

Germany's Position in the International Exchange of Technological Services: Little Cause for Concern

In technological services – as in services in general – Germany has had a current account deficit for quite some time. This is frequently considered to be an indicator of Germany's low capacity in important intermediate inputs.

However, in relation to its total international services transactions, Germany's position in technological services does not indicate any particular weaknesses. Moreover, there has been no deterioration in its position in recent years. In an international comparison, Germany fares better than some of the other industrialised countries, although the United Kingdom and the United States occupy better positions.

In principle, caution is advisable when interpreting available data sets: on the one hand, the exchange of technological services is dominated by multinational companies, making it difficult to draw conclusions about the transfer balance of technological knowledge. On the other hand, the international exchange of technological services is not fully recorded in the more typical data sets: thus, exports of product-related services are, for the most part, contained in data on exports of goods. Moreover, in the course of internationalisation, technological services are increasingly being offered by local branches abroad; up to now, this development has

remained largely excluded from the balance of payments statistics.¹

On balance, the German services account – just like the technological services account (cf. box 1) – has been consistently negative throughout the past decade. In 2003, however, the technological services account improved noticeably over the previous year's, a trend that is evident in every area of technological services (cf. table 1).

The economic interpretation of the deficit in technological services is based almost consistently on the assumption that, in these economically important intermediate inputs, Germany should be in a position to achieve a surplus. The concept of a cover ratio² (receipts as a percentage of expenditures), suggests direct financing of expenditures by receipts. With the international division of labour, however, it is inevitable that individual countries are net importers in certain specific areas. As long as deficits can by and large be balanced out by surpluses in other areas, this is no cause for concern.

In total, the deficits in Germany's technological services are extremely low in relation to its total external trade surpluses: in 2002, this ratio stood at 4.1%, in 2003 at 0.8%. In international competition, technological services contribute to success in markets for manufactured goods. This holds true even if they are imported. Partic-

¹ The findings of this report were compiled within the scope of a research project supported by the Federal Ministry of Education and Research (BMBF) – 'Fit for Service – Internationales Benchmarking der Dienstleistungswirtschaft in Deutschland' (Förderkennzeichen 01 HG 9967/6).

² Cf. for example, Birgit Gehrke and Harald Legler: 'Technologische Dienstleistungen in der Zahlungsbilanz – Deutschlands Position, aktuelle Entwicklung und Interpretation'. NIW, *Studien zum deutschen Innovationssystem*, no. 19-2004. Hanover 2004.

Box 1

Technological services in the balance of payments

In the balance of payments, cross-border payments are attributable to 'technological services' for the following services¹:

- Royalties and licence fees: remuneration (both regular payments for licences and acquisition or transfer payments) for copyright laws, patents, licences, inventions, and processes (technical know-how), as well as for other rights (e.g., franchise fees, rights on sporting events, etc.)²

¹ According to the German Bundesbank's delimitation: 'Technologische Dienstleistungen in der Zahlungsbilanz'. *Statistische Sonderveröffentlichung*, no. 12, Frankfurt/Main, May 2002. The individual items in this selection correspond to the currently applicable Balance of Payments Manual 5 (BPM 5) no. 266, no. 279, no. 263, and no. 280.

- Research and development (R&D): remuneration for research into and development of new products and procedures, and scientific advice (excluding electronic data processing)
- Computer services: remuneration for data processing, production and upkeep of software, basic research and development in the data processing field, including licence payments (including games)
- Architectural, engineering and other technical services: remuneration for engineering and construction services, architectural fees, maintenance and inspection work, technical advice and planning

² Remuneration for film and data processing licences, and for patent lawyers is not included. Cf. also: German Bundesbank: *Statistische Sonderveröffentlichung*, no. 7, Frankfurt/Main, 2001

Table 1

German Cross-border Payments for Technological Services, 1996 and 2000 to 2003

In million euro

		1996	2000	2001	2002	2003
Services, total	Receipts	64 280	90 175	98 526	110 050	108 415
	Expenditures ¹	104 066	149 935	159 393	156 574	153 575
	Balance	-39 786	-59 760	-60 867	-46 524	-45 160
Technological services	Receipts	8 297	14 744	16 234	17 346	19 456
	Expenditures	10 849	19 770	23 496	22 934	20 463
	Balance	-2 551	-5 026	-7 262	-5 588	-1 007
Royalties and licence fees	Receipts	2 596	3 175	3 687	4 021	3 758
	Expenditures	4 522	6 186	6 142	5 481	4 640
	Balance	-1 926	-3 011	-2 455	-1 460	-882
R&D	Receipts	2 576	4 480	3 875	4 369	4 241
	Expenditures	2 739	4 431	5 475	5 723	4 325
	Balance	-163	49	-1 600	-1 354	-84
Architectural, engineering and other technical services	Receipts	1 894	2 974	3 319	3 191	5 650
	Expenditures	2 155	4 190	5 586	5 344	5 090
	Balance	-260	-1 216	-2 267	-2 153	560
Computer services	Receipts	1 231	4 115	5 353	5 765	5 807
	Expenditures	1 433	4 963	6 293	6 386	6 408
	Balance	-202	-848	-940	-621	-601

¹ Including freight and insurance costs of imports.

Source: German Bundesbank, May 2004.

ularly where technological services are concerned, net imports can be interpreted as an indicator of an economy's ability to absorb knowledge and technology. It is also generally recognised that knowledge imports create additional impulses for other knowledge areas (i.e., 'knowledge spillover').

In addition, the development of the deficit in technological services is not in itself alarming. Both receipts for and expenditures on technological services have

approximately doubled in nominal terms between 1996 and 2003. A meaningful measure for interpretation is the balance of technological services as a percentage of half the total receipts and expenditures (payment volume). During the time period studied, this measure has, on the whole, been less strongly negative for technological services than for services as a whole; furthermore, no deterioration has been noted over time. Indeed, in certain specific areas, such as royalties and licence fees, the

Box 2

Revealed comparative advantage (RCA)

The revealed comparative advantage (RCA) is a measure of a country's relative position in a specific product group, *j*, in both exports (*ex*) and imports (*im*). The RCA demonstrates the extent to which a country's export-import ratio for a studied product group, *j*, deviates in total from its export-import ratio. For a country, *i*, this is normally expressed as:

$$RCA = 100 \ln \left[\frac{(ex_j/im_j)}{(Tex/Tim)} \right],$$

where *T* denotes the total across all product groups *j*.

The indicator assumes a positive value when the export-import ratio of a given product group is above-average, or where the share of exports is greater than the share of

imports. A positive sign points to comparative advantages, i.e., to a strong internationally competitive position of the country's examined product group. It is assumed that this sector should be categorised as being particularly competitive since, in relative terms, foreign competitors were not able to gain a foothold domestically to the same extent to which, conversely, domestic producers were able to outside their own country. It is therefore a measure of specialisation.¹

¹ Cf. Dieter Schumacher, et al.: 'Marktergebnisse bei forschungintensiven Waren und wissensintensiven Dienstleistungen: Außenhandel, Produktion und Beschäftigung'. *Research Notes DIW Berlin*, no. 25, Berlin, April 2003.

trend has been positive. By contrast, the development in engineering services was negative until 2002; in 2003, meanwhile, there was a tremendous shift, leading, in fact, to a surplus (cf. figure).

International comparisons

An evaluation of Germany's position in cross-border technological services can be carried out by applying the revealed comparative advantage (RCA) measure (cf. box 2). This measure reflects Germany's patterns of specialisation in technological services with regard to its total services transactions.³ The RCA value for total technological services is consistently positive throughout the period observed; according to this measure, no particular comparative weaknesses in technological services are evident.

On the basis of recent OECD and Eurostat data, which include information for 2002, it is possible to compare the patterns of specialisation of selected countries.⁴ For Germany, given the availability of even more up-to-date national information, 2003 has also been included (cf. table 2). For interpretation, it is important to take into account that, in the selected countries, the patterns of specialisation in technological services are relatively stable.

With regard to royalties and licence fees, Germany demonstrates relative disadvantages in an international comparison, although these have been reduced over time. The positions of France and the United Kingdom were comparable to that of Germany in 2002, while Sweden and the United States demonstrated a pronounced focus on specialisation in this area.

In terms of R&D, Germany enjoyed relative advantages, although these have shrunk during the period studied. The United States, Sweden and, especially, the United Kingdom demonstrated much greater specialisation in this field.

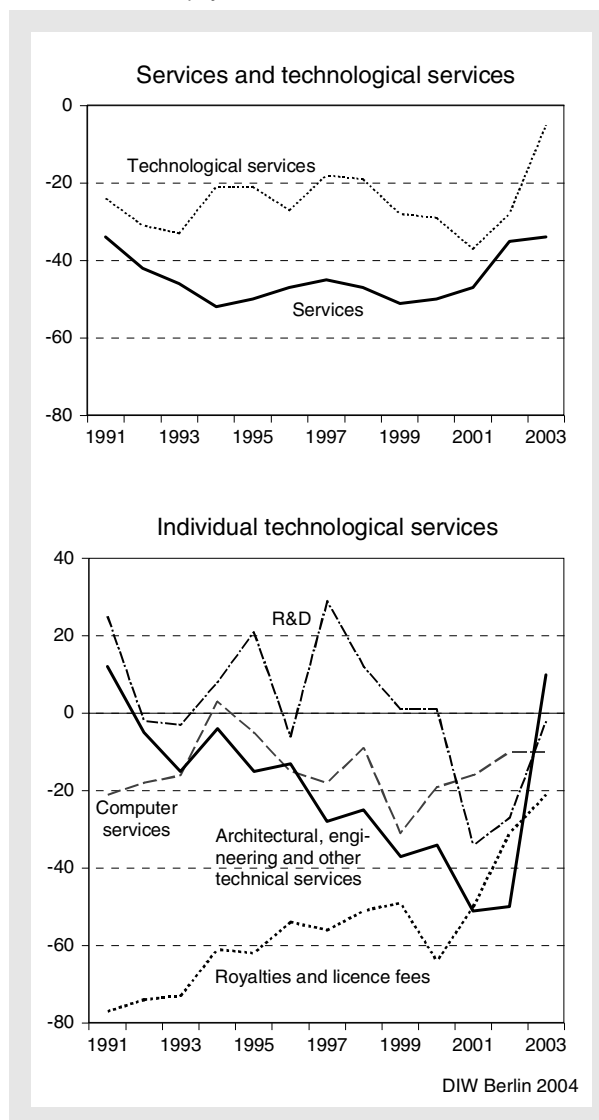
In computer services, Germany's RCA value is positive. In this field, therefore, Germany is faring better than France or Italy. However, the specialisation of Sweden, the United States and the United Kingdom in data processing is much more pronounced than Germany's.

In terms of architectural, engineering and other technical services, Germany recorded a relative disadvantage in 2002, but a relative advantage in 2003; France

³ Using total external trade in goods and services as a reference figure would only highlight the fact that Germany's specialisation is in goods trade.

⁴ For the United States, the data in this statistic permit international comparability only from 2001 onwards.

Figure
Germany's Services Balance, 1991 to 2003
As % of half of the payment volume



Sources: German Bundesbank; DIW Berlin calculations.

and Sweden, in particular, had relative disadvantages, while the United Kingdom and the United States enjoyed pronounced relative strengths.

On the basis of the RCA values, Germany's relative specialisation in technological services for 2002 was generally positive, while for France and Italy, for example, there were relative disadvantages; in the United Kingdom and the United States, meanwhile, the specialisation in this area is markedly stronger than in Germany. For 2003, Germany's RCA values signal very substantial improvement. It remains to be seen whether this development will have an effect on the 2003 international comparison, and whether it will continue.⁵

Table 2
RCA Values of Technological Services in an International Comparison, 2002

	Technological services, total	Of which:			
		Royalties and licence fees	R&D	Architectural, engineering and other technical services	Computer services
USA	65	59	84	158	81
Japan	-	44	-	-	-
European Union	-12	-54	-19	27	40
France ¹	-1	7	16	-17	-8
Italy	-14	-81	84	15	-101
Sweden	0	52	9	-87	65
United Kingdom	59	7	131	108	80
Germany	5	5	7	-20	21
Memo Item: ²					
2002	7	4	8	-16	25
2003	30	14	33	45	25

¹ 2001 values. — ² German Bundesbank data.
Sources: OECD/Eurostat; DIW Berlin calculations.

The significance of multinational companies

Payments for technological services between internationally affiliated companies are based on internal transfer prices and are frequently made on the basis of tax considerations. According to the German Bundesbank, companies' internal financial flows can, 'to a certain extent, be structured freely ...' so that '... conclusions on the state of technological knowledge in Germany compared with that of other countries are possible to only a limited extent.'⁶

Payments for royalties and licence fees

Multinational companies account for more than 90% of recent German payments for royalties and licence fees (cf. table 3). For the most part, payments flow from the subsidiary companies directly involved to their parent

⁵ At the current margin, the balance of payments statistics for technological services have been repeatedly revised by the Bundesbank, at times strongly.

⁶ Deutsche Bundesbank: 'Patent- und Lizenzverkehr sowie anderer Austausch von technischem Wissen mit dem Ausland in den Jahren 1990 und 1991'. In: *Monatsberichte der Deutschen Bundesbank*, April 1992, pp. 33-51.

companies, which generally hold the rights on the company's inventions. The balance of payments between subsidiary companies abroad and their German parent companies has been positive for quite some time. By contrast, as anticipated, the balance of payments between foreign subsidiaries in Germany and their parent companies is negative.

In the exchange of technological services, the United States is Germany's most important partner: most recently, the United States accounted for about one-quarter of Germany's receipts and one-third of its expenditures in this area. Given the good availability of information in the United States, it is possible, based on the example of bilateral German-US relations, to illustrate the influence of multinational companies on the account balance of royalties and licence fees. Compared with Germany, the US surplus from royalties and licence fees has halved since the mid-1990s. This is due primarily to the strong increase in payments within affiliated companies, a result of the expansion of German multinational firms in the United States.

The United States' relative balance vis-à-vis Germany fell from 120% in 1996 to just below 40% in 2002

Table 3
Germany's Cross-border Payments for Patent and Licence Fees, Multinational Companies, 1996 and 2000 to 2002

	Total	Of which: companies with		Other
		subsidiaries abroad	foreign parent companies	
	In million euro	% Share		
Receipts				
1996 ¹	1 888	68.0	26.6	5.4
2000	2 403	58.6	29.0	12.4
2001	2 686	61.6	31.0	7.4
2002	3 086	60.4	34.8	4.8
Expenditures				
1996 ¹	2 771	25.1	64.9	10.0
2000	3 682	24.6	67.1	8.3
2001	3 742	25.7	66.4	7.9
2002	2 842	31.4	59.3	9.4
Balance (in million euro)				
1996 ¹	-883	1 150	-2 535	-343
2000	-1 279	502	-1 773	-8
2001	-1 056	695	-1 653	-98
2002	244	973	-611	-118

¹ Values for 1996 converted: 1 euro = 1.95583 German marks.
Sources: German Bundesbank; DIW Berlin calculations.

(cf. table 4). Similar developments have been observed for France, Japan, the Netherlands, and Sweden; the United Kingdom's position vis-à-vis the United States, meanwhile, has deteriorated. Overall, Germany, albeit still with a negative account balance, has noticeably improved its position vis-à-vis the United States in the payments for royalties and licence fees.⁷

Payments for research and development

The share of payments for R&D between affiliated companies has not been recorded separately in Germany's balance of payments. Indications of their scale exist for the United States, where corresponding data have been published since 2001. In 2002, the share of intrafirm payments for R&D in the USA stood at almost 83% in terms of receipts and at 52% in terms of expenditures.⁸

As a rule, payments for R&D are made to the affiliated company in which the R&D is being carried out, i.e. payments usually flow from parent to subsidiary companies, although in some cases the reverse applies. Receipts and expenditures are concentrated on a few large companies in branches that are very closely inter-linked at an international level, such as in the vehicle construction, electronics, data processing and chemical industries.⁹ Many – especially larger – affiliated companies abroad initially finance their R&D activities themselves, but then sell their findings to the parent company, or to other associated companies. R&D activities in foreign subsidiaries are, therefore, only partly financed by the parent company.¹⁰

Information deficits

There is a certain lack of information of the type that would be required to enable a comprehensive evaluation of the international exchange of technological services in the current account. Thus:

⁷ This is not the case for payments between non-affiliated companies, however.

⁸ Cf. Maria Borgia and Michael Mann: 'Cross-Border Trade in 2002 and Sales through Affiliates in 2001'. In: *Survey of Current Business*, no. 82, October 2003, pp. 58-118.

⁹ Cf. Marian Beise and Heike Belitz: 'Internationalisierung von Forschung und Entwicklung in multinationalen Unternehmen'. DIW Berlin und ZEW materials on the 'Berichterstattung zur technologischen Leistungsfähigkeit Deutschlands 1996'. Berlin, Mannheim, March 1997.

¹⁰ Cf. Heike Belitz: 'Forschung und Entwicklung in multinationalen Unternehmen'. *Studien zum deutschen Innovationssystem*, no. 8-2004. DIW Berlin study carried out for and on behalf of the Federal Ministry of Education and Research. Berlin, January 2004.

Table 4
US Balance for Patent and Licence Fees,
1996 and 2002

As % of half of the payment volume

	1996	2002
All countries	122.2	78.5
European Union	118.6	83.6
France	134.9	50.6
Italy	161.1	160.2
United Kingdom	44.7	99.5
Japan	122.2	23.9
Sweden	136.0	58.6
Germany	119.2	38.6
Of which: payments between affiliated companies		
All countries	127.8	72.2
European Union	124.8	90.3
France	165.0	80.3
Italy	171.4	170.3
United Kingdom	45.8	111.4
Japan	108.1	-37.3
Sweden	–	–
Germany	120.1	19.5

Sources: US Department of Commerce; DIW Berlin calculations.

- Technological services are not exported only as a share of services transactions. These services become part of goods exports in instances in which industrial companies do not invoice for them separately – for example, if vehicle manufacturing companies factor the costs of operations, planning, maintenance or other product-related services¹¹ into their export prices.
- It is not always possible for companies to differentiate affiliated payments by individual types of services. Thus, for example, in the balance of payments, R&D services may be classified as 'management services'.
- Gaps also occur because sales by foreign affiliates are barely recorded in cross-border services transactions. This type of international exchange of services has experienced strong expansion in recent years.

Trade in services via foreign affiliates

Given the significance of multinational companies' branch operations for trade in services, efforts at further development of international statistical conventions are

¹¹ Cf. Frank Stille: 'Product-related services – still growing in importance'. In: *DIW Economic Bulletin*, vol. 40, no. 6, June 2003.

moving in the direction of complementing traditional categories of services transactions with the turnover in services of subsidiary companies abroad.¹²

For the USA, information is available on the turnover of subsidiaries' services in the 'professional, scientific and technical services' sector.¹³ In 2001, German subsidiaries in this field achieved a relatively low turnover (of US \$ 0.4 billion) compared with French or British subsidiaries (cf. table 5).

By contrast, German manufacturing companies top the list in the USA in terms of sales of services, which, for the most part, are presumably technological services. In 2001, they sold services worth US \$ 8.3 billion; this accounted for almost 5% of their total turnover in the United States. Manufacturing companies accounted for one-fifth of German companies' total turnover in services in the United States.

Applying this approach qualifies the trade surplus of US multinational companies in professional, scientific and technical services. In these services, US companies' turnover abroad is almost twice as high as that of foreign competitors in the United States; however, insofar as this is attributed to manufacturing, these companies achieve only one-third of the services turnover abroad that foreign manufacturing firms achieve in the United States.

In the case of Germany, therefore, it is primarily industrial companies that sell technological services in the United States, while in the case of other countries this is done primarily by subsidiaries operating in this sector. For the most part, the subsidiary companies under US majority ownership that sell technological services abroad are also specialised services companies.

Conclusion

The extent of Germany's deficit in technological services is not alarming. Compared with the surpluses achieved in external trade, it is extremely small. With reference to the strongly increased payment volume, its deficit has not increased in recent years.

Germany's specialisation in technological services does not highlight any comparative weaknesses in relation to its total international services transactions. In an international comparison Germany is faring better in this regard than the EU average.

¹² Cf. 'Manual on Statistics of International Trade in Services'. UN et al., New York, 2002.

¹³ Professional, scientific and technical services: Architectural, engineering and related services; Computer systems design and related services; Management, scientific and technical consulting; other (Scientific research and development, ...).

Table 5

Turnover of Technological Services by Subsidiaries, 2001, by Sector of Origin

In billion US dollar

	Foreign subsidiaries ¹ in the USA, by country of origin	US subsidiaries ¹ abroad, by host country
Professional, scientific and technical services sector		
All countries	37.4	66.9
France	14.2	3.5
United Kingdom	7.8	–
Germany	0.4	4.3
Netherlands	1.6	2.2
Japan	1.3	–
Canada	1.7	4.5
Manufacturing Industry		
All countries	30.6	9.8
France	2.3	0.8
United Kingdom	3.7	0.7
Germany	8.3	1.5
Netherlands	–	0.1
Japan	0.4	0.2
Canada	1.0	3.2

¹ In majority ownership.

Source: Borga and Mann, op. cit.

Since payments for R&D, and for royalties and licence fees, are often subject to strategic company factors, the evaluation of comparative strengths and weaknesses in technological services based on such data sets is limited.

Moreover, there are information deficits. In cross-border sales, product-related services – which are important particularly in internationally competitive sectors – are not, for the most part, recorded in the services account but, rather, in the goods account. Information on the turnover of German subsidiaries in the United States shows that particularly companies in manufacturing are also able to market technological services successfully.

On the whole, the German competitive position in technological services seems to be more positive than the information contained in the current services account might suggest.

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