C 7 PRODUCTION, VALUE CREATION AND EMPLOYMENT

Overview

Successful innovations lead to the creation of additional value. By specialising in technological innovations and high quality goods and services, highly developed economies can charge prices, which make it possible for employees to earn high real incomes and for the companies to achieve growth in production and higher levels of employment. The technological capability of a country is therefore linked to the level of its R&D-intensive products and knowledge-intensive services it generates. The advantages of the highly-developed economies (high level of technological knowledge, high level of investments in R&D, highly-qualified personnel) have the greatest effect in these markets. Long-term economic development therefore requires structural change towards R&D-intensive industries and knowledge-intensive services.

In Germany, the knowledge-intensive industry has been developing much more dynamically in terms of gross value added and employment effects than the non-knowledge-intensive industry. In the services, the differences between knowledge-intensive sectors and the non-knowledge-intensive sectors is less pronounced. Overall, there is a trend towards tertiarisation.

In comparison with other OECD countries, technology and knowledge-intensive sectors of the economy in Germany account for a large proportion of the work volume of the economy as a whole and of the value added. This is also reflected in foreign trade. In 2006, Germany had the largest share of world trade for research-intensive goods as well as for all industrial goods. However, Germany's specialisation advantages in commerce with technology goods are declining over time. German companies are facing growing foreign competition on the domestic markets. This applies in particular for the automotive industry, which has been mainly responsible for the German specialisation advantages in high-value technology. Germany has traditionally not been specialised in cutting-edge technologies.

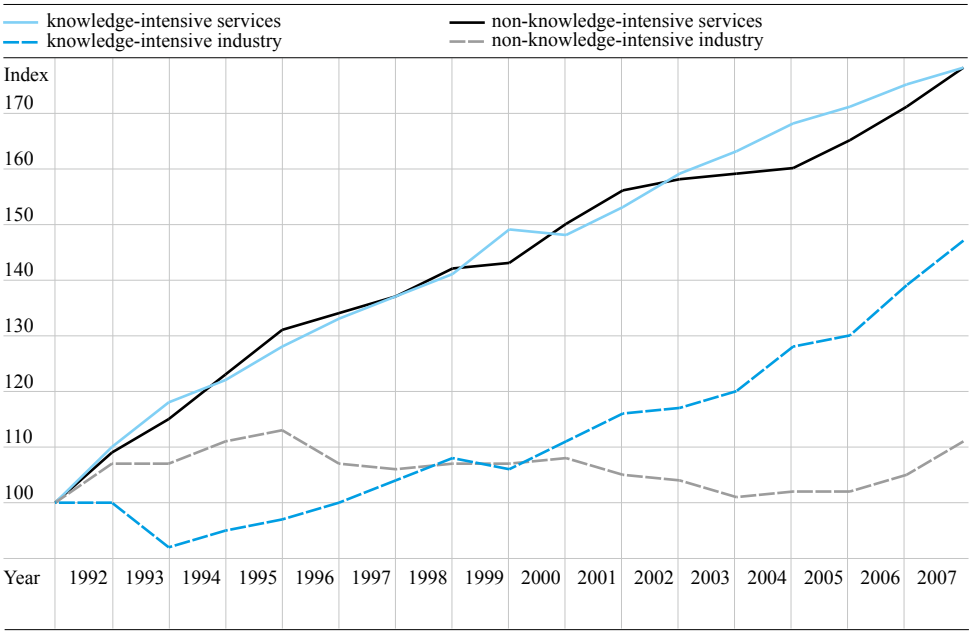
This section draws on the evaluation of data from various sources by the German Institute for Economic Research (DIW) and the Lower Saxony Institute for Economic Research (NIW).[197]

Investigated indicators:

- Development of gross value creation in various manufacturing sectors in Germany
- Employment in manufacturing sectors in Germany
- Share of R&D-intensive industries and knowledge-intensive services in labour input and value creation
- Germany's foreign trade specialisation in R&D-intensive goods
- Development of foreign trade in R&D-intensive goods for selected OECD countries

GROSS VALUE CREATION IN GERMANY'S BUSINESS ECONOMY

C 7 – 1



Index: 1991 = 100.
Source: Federal Statistical Office, Series 18 (1.4.) Calculations by NIW.

Knowledge-intensive industry accounts for 21 percent of gross value created, other industry 16 percent, knowledge-intensive services 37 percent, other services 26 percent.

Continued growth in gross value created in the services

The increasing link between industry und services is leading to a restructuring of the German economy. Since 1991, both knowledge-intensive services and non -knowledge-intensive services have been growing steadily. However, internal R&D activities and the broad application of technologies from the industrial sector have increased the technology dependence of many services.

In contrast, the growth opportunities of the manufacturing sector are limited in the long term. In general, companies in this sector are more dependent on the state of the economy than in the services sector. The effects of this dependence vary between knowledge-intensive and non-knowledge-intensive manufacturing sectors. In the course of the global recession at the start of the 1990s, the knowledge-intensive sectors suffered considerable set-backs, whereas the non-knowledge-intensive sectors (above all consumer goods) profited from the special situation existing after German unification. From 1993 onwards, the development changed. Less knowledge-intensive industrial sectors stagnated or declined, whereas knowledge-intensive sectors experienced a period, in which the growth dynamic almost paralleled that of the services sector. The last two years covered by the data have also been positive for the manufacturing sectors, which are less knowledge-intensive.

C 7 – 2 EMPLOYMENT IN THE BUSINESS SECTOR IN GERMANY

	1998	2002	2005	2008	1998–02	2002–05	2005–08	1998–08
	in 1 000				Changes in percent			
Industry	**10 241**	**9 421**	**8 554**	**8 724**	**–2.1**	**–3.2**	**0.7**	**–1.6**
Knowledge-intensive sectors	3 494	3 510	3 376	3 521	0.1	–1.3	1.4	0.1
Non-knowledge-intensive sectors	6 747	5 910	5 178	5 203	–3.3	–4.3	0.2	–2.6
Service	**12 373**	**13 418**	**13 037**	**13 983**	**2.0**	**–1.0**	**2.4**	**1.2**
Knowledge-intensive sectors	4 955	5 504	5 379	5 556	2.7	–0.8	1.1	1.2
Non-knowledge-intensive sectors	7 418	7 914	7 657	8 427	1.6	–1.1	3.2	1.3
Business sector	**22 614**	**22 839**	**21 590**	**22 707**	**0.2**	**–1.9**	**1.7**	**0.0**
Knowledge-intensive	8 449	9 015	8 755	9 077	1.6	–1.0	1.2	0.7
Non-knowledge-intensive	14 165	13 824	12 835	13 631	–0.6	–2.4	2.0	–0.4

Source: Federal Agenca for Employment. Employment statistics. Calculations and estimates by NIW.

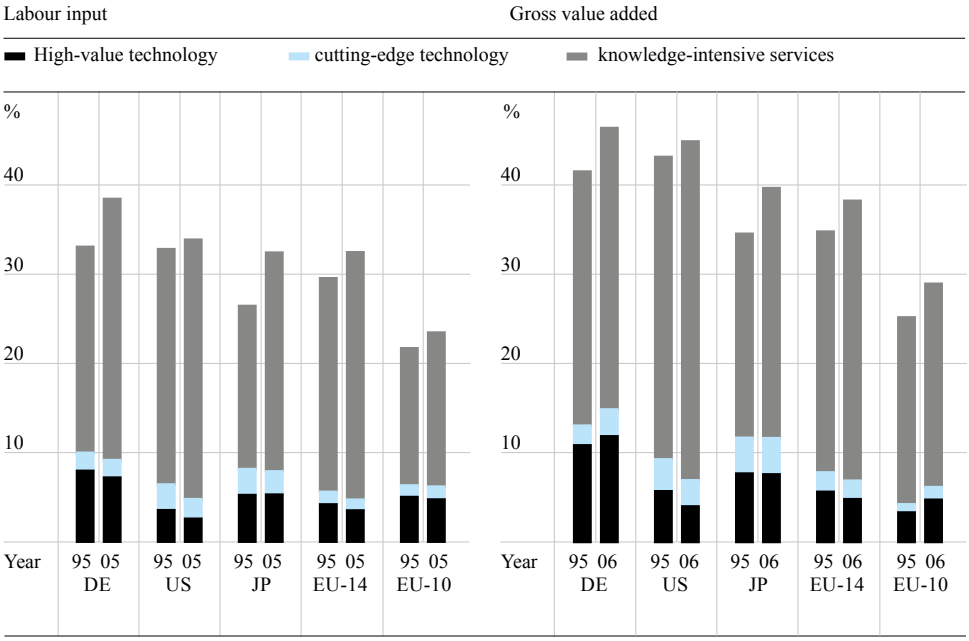
Business sector: excluding agriculture, public administration and services, education, private households, etc.

The trend towards tertiarisation in Germany continues

The growing importance of the tertiary sector is leading increasingly to a redistribution of the labour force. In the period 1998–2008, the average number of employees in the services sector increased by 1.2 percent per annum, compared with a 1.6 percent p.a. drop in the numbers employed in industry. Differentiating between levels of knowledge intensity and comparing changes over time gives a better overview of the development of employment. From 1998 to 2002, employment increased in all knowledge-intensive sectors. This contrasts with a 3.3 percent p.a. decline in the industrial sectors, which are not knowledge-intensive. The unfavourable economic situation in the period 2002–2005 impacted negatively on the business sector as a whole, while the figures for 2005 to 2008 indicate a recovery.[198] However, this has not been enough for the non-knowledge-intensive manufacturing sectors to make up fully for the losses suffered in the previous years. In the services sector, the economic recovery from 2005 to 2008 has led to an improvement in the employment situation compared with 1998. In particular the non-knowledge-intensive services benefited from the improved employment possibilities for lower-skilled personnel in this period. In the knowledge-intensive services, the increasing shortage of skilled personnel has led to a weaker expansion of employment opportunities.

LABOUR INPUT AND VALUE ADDED IN THE R&D-INTENSIVE MANUFACTURING SECTOR AND KNOWLEDGE-INTENSIVE SERVICES

C 7 – 3



The value added for 2006 was estimated using STAN values.
Source: EUKLEMS Database (3/2008). OECD STAN (2008). Calculations and estimates by DIW Berlin.

The labour input is measured in working hours and represents the macroeconomic input of a sector; the nominal value added represents the output.

Germany overtakes the USA for value added in the knowledge-intensive sectors

The comparison of the shares of labour input and value addition in the research-intensive sectors reflects the importance of R&D for employment and economic growth. From 1995 to 2005, labour input in the knowledge-intensive services increased for all the countries and regions compared. This trend reflects the increasing tertiarisation and research-orientation of the economies. At the same time there was a relative drop in the significance of research-intensive manufacturing sector. Only the new EU member countries saw an increase in labour input in cutting-edge technology. On the output side (value added) the knowledge-intensive services generally show more growth. The eastern European countries show a different development trend, and in particular the research-intensive industries have above-average growth rates. In an international comparison, Germany is in a leading position for the overall evaluation of labour input and value added in the R&D-intensive sectors. This is due above all to the large proportion of high-value technology. However, for a further positive macroeconomic development it is important to expand the knowledge-intensive services, because Germany is still not strong enough in this area.

C 7 – 4 GERMAN FOREIGN TRADE SPECIALISATION[199] FOR R&D- INTENSIVE GOODS

Year	DE	US	JP	FR	GB	DK	SE	FI	CH	EU-14
Comparison of export and import structure (RCA)										
1991	24	19	76	10	18	–23	–4	–62	20	–8
1995	25	13	64	8	11	–21	–13	–49	17	–8
2000	15	17	49	9	12	–6	–6	–27	15	–4
2006	11	23	44	12	20	–4	–3	–25	21	0
Relative share of imports in world trade (RMA)										
1991	–9	6	–39	–6	–2	–17	–3	2	–10	–2
1995	–12	7	–30	–7	2	–17	7	6	–8	–2
2000	–4	0	–20	–6	2	–23	3	3	–11	–1
2006	2	–3	–15	–6	–3	–19	–3	2	–8	–2
Relative share of exports in world trade (RXA)										
1991	15	27	38	6	16	–40	–7	–59	11	–2
1995	13	22	34	3	14	–38	3	–42	13	–2
2000	11	19	29	5	15	–29	–1	–23	10	–1
2006	13	21	29	7	17	–23	–7	–22	13	–2

Source: DIW Foreign trade data. Calculations by DIW Berlin.

EU-14 refers to EU-15 without Germany, trading with third countries.

Decline in comparative advantage of Germany in trade with R&D-intensive goods

The values of the RCA indicators confirm the leading position of Japan, the USA, Switzerland, Great Britain, Germany and France in international trade with R&D-intensive goods. For all countries, the comparative advantages of research-intensive goods (RCA-value > 10) are linked to an above-average export specialisation (high RXA-value).

However, the comparative advantage of Germany is steadily declining. This is not due to changes in export specialisation, as is clearly demonstrated by the fairly constant RXA value. Rather, the decline is due to rising imports of R&D-intensive goods from emerging economies in the medium- to low-price sector, which is reflected in the positive value for the RMA indicator in 2006. A similar development can be observed in Japan. In contrast, Finland and Denmark show marked improvement in the net position concerning R&D-intensive goods – rising RCA values. This is primarily due to the increased specialisation in the export of R&D-intensive goods. In the countries with a lower change in the net position regarding specialisation in R&D-intensive goods, such as the USA, France, Great Britain, Sweden and Switzerland, the specialisation in R&D-intensive goods has declined for exports and at the same time also declined (even more) for imports.

NET CONTRIBUTION OF R&D-INTENSIVE GOODS TO FOREIGN TRADE FOR SELECTED OECD COUNTRIES IN PER MILL

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Year	DE	US	JP	FR	GB	DK	SE	FI	CH	EU-14
					R&D-intensive goods					
1991	65.4	52.8	218.2	29.3	48.2	–49.8	–14.9	–140.4	55.0	–17.2
1995	70.8	32.7	196.0	24.4	31.1	–48.0	–38.8	134.0	48.2	–20.6
2000	49.6	46.1	167.0	28.9	35.8	–16.9	–19.4	–86.4	44.0	–11.3
2006	43.5	59.9	151.7	36.4	58.2	–8.5	–12.3	–74.3	65.5	0.0
					Cutting-edge technology					
1991	–16.1	53.6	55.7	1.6	25.1	–15.2	–7.9	–56.3	15.8	–6.1
1995	–21.4	25.7	39.2	7.2	26.6	–7.2	–4.9	–44.6	9.3	–4.4
2000	–30.9	40.5	0.2	10.2	19.5	5.1	14.2	–1.0	8.9	–0.2
2006	–34.4	33.6	–21.9	13.0	50.8	10.0	4.7	–14.7	54.6	4.8
					High-value technology					
1991	81.5	–0.8	162.5	27.7	23.2	–34.7	–7.0	–84.2	39.2	–11.1
1995	92.2	6.9	156.9	17.2	4.5	–40.8	–33.9	–89.4	38.9	–16.2
2000	80.5	5.7	166.8	18.8	16.3	–22.0	–33.6	–85.4	35.1	–11.1
2006	77.9	26.3	173.7	23.4	7.4	–18.5	–17.0	–59.6	10.8	–4.8

Source: DIW Foreign trade data. Calculations by DIW Berlin.

The net contribution to foreign trade comparative advantage (or for negative values the comparative disadvantage) of a country. The net contribution is equal to the contribution to exports minus the contribution to imports (BZX – BZM).[200]

High-value technology remains Germany's export strength

The R&D-intensive goods in Japan make by far the greatest net contribution to the foreign trade balance. Germany, Switzerland, Great Britain, the USA and France also have clear comparative advantages in foreign trade with R&D-intensive goods. However, the German position in the group of six leading nations has worsened considerably since the early 1990s. In 1991, Germany was ahead of the USA, Great Britain and Switzerland, but by 2006 it was trailing someway behind them at the end of group, just ahead of France.

Differentiation according to knowledge intensity shows that Japan and Germany have a clear dominance in high-value technology goods. However, although this technology class represents the traditional strongpoint of the German manufacturing sector, there is a negative trend in the development of the net contribution to foreign trade. For cutting-edge technology, Germany and Japan show comparative disadvantages. In contrast, USA, Switzerland, Great Britain and France have a more or less balanced technology profile with comparative advantages for both cutting-edge technology and high-value technology, although the net contribution of cutting-edge technology goods to foreign trade in Great Britain und Switzerland shows a marked increase at the end of the observation period. Denmark and Sweden also have comparative advantages for cutting-edge technology goods.