

The German economy in the international division of labour: a look at value added flows

The German economy has continued to open up over the past 20 years in the wake of advancing globalisation. German enterprises have used the opportunities that have been presented by central and east European countries becoming integrated into the European production network and by shifts in growth towards the emerging markets. They staked out the position on these fast-growing markets early on and achieved cost advantages by making greater use of international value chains. This was accompanied by a greater degree of specialisation and a substantial rise in exports and imports, especially in the case of intermediates.

Thanks to new data, it is now possible to present a detailed account of foreign trade in terms of value added. This and a comparison with flows of goods provide additional insights into the structure of foreign trade and its role in the international division of labour. The revenue and expenditure generated in foreign trade of goods and services are increasingly exceeding the volume of cross-border flows of value added. For example, Germany's value added exports amounted to 70% of export revenues on average in 2010 and 2011; in the second half of the 1990s, the figure was almost 80%. The larger share of foreign value added suggests that the success of German exports is increasingly shared with suppliers of inputs and intermediates, including from other European countries. In addition, bilateral trade links in particular are becoming more influenced by supply and demand-driven third-country effects. As a result, the importance of individual countries or groups of countries for the German economy's foreign business is also shifting. The most important export destination of the German economy in terms of value added is the United States, ahead of France – the frontrunner in gross trade.

From a sectoral perspective, it is mainly the manufacturing sector that is very closely involved in international production networks and is therefore a very active participant in intermediate goods trade. At around one-fifth, services make up a relatively small share of German exports. By contrast, services value added, which is often embedded in merchandise trade, now amounts to nearly half of Germany's export revenues. Thus, competition and cost structures in the services sectors are of major importance for the German economy's international competitiveness.

Broadening of global demand and partitioning of value chains

Further advance in the international integration of the German economy

Over the past 20 years, there has been a further advance in the integration of the German economy into the global trade of goods and services. Especially after the reunification boom faded, German enterprises used the surge of globalisation following the fall of the Iron Curtain in the early 1990s and the integration of the emerging markets into the global economy to open up new sales markets and to achieve cost advantages by reorienting supply links and creating international production networks. Moreover, this period saw an increase in the range of foreign-produced products available to German consumers.

Growth prospects improved, but also greater cyclical vulnerabilities

With the marked intensification of foreign trade, the German economy has tended to become more susceptible to external shocks, which is reflected in particular by greater dependence on international cyclical fluctuations. Openness has nevertheless had a positive impact on the long-term growth trend, since an increasing presence in rapidly growing sales markets has made it possible to concentrate more on comparative advantages. This has opened up sales opportunities that were not offered by the domestic markets or by the traditional export regions.

Importance of foreign sales markets for German enterprises

Between 1995 and 2013, the flat path of economic growth meant that real final demand in Germany increased on average by no more than roughly 1% per year. By contrast, Germany's export markets, measured in terms of their real imports, were expanding by about 5% per year. Moreover, sales opportunities in non-euro-area markets were increasing significantly more quickly than they were within the euro area.

Structural changes in the goods and regional profile of foreign trade

The fact that German enterprises sell goods and services abroad amounting to roughly 45% of nominal gross domestic product (GDP), compared with no more than one-quarter in the

second half of the 1990s, is not due solely to the sharp expansion in global demand. What was just as important was the fact that firms succeeded in responding to regional and product-specific shifts in the global growth dynamics. According to calculations by UNCTAD,¹ the weight of the developed economies in global merchandise imports has declined over the past 20 years from seven-tenths to somewhat more than half. The euro area's share has fallen from three-tenths in the second half of the 1990s to one-quarter at the current end. The importance of the United States went down during this period from one-sixth to one-eighth. The emerging markets – principally in Asia – have meanwhile gained strongly in importance. China now accounts for one-tenth of global merchandise imports, compared with one-fortieth 20 years earlier.

Global demand has become markedly broader in terms of its regional distribution. This is shown by measures of concentration which UNCTAD calculates on the basis of the country-specific distribution of global merchandise imports.² Even so, the process of diversification was idiosyncratic for the individual groups of products. The automotive industry, for example, is faced nowadays with a much more variegated global market than it was even 20 years ago. The same applies to food products and mineral fuels. By contrast, there has been no regional broadening of demand for machinery and chemical products in the period under review, while the available figures in fact show a stronger concentration for electrical appliances and equipment.

Regional and product-specific diversification of foreign trade

¹ UNCTAD: United Nations Conference on Trade and Development.

² As a measure of concentration, the Herfindahl-Hirschmann Index is used, which ranges from 0 (equal distribution across all countries) to 1 (concentration on one country). The calculation is performed according to the following formula:

$$H_i = \frac{\sqrt{\sum_{j=1}^n \left(\frac{x_{ij}}{\sum_{j=1}^n x_{ij}} \right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}}$$

where H_i captures the concentration index for the product i , x_{ij} the value of exports of country j and product i and n the number of countries.

Demand on the international goods markets				
Item	1995 to 1999	2000 to 2004	2005 to 2009	2010 to 2013
Share of goods in imports (goods and services)	As a percentage			
World	80.1	80.2	80.5	80.7
<i>of which</i> euro area	79.1	78.4	78.5	78.0
Countries' share of global goods imports ¹				
Developed economies	69.6	69.0	63.4	56.1
<i>of which</i> euro area	30.6	29.5	28.6	24.4
<i>of which</i> Germany	8.3	7.5	7.3	6.6
France	5.4	5.0	4.5	3.8
Italy	3.8	3.7	3.5	2.8
United Kingdom	5.4	5.2	4.4	3.7
USA	16.1	17.6	14.3	12.5
Japan	5.8	5.2	4.6	4.6
Transition economies	1.9	1.8	2.8	3.2
Developing countries	28.5	29.2	33.8	40.7
<i>of which</i> Asia	20.6	21.7	25.6	31.4
<i>of which</i> China	2.6	4.6	6.8	9.7
India	0.7	0.9	1.7	2.5
America	5.5	5.3	5.3	6.0
Africa	2.3	2.1	2.7	3.2
Regional concentration of global goods imports ²	Herfindahl-Hirschmann Index ³			
All goods	0.175	0.184	0.158	0.152
<i>of which</i> Food	0.157	0.153	0.130	0.114
Crude materials (excl food and mineral fuels)	0.174	0.175	0.227	0.319
Mineral fuels	0.201	0.217	0.193	0.172
Chemical products	0.138	0.153	0.146	0.140
Manufactured goods	0.152	0.156	0.136	0.125
Machinery and transport equipment	0.192	0.194	0.163	0.165
<i>of which</i> road vehicles	0.249	0.265	0.195	0.181
industrial machinery and parts	0.142	0.157	0.139	0.138
electrical machinery, apparatus and appliances	0.186	0.179	0.196	0.216

Source: UNCTAD. **1** Composition of groups of countries in accordance with UNCTAD classification. **2** Classification of goods in accordance with Standard International Trade Classification (SITC), Rev. 3. **3** Normalised to range from 0 (equal distribution across all countries) to 1 (concentration on one country).
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German exporters hold their position on global markets ...

Overall, German exporters have well mastered the challenges brought about by the structural shifts in the global goods markets.³ Germany's share of global merchandise trade has shown a moderate decline from 10% to 8% over the past 20 years; after adjustment for exchange-rate and price effects, it has remained constant, however. Applying the relevant concentration measures, the regional diversification of global demand was accompanied by an almost matching regional diversification of German goods exports.

A large number of firm-specific measures were needed to maintain or boost German export-

ers' competitiveness and thus strengthen their position in existing markets or open up new ones. An attractive range of goods is characterised by high-quality and innovative products which also have to be competitively priced. To achieve cost advantages, German enterprises have broadly focused on a greater international division of labour. This is reflected in longer value chains, higher shares of intermediates, relocating production abroad as well as mergers and cooperation agreements with part-

... also by integration into global value chains

³ See also Deutsche Bundesbank, The German economy's current account surplus, Annual Report 2013, particularly p 43 ff.

Sales of German firms in the international goods markets

Item	1995 to 1999	2000 to 2004	2005 to 2009	2010 to 2013
Exports (goods and services)	As a percentage of gross domestic product			
	24.8	32.7	40.7	44.6
Shares of goods in exports (goods and services)	%			
	86.2	85.7	84.9	84.7
Germany's share of the world market ¹				
nominal	9.9	9.5	9.2	8.1
real ²	8.9	9.4	9.3	9.2
Export business	As a percentage of total sales ³			
Manufacturing	28.1	32.4	35.2	36.9
of which Food products and beverages (incl tobacco products)	9.9	11.8	14.4	15.6
Chemical industry	41.2	42.4	41.8	43.9
Metal-working industry	21.7	26.7	30.4	30.0
Electrical engineering	32.9	40.4	41.7	41.4
Manufacture of machinery and equipment	37.6	42.1	46.9	47.9
Manufacture of transport equipment	48.1	53.0	54.8	59.7
Construction	1.4	1.9	2.1	1.7
Wholesale and retail trade	7.6	9.4	11.1	12.2
Transport and storage	24.9	27.3	27.4	24.2
Information and communication ⁴	–	–	6.5	3.8
Business services ⁴	–	–	5.6	4.7
Regional concentration of goods exports (merchandise trade)	Herfindahl-Hirschman Index ⁵			
All goods	0.172	0.171	0.156	0.150

1 Source: International Monetary Fund (IMF) International Financial Statistics (IFS) database up to 2012. 2 To calculate real world market shares, the nominal world market shares are adjusted for exchange-rate and price effects; base year 2005. 3 Data only from 1997 onwards and only up to 2012. Up to 2007 on the basis of the 1993-2003 Commodity Classification; from 2008 onwards on the basis of the 2008 Commodity Classification. 4 Data only from 2008 onwards. 5 Normalised to range from 0 (equal distribution across all countries) to 1 (concentration on one country).

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ners abroad. Furthermore, the increasing complexity of products has led to increased services value added from distribution and customer services.

From an economic perspective, German enterprises responded to the fundamental changes in the conditions of supply and demand brought about by globalisation. The fact that the regions of the globe have become closer economically has led to the relative scarcities of the production factors being configured differently now than they were 20 years ago. Besides the increasing fragmentation of production processes, which was encouraged by lower transport costs as well as easier communication and coordination, other trends have also taken hold. First, global industrial production has become perceptibly more capital-intensive due, in particular, to the rapid accumulation processes in the emerging market economies. Furthermore, there has been an increase in the contribution to global value

added made by highly skilled labour, while medium and low-skilled jobs have become less important over the past 20 years. Corresponding shifts in the advanced economies were the key factor behind this.⁴

For the analysis of foreign trade relationships, all these aspects mean that a comprehensive picture cannot be derived from looking at the flows of goods alone. In relation to bilateral trade, a pure cross-comparison of imports and exports of goods and services can lead to a distorted diagnosis if the input content of the supplied products and the demand effects emanating from non-euro-area countries are not taken into account as well. For that reason, economic research has devoted itself over the past few years to an in-depth analysis of international trade links on the basis of value added

Foreign trade analysis increasingly focusing on international value chains

Changes in scarcities on a global scale

⁴ See also M P Timmer, A A Erumban, B Los, R Stehrer and G J de Vries (2014), Slicing up Global Value Chains, Journal of Economic Perspectives, Vol 28, No 2, pp 99-118.

Global input-output tables

Empirical research into value added trade and global value chains is based largely on global input-output tables, which capture sectoral sourcing relationships at the global level. Global input-output tables are constructed by linking harmonised national input-output tables with disaggregated bilateral trade data. Specifically, flows of goods between countries are assigned to the corresponding economic sectors and broken down into intermediates and final goods in line with their end use. Several assumptions have to be made in this process. For example, it is assumed that, within a given sector, imports of intermediates are distributed across the various sectors in proportion to national input shares. In addition, the bilateral export and import data produced by the statistical offices of various countries often differ from each other¹ and have to be reconciled for the preparation of global input-output tables.

The WIOD² global input-output tables, which are readily available to the public, serve as a new, analytically meaningful and versatile database for studying international relationships between production and demand and the associated foreign trade. Among other things, they allow a detailed quantification of value added trade along various dimensions, which used to be possible to a limited extent only in case studies. By linking global input-output tables with sectoral employment statistics and capital stock data, it is possible, for example, to estimate the effects of structural changes in international trade on capital intensity and demand for labour by level of education.³ With the help of global input-output tables, it is now also possible for the first time to analyse the effects of cross-border production links on the price competitiveness of

individual economies at a theoretical and empirical level.⁴

Looking to the future, the task remains to make global input-output tables for current years available to researchers and political decision-makers as quickly as possible and to further improve the quality of data. The assumptions necessary for the preparation of global input-output tables give rise to differences with regard to bilateral gross trade flows, for example, between the official national statistics and the corresponding data from the OECD or WIOD global input-output tables. Despite these statistical uncertainties, the results presented in this report can, however, be regarded as relatively robust in terms of the underlying trends they reveal.

¹ According to the IMF's WEO database, this resulted in a statistical trade surplus across all countries of just under 1% of global GDP in 2013.

² WIOD stands for World Input-Output Database.

³ See M P Timmer, A A Erumban, B Los, R Stehrer and G J de Vries (2014), Slicing up Global Value Chains, *Journal of Economic Perspectives*, Vol 28, No 2, pp 99-118.

⁴ See R Bems and R C Johnson (2012), Value-Added Exchange Rates, NBER Working Paper, No 18498.

flows.⁵ With regard to the euro area, the background to this was, not least, the question of why some economies were able to handle the competitive pressure stemming from globalisation better than others. It proved to be an advantage for such studies that global input-output tables have become available recently. One source is the statistical basis created as part of an OECD-WTO initiative. Another source is the data compiled by the WIOD⁶ project, which was funded by the European Commission. The latter were used for the analyses described below.

Flows of goods versus exchange of value added

Analysis of cross-border trade in goods and services

The foreign trade statistics relate to the export and import of goods. Below, cross-border trade in goods is considered in the same way as in the national accounts, ie including trade in services.⁷ This broader definition captures the flows of income and expenditure associated with exports of goods and services. In this context, it is irrelevant whether the goods are produced entirely or only partly in the country of origin.

International division of labour leads to goods flows deviating from the exchange of value added

The cross-country breakdown of production stages leads to international trade in intermediate goods. This means that direct trade flows between two countries allow only very limited conclusions to be drawn as to where abroad and to what degree domestic value added is ultimately absorbed. A country's gross exports do not exclusively contain domestic value added insofar as imported inputs are incorporated into the exported final and intermediate goods. Conversely, the domestic value added contained in exported inputs is not necessarily absorbed by the importing country in final demand. In this connection, double counting may occur in the foreign trade statistics.⁸

Cross-border flows of value added can be represented in either of two ways. Value added exports measure the part of domestic value

added absorbed in final demand abroad. In other words, it is that part of domestic GDP which originates from consumption and investment decisions abroad. By contrast, the value added content of exports comprises the domestic value added contained therein, irrespective of whether it is included in domestic final demand or crosses another border – possibly even into its country of origin – in the form of inputs or final goods. In the aggregate (ie for all trading partners combined) the two concepts differ only in terms of reimports of domestic value added, which are typically on a relatively small scale.

Value added exports versus value added content of exports

Of greater significance quantitatively is the distinction between value added exports and the value added content of exports in the context of studies of bilateral trade relationships. The regional profile of value added exports can be interpreted as the country-specific distribution of the GDP effects of foreign trade in accordance with its final use in the form of consumption and investment. By contrast, comparing the value added content of bilateral gross trade flows provides indications of the actual flows of the value added contained in goods from their creation to their final absorption. From this, it is possible to derive close relationships with the relative position of economies in international value chains by comparing the number of upstream production stages with the number of downstream production stages up

Differences mainly in bilateral trading relationships

⁵ See, for example, the publications produced by the ESCB Competitiveness Research Network (CompNet (www.ecb.europa.eu/home/html/researcher_compnet.en.html)).

⁶ WIOD stands for World Input-Output Database. Data can be downloaded from www.wiod.org.

⁷ When interpreting the analyses based on WIOD data, it should be noted that both the cif/fob adjustment and the consumer spending of residents in the rest of the world and the consumer spending of non-residents at home are not available in a breakdown by trading partners. The present analyses therefore relate to the definition of trade in goods and services excluding travel and international transport margins.

⁸ See R Koopman, Z Wang and S Wei (2014), Tracing value added and Double Counting in Gross Exports, *American Economic Review* 104, 2, pp 459-495. Double counting occurs, for example, if a car engine is exported for further processing and then reimported and recorded a second time as part of the finished motor vehicle in the export earnings of the country of origin.

Decomposition of bilateral gross trade balances into direct value added flows and third-country effects

Surpluses and deficits in the cross-border trade of goods and services are often regarded as evidence of high or low competitiveness. However, conclusions of this kind are inadequate, particularly when looking at relationships between countries or groups of countries, as bilateral gross trade balances and value added balances can sometimes deviate considerably from each other in the context of highly developed international production networks. Indeed, direct flows of value added between two trading partners are not the only factor relevant to bilateral foreign trade statistics, as third-country effects on the supply and demand side also play an important role.

The gross trade balance between two countries can be broken down according to the country of origin and country of end use of the value added. Overall, four components can be distinguished: the net value added of the two trading partners absorbed by final demand in one of the two trading partners (IW^i) or in third countries (IW^a), and the net value added from third countries absorbed in final demand in one of the two trading partners (AW^i) or in third coun-

tries (AW^a). IW^i is largely the same as the bilateral value added balance, though not wholly identical to it. This is because double counting terms and re-imports are included in IW^i but not in the value added balance, and also because value added flows that affect the value added balance can also be contained in the bilateral gross trade balances of both trading partners with third countries.¹ As a result of global value chains, demand in third countries therefore has a direct impact on the bilateral gross trade balances of other countries, as represented by the components IW^a and AW^a . For example, demand in Spain can lead to an increase in Germany's trade surplus with France if intermediate goods from Germany are imported by France and then processed there to satisfy final demand in Spain.

¹ For example, in many cases the USA imports German value added via third countries, meaning that this part of the German value added balance with the USA does not appear in the bilateral flows of goods between these two countries. See A J Nagengast and R Stehrer (2014), Collateral imbalances in intra-European trade? Accounting for the differences between gross and value added trade balances, Deutsche Bundesbank Discussion Paper, No 14/2014.

Decomposition of Germany's bilateral gross trade balances by country

As a percentage of the respective gross trade balance

Item	Value added	Final demand	Trading partners						
			Euro-area countries	of which			Non-euro-area countries	of which	
				France	Italy	Spain		USA	United Kingdom
IW^i	Trading partners	Trading partners	125	63	75	71	95	83	81
IW^a	Trading partners	Third countries	- 7	7	- 15	- 2	- 15	- 23	- 42
AW^i	Third countries	Trading partners	- 6	25	40	29	20	41	61
AW^a	Third countries	Third countries	- 12	5	0	2	0	- 1	- 1
For information purposes: value added balance			135	77	92	90	93	108	91

Source: Bundesbank calculations based on WIOD data (www.wiod.org). Trade in goods and services excluding travel and international transport margins. Gross trade balances decomposed in accordance with the methodology of Nagengast und Stehrer (2014).

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Third-country effects in Germany's gross trade balances with euro-area countries and non-euro-area countries

As a percentage of the respective gross trade balance

Item	Gross trade balance with euro-area countries		Gross trade balance with non-euro-area countries	
	by origin of value added (AW ² +AW ¹)	by country of final demand (IW ² +AW ²)	by origin of value added (AW ² +AW ¹)	by country of final demand (IW ² +AW ²)
Euro-area countries	–	–	20	– 15
France	–	–	4	– 4
Italy	–	–	3	– 3
Netherlands	–	–	4	– 2
Austria	–	–	3	– 3
Non-euro-area countries	– 18	– 19	–	–
United Kingdom	– 7	2	–	–
Central and eastern European EU countries ¹	7	– 3	–	–
USA	– 6	– 4	–	–
China	3	– 7	–	–

Source: Bundesbank calculations based on WIOD data (www.wiod.org). Trade in goods and services excluding travel and international transport margins. Gross trade balances decomposed in accordance with the methodology of Nagengast und Stehrer (2014). ¹ Bulgaria, Czech Republic, Hungary, Lithuania, Poland and Romania.

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Results for Germany

The effects of the increasing international division of labour are clearly evident in Germany's bilateral gross trade balances. For example, Germany's gross trade balances with France, Italy and Spain all overstate Germany's actual value added surplus. In all three cases this is primarily due to the fact that German goods contain a large proportion of foreign value added.

The German gross trade balance with most of the smaller euro-area countries is also higher than its value added balance. Despite this, Germany's overall value added surplus vis-à-vis all euro-area partner countries exceeds its corresponding gross trade balance with these countries. The main reason for this is the existence of value added deficits with the Netherlands and Ireland that are significantly lower than the corresponding negative gross trade balances with these two countries. Notwithstanding statistical uncertainties in the WIOD² input-output tables, it is possible that third-country demand effects resulting from the seaport in Rotterdam and the decisions of

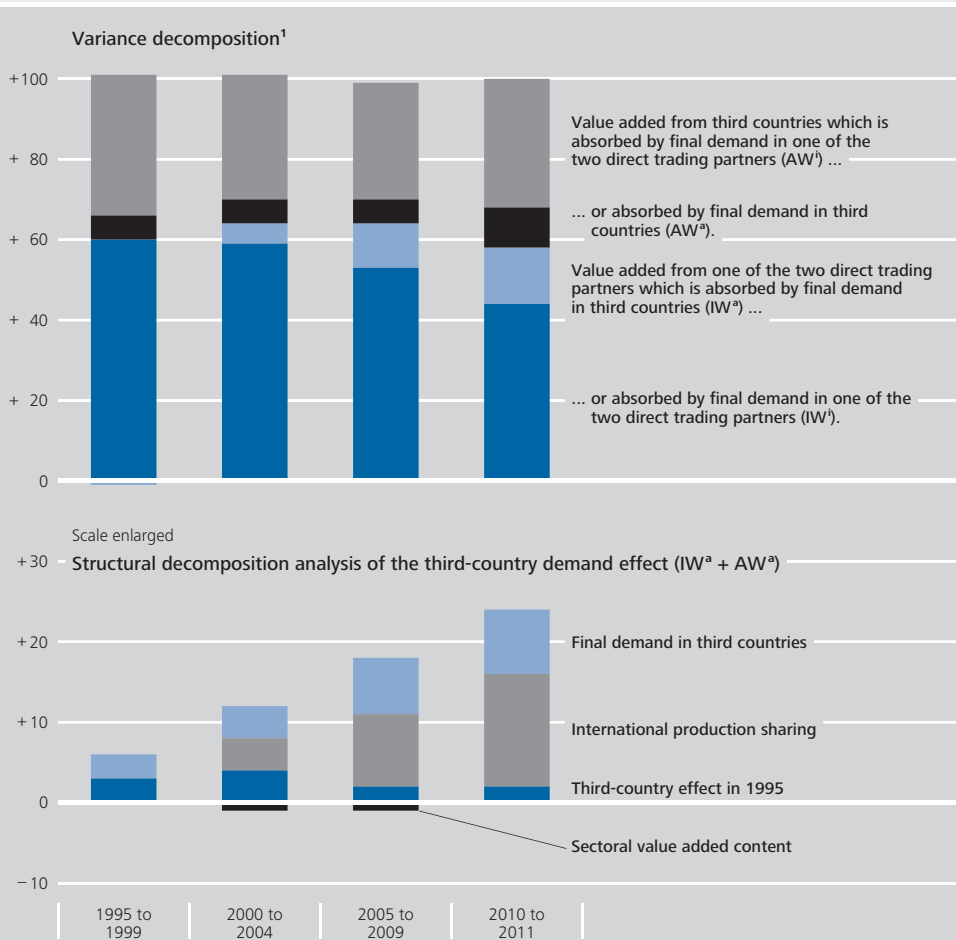
international groups on where to base their headquarters (especially in the pharmaceuticals industry) play a role here, pushing the German gross trade deficits with both countries significantly higher than the corresponding value added balances.

In light of the decomposition of gross trade balances to show foreign value added and third-country demand effects, the fact that the value added balance with euro-area partner countries exceeds the corresponding gross trade balance is attributable to two factors. First, euro-area countries do not import German value added solely in the form of direct imports, but also via third countries. Second, Germany imports inputs from the euro area in order to satisfy final demand in non-euro-area countries, therefore reducing the amount of value added from euro-area partner countries absorbed in Germany and thus captured in the value added balance. Demand in China, the USA and EU countries in central and eastern Europe is most important in this context.

² WIOD stands for World Input-Output Database.

Decomposition of bilateral gross trade balances between EU countries

As a percentage of the total variance



Source: Bundesbank calculations based on WIOD data. Goods and services excluding travel and international transport margins. ¹ Variance of bilateral gross trade balances between all EU countries excluding Croatia, ie. $27^2 - 27 = 702$ bilateral balances or 351 country pairs.

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Germany's value added balance with countries outside the euro area is lower than its corresponding gross trade surplus with these countries. This is because the differences between Germany's gross trade balance and value added balance cancel each other out in the breakdown by euro-area countries and non-euro-area countries owing to consistency requirements. The decomposition of the gross trade figures shows that Germany exports a significant volume of value added from euro-area countries to third countries – above all from the Netherlands, France and Italy. This is partially offset by some domestic value

added embedded in German exports to third countries being absorbed in the euro area – especially in France, Italy and Austria – though the first effect outweighs the second.

Germany's value added balance with the USA surpasses its corresponding gross trade surplus and is therefore something of an exception. This is attributable to the fact that German value added embedded in aircraft or motor vehicles, for example, is often exported from Germany to the USA via other countries as opposed to directly. The German value added balance with the

United Kingdom, on the other hand, is lower than the bilateral gross trade balance, as indeed it is with most countries. Value added from third countries increases the German gross trade surplus with both the USA and the UK. The third-country demand effect, however, has a negative sign in both cases. This means that Germany has become particularly specialised in downstream production steps for inputs traded with the USA and the UK destined for end use in third countries.

International tendencies

The analysis of a larger selection of countries facilitates an estimate of the average quantitative significance for international gross trade imbalances of the individual components of bilateral gross trade balances. A variance decomposition of all bilateral gross trade balances between EU countries shows that value added balances are deviating more and more from bilateral flows of goods. The proportion of value added from the direct trading partner absorbed in final demand in one of the two trading partners (IW^i) fell from an average of 60% for the years 1995-99 to an average of 44% for the years 2010-11. The next largest component, with an average of 32%, was foreign value added absorbed by one of the two trading partners (AW^i). The relative size of this component changed only marginally in the period under review. By contrast, strong dynamism can be seen, above all, in the growing significance of demand in third countries ($IW^a + AW^a$), whose share of value added absorption increased from 5% (1995-99) to 24% (2010-11). Of this, an average of 19 percentage points were attributable to demand in countries outside of the EU in 2010 and 2011. This means that, as a result of demand in non-EU countries, bilateral gross trade balances between EU countries are

usually slightly higher than corresponding value added balances.

The growing significance of third-country demand effects could in principle be attributed to changes in final demand in third countries, the increasing division of labour within international production networks and the value added share of individual sectors. A structural decomposition analysis indicates that changes in the level and structure of final demand accounted for just over one-third of this growth. The greatest contribution to the rise in the third-country demand effect, accounting for 14 percentage points of the change, was due to the increased fragmentation of production within the EU. A good example of this development is the increasingly close reciprocal trade relations between Germany and the EU member states in central and eastern Europe. The proportion of value added in German exports that is attributable to this group of countries increased markedly (1995: 1½%, 2008: 2%), as did the proportion of German value added embedded in exports from these countries (1995: 4½%; 2008: 6½%). The increase in intra-European trade imbalances over the last decade is therefore not attributable solely to higher demand in Europe for European products, but also to growth momentum in third countries and the market-driven intensification of international production links.

to final demand.⁹ Effective tariff quotas in international value chains can be quantified by taking into account the fact that tariffs are charged on the nominal value of goods and that value added can be tariffed repeatedly as a result of borders being crossed multiple times (tariff magnification effect).¹⁰

Gross trade balances versus value added balances

In terms of assessing the relative attractiveness of production that is due to the primary factors of production, value added balances are better suited to comparing individual countries or groups of countries with each other than are gross trade balances, which contain a non-negligible percentage of foreign value added. In the same way as value added exports, value added balances are defined by the origin of value added and its absorption in final demand abroad. A comparison of the value added traded between two countries can differ considerably from the income-expenditure balance in cross-border trade (see box on pages 33 to 36). Nevertheless, in the aggregate across all trading partners, the value added balance is identical with the gross trade balance. This is due to the fact that imported inputs which are used to produce export goods appear on both the import and export side and therefore cancel each other out on balance.

Value added analysis of Germany's foreign business

Exports with declining share of domestic value added

Germany's value added exports accounted for an average of seven-tenths of export revenues in 2010 and 2011; in the second half of the 1990s, this figure had stood at almost four-fifths (78%). The decline shows that purchases of foreign intermediates have clearly become more important for the domestic production of goods and services. The increasing integration of the German economy into the international division of labour does mean that, at present, only around 70 cents of every euro of revenue earned through foreign business is generated as domestic income, compared with 78 cents just under 20 years ago. At the same time,

however, the current volume of exports would not be possible without the intensive use of imported intermediates.

Taking the average of the years 2010 and 2011, the value added content of gross exports, at 73%, was slightly higher than the corresponding ratio for value added exports. Reimported value added for goods intended for end use in Germany (2 percentage points) or for goods that were reexported again (1 percentage point) – referred to in the literature as double counting – was also reflected here. The remaining 27% was accounted for by foreign value added, which is embedded in goods that are produced domestically for export. Just under one-third of this amount was attributable to euro-area countries. The sound performance of German exporters therefore also benefited countries with upstream production stages in international value chains; in purely mathematical terms, GDP in these countries went up by an average of 20 cents for every euro of revenue earned by German exporters.¹¹ By the same token, Germany also benefited from the demand for foreign products, as German enterprises sometimes act as intermediaries in international value chains. Just under one-quarter of Germany's value added exports were not absorbed by Germany's direct trading partners, but crossed at least one other international border before reaching the final consumer.

Economies benefiting from positive export performance of their trading partners

The decline in the domestic value added content of exports is a global phenomenon that reflects how economies have become specialised in specific production stages, especially in those that are consistent with their domestic

Intensification of cross-border division of labour reduces domestic value added content

⁹ See P Antras, D Chor, T Fally and R Hillberry (2012), Measuring the Upstreamness of Production, American Economic Review, Vol 102, No 3, pp 412-416.

¹⁰ See OECD (2013), Interconnected Economies: Benefiting from Global Value Chains, OECD Publishing.

¹¹ Although foreign value added on an average of the years 2010 and 2011 made up 27% of German export revenue, the relevant share accounted for by foreign GDP amounted to just 20% owing to the occurrence of double counting in exports of intermediates. See R Koopman et al (2014), op cit.

Decomposition of German goods and services exports*

As a percentage of gross exports

Item	1995 to 1999	2000 to 2004	2005 to 2009	2010 to 2011
Domestic value added	82	78	74	73
Value added exports ¹	78	75	71	70
absorbed in final demand of the direct trading partner	63	59	54	54
exported as final goods	34	32	29	28
exported as intermediates	30	26	25	26
exported by the direct trading partner for absorption in third countries	15	16	17	16
reimported by Germany	3	3	3	3
for absorption in Germany	3	2	2	2
Foreign value added	18	22	26	27
in final goods	8	10	11	11
in intermediates	6	7	8	9
Double counting terms	4	5	7	7

* Excluding travel and international transport margins. Bundesbank calculations based on WIOD data (www.wiod.org). Decomposition of exports in accordance with the methodology of Koopman, Wang and Wei (2014). ¹ Domestic value added absorbed in final demand abroad, excluding double counting terms. Subdivision of value added exports in accordance with the methodology of Nagengast and Stehrer (2014).

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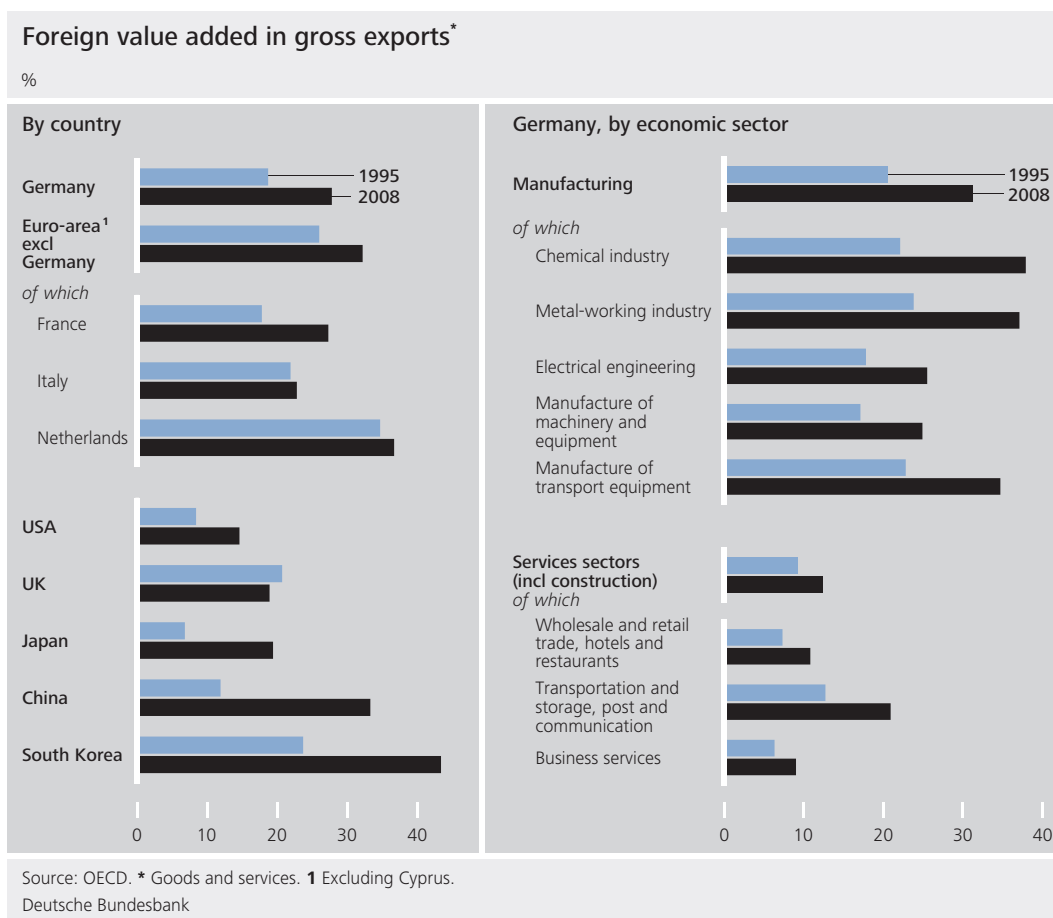
factor endowments and their own comparative advantages. In the euro area (excluding Germany), the domestic share of value added fell from an already low level in 1995 by a further 6 percentage points to 68% in 2008, reflecting the close division of labour in the European production network. In Asia, the internationalisation process has been particularly dynamic over the past decade. Between 1995 and 2008, for example, the share of foreign value added in Chinese exports rose by more than 20 percentage points to one-third. More than 1 percentage point of this was accounted for by the increase in German value added. This underscores the growing importance of China as a production location for German enterprises, with high-quality intermediates often being imported from Germany by their subsidiaries based there.¹² Compared with other advanced economies, the interconnectedness of the German economy is relatively pronounced. The USA, Japan and the UK, for example, posted a significantly lower foreign share of value added in gross exports in 2008 than Germany.

the high value added content of imported intermediates in exports, the national value added share of the flow of goods, especially between trading partners that are located close to one another, tends to be lower. On the whole, this results in shifts in the weights of Germany's trading partners if the respective value added flows are considered instead of the revenues generated from goods and services. In terms of value added, the euro-area countries are becoming much less important both on the export and the import side. By contrast, the USA is overtaking France as Germany's most important trading partner. Furthermore, both Japan and China are gaining slightly in importance in terms of value added. In principle, preference should be given to value added-based trade weights when assessing the consequences of real economic shocks abroad on the German economy, as these trade weights better reflect the final demand for German economic output.

Shifts in the weights of Germany's trading partners

A bilateral assessment of German foreign trade shows that geographical distance has a clear influence on the intensity of international value chains, as trade in intermediate goods with neighbouring countries is particularly attractive owing to the low transport costs. Because of

¹² See Deutsche Bundesbank, Reasons for the recent slump in German goods exports to China, Monthly Report, November 2013, pp 47-49.



Sectoral and product-specific export trends

Direct exports of services without gain in importance

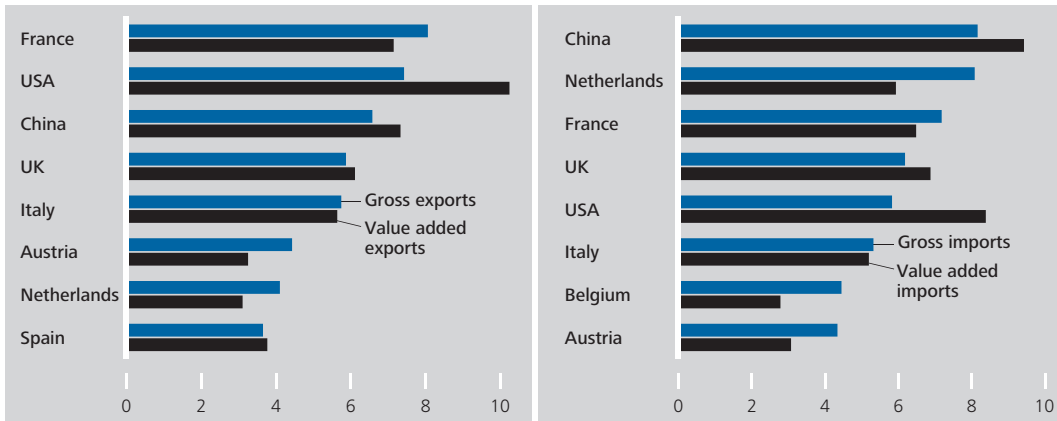
The globalisation tendencies in the real economy have both a demand-side component resulting from the offshoring of goods and a supply-side component resulting from the fragmentation of value chains. Whereas growth in the cross-border trade in goods is driven by both components, the increase in the international exchange of services is primarily the result of the partitioning of production processes. The weight of services in the global trade of goods has remained unchanged at one-fifth over the past 20 years. Even among the advanced economies, such as the euro area, the share of cross-border service flows has increased only marginally on a *pro rata* basis. It is therefore not surprising that there have been no notable shifts between merchandise and services trade in the German economy's goods exports since the mid-1990s.

In the German export business, 85% of revenue – and thus distinctly more than on an international average – is accounted for by merchandise exports. This is due largely to the solid industrial basis of the German economy and the manufacturers' strength on global markets. Well over one-third of revenue in Germany's manufacturing sector is accounted for by foreign business. Within the manufacturing sector, transport equipment is the most significant subsector, accounting for a share of three-fifths. This is followed by machinery and equipment, the chemical industry and electrical engineering, all of which account for shares of between 40% and 50%. Outside of the industrial sector, only the transport sector with a one-quarter share and the wholesale and retail sector with a one-eighth share account for double-digit export figures. In the other economic sectors, by contrast, cross-border sales relationships play only a minor role. With the exception of construction and energy, which are still focused on the domestic markets, these

Foreign business in the manufacturing sector of major importance

Partner shares in German gross and value added trade

As a percentage of the total amount



Source: Bundesbank calculations based on WIOD data. Goods and services excluding travel and international transport margins. Average of the years 2008 to 2011.

Deutsche Bundesbank

are the services sectors whose activities are either not tradable at all or in some cases can only be offered to a limited extent on a direct cross-border basis owing, among other reasons, to language barriers and country-specific requirements.

Services value added often embedded in goods exports

By contrast, the share of services value added contained in goods exports has become more significant. Taking the average for the economy as a whole, this share stood at 45% in 2008 and was thus up by 6 percentage points on 1995. In the manufacturing sector, the equivalent share amounted to 35%, compared with 29%, and in the manufacture of transport equipment it even almost reached 40%, compared with 27% in 1995. Similar trends can also be observed in most other advanced economies. The growing share of services value added in exports implies that the quality of domestic services and the costs involved in providing them are becoming increasingly important as components of the international competitiveness of economies.

Structure of international value chains an important factor

Furthermore, the analysis of the value added content of gross trade shows that the share of foreign value added in manufacturing sector exports has now reached more than one-third in some cases. This share has risen sharply since 1995, especially in the chemical and metal-

working industries as well as in the manufacture of transport equipment. In 2008, more than half of the imported intermediates in the manufacturing sector were exported again for end use abroad.

Looking at the contributions of the primary factors of production in global value chains, a comparatively strong intensification of capital for the German industry becomes apparent for the period from 1995 to 2008, which, in some cases, is significantly greater than the level observed in other advanced economies. This refers to the share of industrial value added, which can be attributed in mathematical terms to productive assets installed in Germany – irrespective of the production stage and thus the sectoral affiliation. Furthermore, the contribution of capital as a factor of production in the foreign share of value added is also likely to have risen with regard to a large number of German industrial products. In the case of products of German car manufacturers, the build-up of production capacities outside of Germany is in fact the most expansive item. It is clear that foreign investment plays an important role in creating competitive products and in consolidating their international competitiveness. Although the contribution of highly skilled labour in the value chains of German industry has increased, the momentum in Ger-

Value chains of German industry characterised by capital deepening and growing importance of highly skilled labour

many has remained subdued, especially in comparison with the other large European countries, but also compared with the USA and Canada.¹³

Conclusion

Bilateral trade flows should also be analysed in terms of their value added content

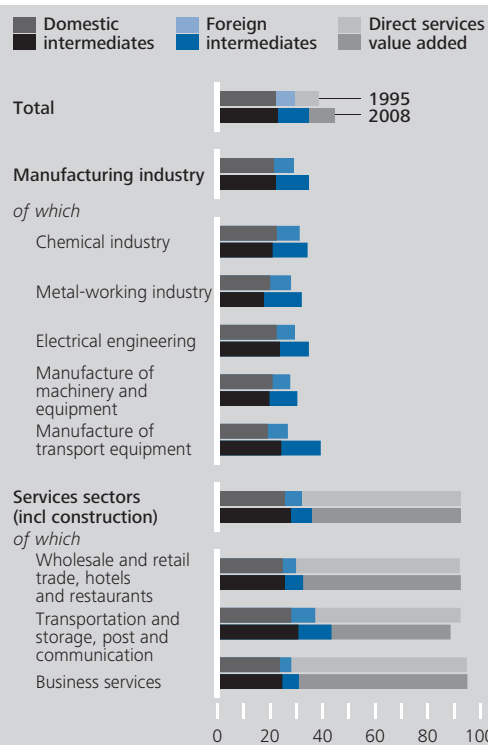
Analysis of foreign trade flows has gained in importance from an economic policy perspective owing to the assessment of the current account balance within the context of the Macroeconomic Imbalance Procedure. Imbalanced positions in cross-border trade are being discussed from the perspective of international competitiveness. In this connection, however, it is often more appropriate from a conceptual point of view to analyse the value added flows rather than the export and import revenues. Looking at the aggregate across all trading partners, the two concepts yield identical results. The greater the level of disaggregation at the country level, however, the greater the differences may become. This is due to the supply and demand-side influences brought about by trade links with third countries. A glance at the breakdown of Germany's foreign business with euro-area countries and non-euro-area countries shows that the gross trade and value added balances do not differ considerably from one another. Particularly, the trends that they exhibit are largely consistent. Thus, Germany's value added surplus vis-à-vis its euro-area partner countries, just like its gross trade balance, is likely to have declined substantially since 2007, whereas the surplus vis-à-vis its non-euro-area partner countries has increased significantly over the past few years.¹⁴

Bilateral foreign trade imbalances are nothing unusual

In cross-border trade with goods and services, imbalances between individual countries or regions are nothing out of the ordinary. Generally, they reflect the global demand trends against the backdrop of the international division of labour, which is geared towards the relative advantages of the economies integrated in the global economy. Thus, surpluses are to be interpreted as the result of a firmly

Services value added in German exports*

As a percentage of gross exports



Source: OECD. * Goods and services.
 Deutsche Bundesbank

established market position and favourable framework conditions. Rapid change is a characteristic feature of globalised economic relations. This in itself facilitates the correction of imbalanced trading positions, provided that the economies which have fallen behind step up their adjustment efforts and the endogenous market forces can unfold their stabilising effect.

Foreign demand is of crucial importance for growth and prosperity for the German economy, the supply and demand-side potential of which is being increasingly affected by demographic factors. The export success over the past few years is an indication that German enterprises have, on the whole, undertaken the right strategic measures to enable them to hold their own on the global markets. The procurement of imported intermediates as well as the

Germany is transmitting international demand impulses to Europe

¹³ See M P Trimmer et al (2014) op cit.

¹⁴ See Deutsche Bundesbank, The German balance of payments in 2013, Monthly Report, March 2014, pp 35-49.

outsourcing of production stages and cooperation agreements with foreign partner companies are playing an important role in this respect. Especially within Europe, a number of closely integrated production networks and

interconnected value chains have emerged. For this reason, the German economy also has an important function to perform in transmitting international economic impulses to its European neighbours.