernisation. In addition, major differences between individual European countries can also be observed. While Germany did not manage to increase labour productivity in knowledge-intensive services over the last decade, the United States, Great Britain and Sweden recorded a very substantial increase in this regard (cf. Figure 4).<sup>79</sup>

Within the BRIC countries and other emerging economies, there are also significant differences in terms of productivity development in knowledge-intensive services. Especially China and India, but also Russia recorded strong increases in productivity, while Brazil and Korea fell slightly behind in this area.<sup>80</sup>

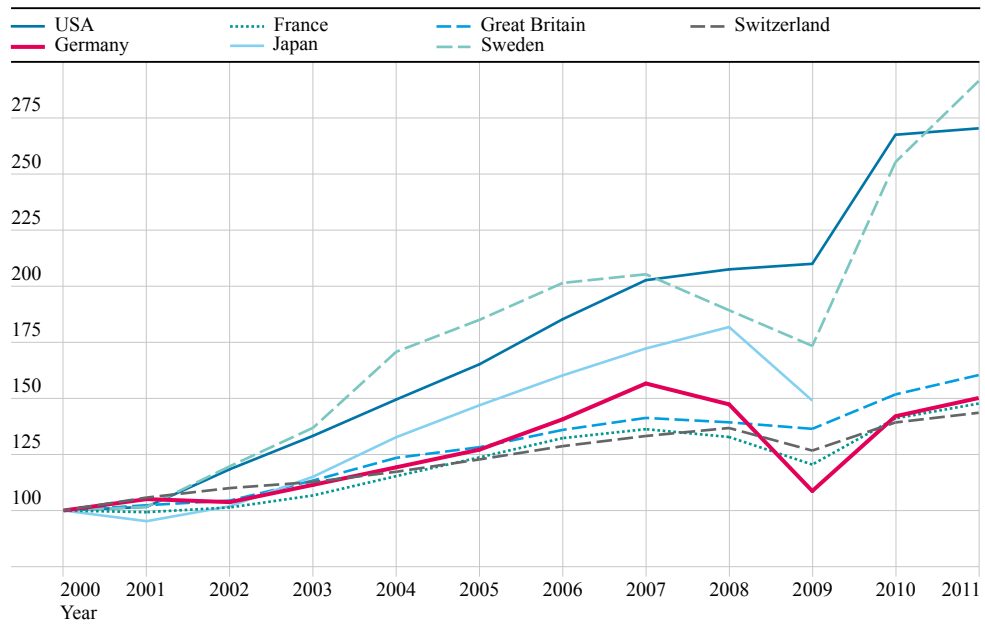
### **Recommendations**

In the coming years, Germany's international competitiveness will crucially depend on the expansion of the knowledge economy and its spillover effects on other sectors of the economy. Germany's existing strengths in the area of high-value technologies should be supplemented by complementary developments in the field of cutting-edge technology and knowledge-intensive services. Service innovation, new business models and systematic internationalisation strategies can help increase productivity in knowledge-intensive services.

The German research and innovation policy needs to significantly improve conditions for cutting-edge technologies. This requires enhanced efforts in the fields of entrepreneurship, innovation and growth financing, as well as R&D tax credits. Germany should also focus on attracting direct investment from foreign companies in those areas where German companies display insufficient development. Especially in the areas of cutting-edge technology and knowledge-intensive services, dynamic investors should be

Development of labour productivity in research-intensive industries (2000 = 100)

FIG 03

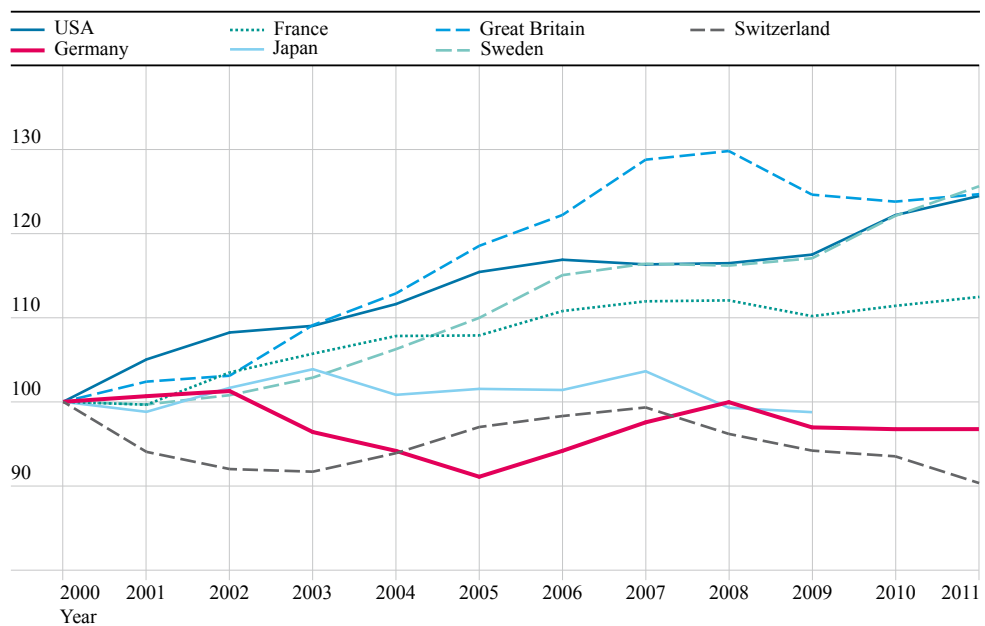


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Source: OECD STAN (2013), Eurostat (2013), EUKLEMS (2013, 2007), BEA (2013), Statistics Bureau - Ministry of Internal Affairs and Communications Japan (2013); calculations and estimates by DIW Berlin. Data on Japan only available up until and including 2009.

Development of labour productivity in knowledge-intensive services (2000 = 100)

FIG 04



DATA  
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Source: OECD STAN (2013), Eurostat (2013), EUKLEMS (2013, 2007), BEA (2013), Statistics Bureau - Ministry of Internal Affairs and Communications Japan (2013); calculations and estimates by DIW Berlin. Data on Japan only available up until and including 2009.

encouraged to establish locations in Germany and to collaborate with German businesses and research institutions.

Even more than in the past, companies in Germany need to focus on applying the most recent information and communication technologies as a means of developing productivity. A close integration of technological innovations and organisational development processes is crucial for achieving high productivity gains.<sup>81</sup> High priority should be attached to the development of information and communication technologies in Germany and their utilisation in other areas of the economy and society (cf. Chapter B 3). Furthermore, the expansion of the knowledge economy should not be pursued in isolation from the upstream and downstream sectors of the economy. A number of countries have systematically developed their knowledge economies, but these often remain relatively isolated from the more traditional economic sectors. The modernisation of the knowledge economy should also be used for creating spillover effects and productivity gains in non-knowledge-intensive sectors of the economy.