

Germany's close integration into global trade and value chains

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The changes in the external environment resulting from the trade conflicts centred on the US since 2017, the coronavirus crisis of 2020 and the war in Ukraine of 2022 have shown the need to take stock of Germany's trade and value chain links. Reflecting its strong position in foreign trade, Germany is also closely integrated into global value chains. Its forward integration – the domestic value added contained in exports of other countries – that is nearly as extensive as its backward integration, in which Germany draws on value added by other countries for its own exports. Furthermore, complex value chains play a relatively large role for Germany, even if simple value chains are generally more important. That is probably a reason that Germany is the regional hub for value chains in Europe.

Between the global financial and economic crisis of 2008/2009 and the coronavirus crisis, net exports on average contributed 0.2 percentage points to Germany's economic growth, much less than in the years between German unification and the global financial and economic crisis (0.5 percentage points). Nevertheless, foreign trade continues to play a major role for the German economy. This is illustrated by its high export dependency of around 28% for employment and 31% for gross value added.¹

The creation of global value chains in the past decades has moved exports and imports of value added into the spotlight. That is because the manufacture of a product now involves labour and capital from various countries. Global value chains are now responsible for a considerable portion of global trade. In the following, we will therefore take a closer look at Germany's position among the individual countries of the G20² as a comparison group with regard to export activity and integration into global value chains.

On balance, it is evident that Germany

- stands out from the individual G20 countries for its export performance and, despite its strong position in trade in goods, also achieves an upper mid-range score in trade in services among the G20 countries,
- has an above-average level of trade on value-added basis and occupies a lower mid-level position for domestic value added share in exports among the G20 countries,
- has nearly equal forward and backward integration into global value chains and is more closely integrated into simple than complex global value chains,

- plays an important role for many European countries as a hub of global value chains.

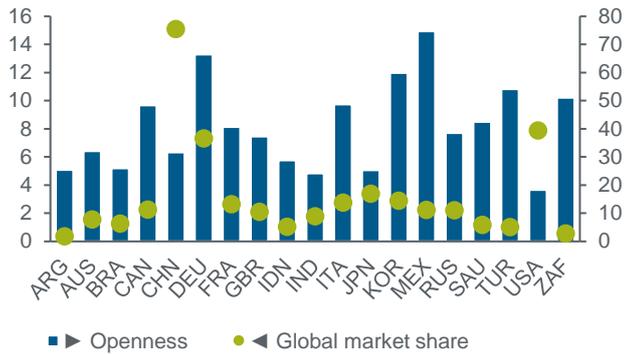
Because of Germany's close integration into global trade and global value chains, the associated advantages and challenges and the impacts of changes in the external environment are of particular relevance. This applies equally to long-term trends and short-term shocks and crises. On the one hand, it offers the potential to harness the advantages of the international division of labour and to generate gains from trade. On the other hand, trade and value chains open the gates for the transmission of adverse shocks from other economies. In addition, changes in trade and value chain relations result in adjustment cost for economies, whether it be as a result of changes in cost-benefit calculations of businesses, possibly influenced by government incentives, or through geopolitical instruments such as sanctions. This creates the need to constantly review and, where necessary, modify trade and value chain relations so that Germany can continue profiting from gains from trade while at the same time avoiding excessively deep vulnerabilities to adverse economic and geopolitical shocks.

Germany stands out from the G20 for its export performance

The term 'export world champion' illustrates that a large portion of public and media attention focuses on a country's economic capacity as measured by the value and volume of goods and services it exports. But this is only one aspect of a country's trade relations with other nations, given that the import of goods and services also plays a major role for its economic development. If the growth in exports is greater than the increase in imports, this external balance makes a positive contribution to economic growth. In addition, exports traditionally demonstrate a country's comparative competitive advantage. Irrespective of that, international competition also provides positive impetus for economic growth on the import side when, among other things, competitive and price pressures as well as technology imports lead to more efficiency and innovation in production.³

Figure 1: Individual G20 countries' trade in goods

Share of exports in global export value in per cent, degree of openness in per cent of GDP



Sources: UNCTAD, KfW Research

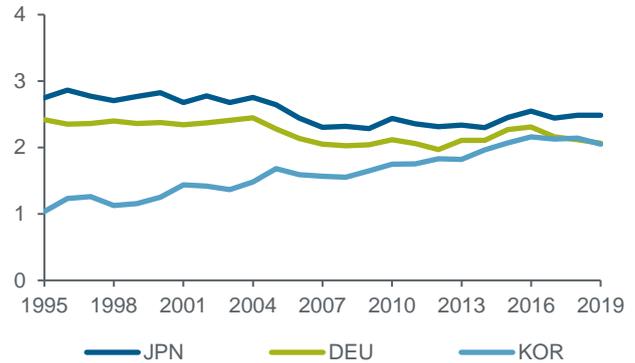
Various indicators are available to assess a country's export performance. One of them is its share in global export value (see Figure 1). With regard to the global market share of exported goods, Germany ranked third among the G20 countries with 7.3% in 2021, directly behind China (15.1%) and the US (7.9%).⁴ In this measure, countries with a generally high economic output are at an advantage because its export capacity closely correlates with its economic capacity. Korea, for example, would have to export almost all its economic output in order to reach a global market share comparable to that of Germany. The picture changes significantly, however, when we look at individual products or groups of products. Thus, Korea comes second only to China for exports of ships and boats, and the value of exports in this product category is 3.4 times as high as that of Germany.

Therefore, in order to take into account the size of a country's economy in the measurement of its export performance, the degree of openness is calculated. If the sum of export and import values is related to economic output, small countries top the ranks (see Figure 1). That is because cross-border trade relations tend to be less relevant to countries with a large domestic market. This highlights Germany's prominent position in international comparison. Despite the size of its economy, the degree of openness of its trade in goods ranks second behind Mexico in the list of individual G20 countries but ahead of Korea or Türkiye.

Other variables for assessing trade performance are the diversity and degree of sophistication of a country's goods exports compared with other countries.⁵ A higher degree of economic complexity (see box for definition) is usually associated with a country's higher income level.⁶ In this respect, Japan has topped the list for years (see Figure 2) although the country is relatively closed and has a comparatively low global market share in goods exports. Germany occupies second place among the G20 countries. However, its export complexity has declined, which the Atlas of Economic Complexity attributes to insufficient diversification over the past years.⁷

Figure 2: Export complexity of Japan, Germany and the Republic of Korea

Index of economic complexity



Source: The Growth Lab at Harvard University. The Atlas of Economic Complexity. www.atlas.cid.harvard.edu

Economic complexity also depends on the complexity of the exported goods. The most complex products include highly developed machines, electronics and chemicals, while commodities and basic agricultural produce are among the least complex products. Korea's main export goods are, by far, integrated microcircuits, which have been given a rank of complexity of 72 in the list of products. Motor vehicles, on the other hand, which have a high share in the value of Japan's and Germany's exports, rank 126th, while motor vehicle parts are in 110th place. Germany's export growth during the period from 2014 to 2019 was mainly driven by highly complex goods such as pharmaceutical products and electrical machinery and equipment.⁸

Definitions of export complexity⁹

An economy's complexity is assessed on the basis of the diversity of the export goods it produces and the number of countries that are capable of also producing those goods. Countries that have a broad range of productive expertise which they are able to maintain over an extended period of time are capable of producing a wide range of goods as well as manufacturing complex products that only few other countries have in their export portfolio.

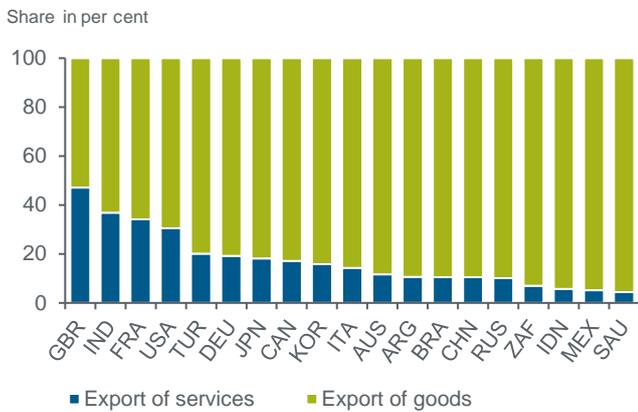
The diversity of goods produced by an economy is measured by the number of goods for which it has a demonstrated comparative advantage of >1. It has a demonstrated comparative advantage of >1 when the export share of a good is greater for its national economy than for the global economy. A demonstrated comparative advantage of >1 for that good is equally used for the number of countries that also manufacture the same good.

Germany’s services trade share sufficient for upper mid-range among the G20 countries

The debate about external trade relations often focuses on the trade in goods. As economies continue to undergo structural change, global value chains with related services such as logistics emerge, and international financial flows increase, trade in services is also gaining more attention and importance.

The strength of most G20 countries still lies in the trade in goods (see Figure 3). Only in the United Kingdom have goods and services achieved a nearly equal share in external trade. The export share of services is also relatively high in India, France and the US. Germany’s 19% export share of services is in upper mid-range, whereby these services almost exclusively consist of commercial services – as they do in all G20 countries.¹⁰

Figure 3: Composition of the value of exports by goods and services



Sources: UNCTAD, KfW Research.

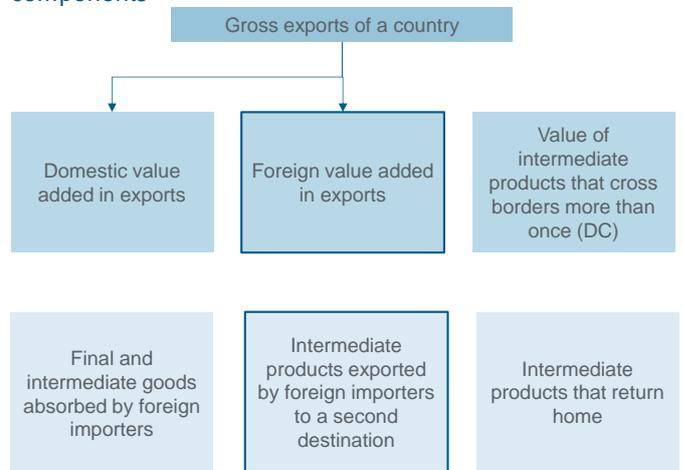
It is likely that attention has been focused on trade in goods because of the significantly higher complexity involved in measuring trade in services. After all, the national border can be crossed by either the service itself, the recipient of the service or the provider of the service.¹¹ At global level, commercial presence in a country is the most important component of international trade in services, followed by cross-border transactions and consumption abroad. The presence of individuals such as employees of services businesses in another country, on the other hand, is of secondary importance.¹²

Germany has an above-average level of trade on value-added basis

Export and import data provides an initial indication of an economy’s level of dependence on imported inputs and demand from abroad. However, the traditional view of trade in goods and services on a gross basis disregards where the relevant value added for the manufacture of those goods takes place and where the production factors such as labour and capital are employed. This approach ignores both the fact that only part of the value of exports originates within the country and that imports can include domestic value added that returns to the country indirectly. If these aspects are taken into consideration, these global value chains prove to be extensive for Germany – as the analysis of trade in goods has already suggested.

There are different ways of measuring the extent of trade on value-added basis. Exports are often attributed to global value chains when the value added crosses a national border at least twice.¹³ The following illustration builds on the fact that the difference between exports and domestic value added that is absorbed by the direct importer can be regarded as trade in value chains.¹⁴ This difference consists of two parts. First, domestic value added that is contained in exports of other countries is accounted for. Domestic value added is exported from one country and exported further by the importer so that at least two border crossings are involved. In the second part, the difference between exports and domestic value added which is contained in the exports is accounted for. Here, foreign value added is imported and then exported again, so that two border crossings take place in this case as well (see Figure 4).

Figure 4: Decomposition of gross exports into value-added components



Source: ECB (2019), p. 9.

On average for the individual G20 countries, trade on value-added basis accounted for 41% of gross exports on the basis of OECD data in 2018, up from 31% in 1995 (see Figure 5).¹⁵ The increase practically came to a standstill after the global economic and financial crisis. That trend can also be identified for Germany, where the share across the entire period of observation was above the average for the G20 countries. In 2018, the last available year, it was 46%. During that year, the highest level was 53% for Korea and the lowest was 27% for Argentina.¹⁶

One likely reason for Germany’s above-average share is that its manufacturing and export structure is concentrated on motor vehicles. After all, the inputs and finished products of the related industries – along with goods from the electronics, textile and garments industries as well as medical goods – are classified by the International Monetary Fund (IMF) as intensively traded in global value chains. Combined, these goods made up around one fourth of global trade in goods in 2019.¹⁷

Figure 5: Trade in global value chains

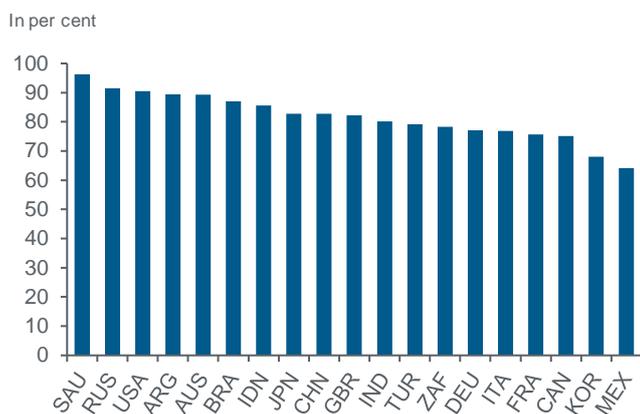


Sources: OECD (Trade in Value Added Database), KfW Research

Germany is in lower mid-range for its share of domestic value added in exports

The share of domestic value added in exports declines with the emergence of global value chains and a country's integration into those value chains. After all, importing inputs also means importing foreign value added, which then flows into the value of the exported goods. In countries that are situated at the beginning of the value chain, domestic value added has a correspondingly high share in exports. Among the G20 countries, this applies primarily to commodity exporters such as Saudi Arabia (96%) and Russia (91%), but also to Australia (89%), whose domestic value added goes primarily into the exportation of intermediate products (see Figure 6). With a 77% share of domestic value added in exports, Germany sits in the lower mid-range of the G20 countries.¹⁸

Figure 6: Share of domestic value added in gross exports



Source: OECD (Trade in Value Added Database)

In assessing this ranking it must be taken into account that imports – and hence the import of foreign value added – have positive effects on economic growth, so that aspiring to a high share of domestic value added in exports as the sole objective does not provide the full picture. What is decisive, rather, is whether the high domestic share of value added originates from a relatively closed economy or from its position in global production networks.

After all, it is not just commodity exporters that hold high shares of domestic value added in exports. Activities undertaken close to the producer – research and development as well as innovation activities – or the consumer – marketing and logistics – typically contain higher value added than activities such as manufacturing and assembly in the middle of value chains. This U-shaped value-added curve along the production chain does not appear in every case, as illustrated by the example of Germany's automotive industry. To be sure, the latter is situated in the middle of the value chain, which would suggest relatively low rates of value-added increase. But customer-specific mass production and production according to individual design in Germany for export appear to ensure that higher value-added growth rates are achieved here than in upstream or downstream stages.¹⁹ While this pattern intensified in the German automotive industry between 1995 and 2009, the change in Japan's automotive industry between 2000 and 2014 was even more dramatic. It evolved from a U-shaped to an inverted U-shaped pattern.

Germany has nearly equal forward and backward integration into global value chains

Deep global value chains increase the susceptibility to external shocks. This applies to foreign demand shocks when a high share of domestic value added is dependent upon foreign final demand. A country is highly susceptible to international supply shocks when its production strongly relies on value added imported from abroad. These dependencies fundamentally describe the different situations countries find themselves in and the potential for vulnerabilities without allowing the impacts of these shocks or the ability of those economies to recover from them to be directly identified. For Germany, it is obvious that foreign supply and demand shocks are both disproportionately relevant at aggregate level compared with other countries.

First, the position of a country within global value chains can be identified in terms of its forward integration on the basis of the portion of exported domestic value added that is exported further by other countries. Second, it is possible to describe the importance of imported foreign value added from upstream production stages for domestic export activity as a measure of backward integration. In both forward and backward integration, value added crosses a national boundary at least twice.

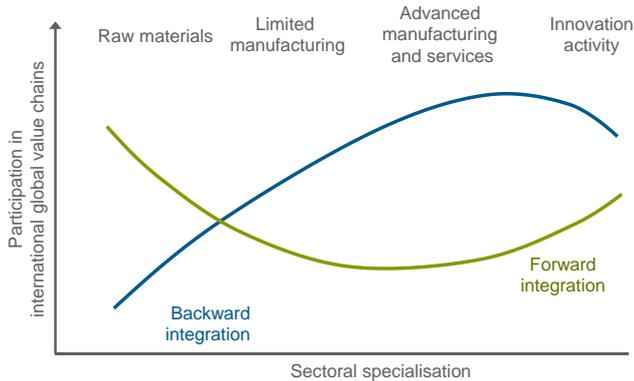
Depending on the economy's sectoral specialisation and innovation activity, different patterns of forward and backward integration into global value chains can be expected, which the World Bank uses to classify countries accordingly (see Figure 7):²⁰

- Commodity exporters show strong forward integration. Their exported goods are used by importers to manufacture goods to export themselves. They have weaker backward integration into value chains because their exports do not rely much on imported inputs and intermediate products.
- With simple manufacture and assembly, the share of an economy's backward integration increases by comparison with commodity producers because it increasingly imports intermediate products required for its own exports. However, its share of forward integration decreases when,

for example, it assembles finished products that are consumed in the export destination country.

- As it transitions to more advanced manufacturing and services, the economy’s backward integration increases once more, but so does the scope of forward integration. Its integration into global value chains generally intensifies.
- For economies that innovate extensively, even stronger forward integration is to be expected. Activities such as research and development are situated at the beginning of value chains. At the same time, backward integration decreases somewhat because these activities and business functions are less reliant on imports.

Figure 7: Forward and backward integration according to the World Bank’s country classification



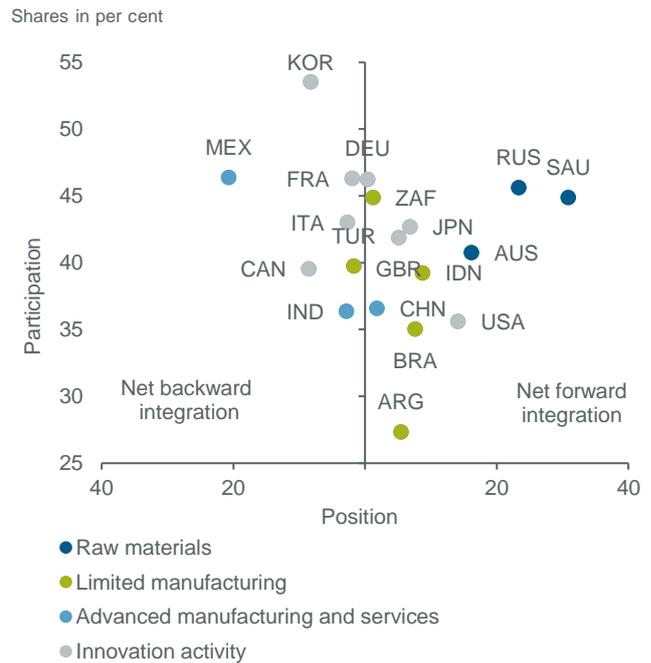
Source: World Bank (2020), Trading for Development in the Age of Global Value Chains, World Development Report, Washington, DC: World Bank, p. 23.

G20 countries are found in each of the four categories (see Figure 8). Mexico stands out with a very strong backward integration, which is high even in comparison with other countries in the advanced manufacturing category such as China and India. The strong value-added connections to the US are a possible explanation. The US, for its part, has the strongest forward integration in the group of countries with innovation activities due to its commodities, R&D activities and financial services, which constitute relevant inputs for the export goods of other countries.²¹

For Germany, the backward and forward integration rates are almost even. Since the mid-1990s, its participation in global value chains has intensified overall, although this process was largely completed in 2007/2008 – in line with the global trend – and has since stagnated.²² At the same time, its backward integration increased slightly more than its forward integration.²³ However, while its forward integration has grown continuously after decreasing during the global economic and

financial crisis, its backward integration has been trending downward after its decline and subsequent recovery.

Figure 8: Participation and position in global value chains



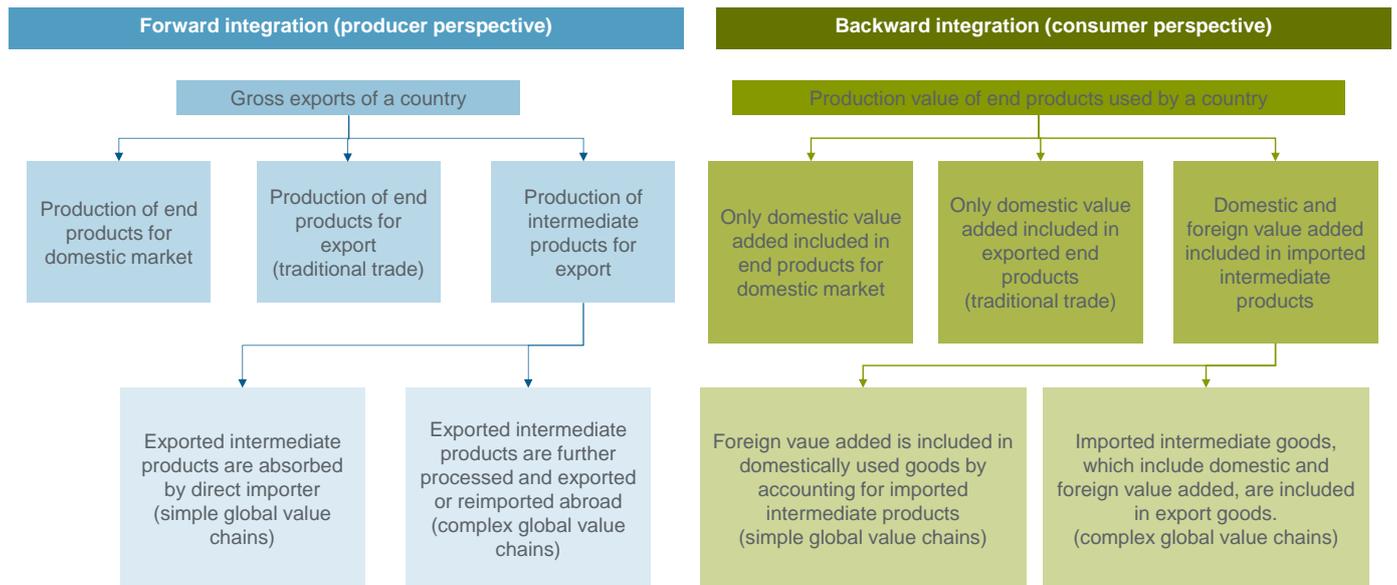
Note: Forward integration: Share of the domestic value added that is contained in exported goods in the respective country’s gross exports, backward integration: Share of foreign value added in the respective country’s gross exports.

Sources: OECD (Trade in Value Added Database), World Bank (2020), KfW Research

Germany is more strongly integrated into simple than complex global value chains

There is relatively high potential for positive or negative variations in final demand or value added abroad to affect domestic production in Germany. How widely these shocks spread along global value chains depends not just on the substitutability of inputs and the diversification of target markets and markets of origin, but also on the complexity of manufacturing networks. The more complex global value chain links are, the greater the potential for disruptions. Here as well, its high share of complex value chains means that Germany has relatively high potential vulnerability to both supply and demand shocks from abroad.

Figure 9: Production concept of global value chains



Source: UIBE (2017), UIBE Global Value Chain Indexes System – Concept Note

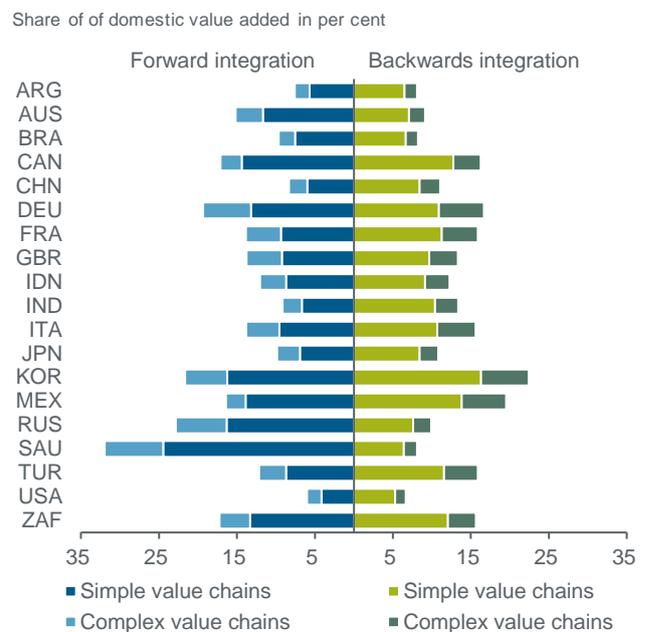
Besides measuring a country’s general integration into global value chains and the forward and backward integration, global value chains can also be broken down into simple and complex ones. To this end, a country’s value added is decomposed into four components (see Figure 9):²⁴

- Value added that goes into final demand without crossing the national border,
- Value added that is contained in finished products destined for export, representing traditional trade in goods and services,
- Value added that crosses a border only once (simple value chains). In forward integration, this is domestic value added that is contained in the inputs exported by a country and used by the importing country to manufacture its domestic products and consumed there. In backward integration, this is foreign value added that is directly imported and used to manufacture products consumed domestically.
- Value added that crosses national borders multiple times (complex value chains). In forward integration, this is domestic value added that is contained in the inputs exported by a country and used by a directly importing country for its part to manufacture goods for export. In backward integration, this includes domestic value added that returns home as well as the foreign value added contained in imported inputs and used to manufacture finished products.

For one thing, the totality of simple and complex value chain links shows the extent of forward and backward integration. In difference to the previous section, however, here the analysis refers to value added and production, not gross exports (trade concept). This delineation of global value chains again shows that Germany has a high rate of both forward and backward integration. Its forward integration rate is behind that of the two commodity exporters Saudi Arabia and Russia as well as the Republic of Korea. Only Korea and Mexico have higher backward integration rates.

All individual G20 countries demonstrate that simple production links to other countries are more important for their domestic value added than complex global value chains (see Figure 10). This also applies to Germany, where around 6% of domestic value added flows into complex and 13% into simple value chains as part of its forward integration, while likewise 6% of production flows into complex and 11% into simple value chains in the context of its backward integration.

Figure 10: Complexity of value chains



VCs=value chains
Sources: OECD, KfW Research

As a hub of global value chains, Germany has great importance for many European countries

In complex value chains, any business in the network can potentially be hit by shocks from abroad. Accordingly, disruptions are more likely to occur in these networks. At the same time, businesses can more easily mitigate the effects of shocks – whether they be domestic or global – by having multiple suppliers and customers and through appropriate diversification. Hubs in value chain networks can exacerbate the spread of economic shocks, but they can also promote the spread of knowledge.²⁵ Owing to its central position for European value chains, Germany plays a prominent role here – both for the risks and for the rewards of these networks.

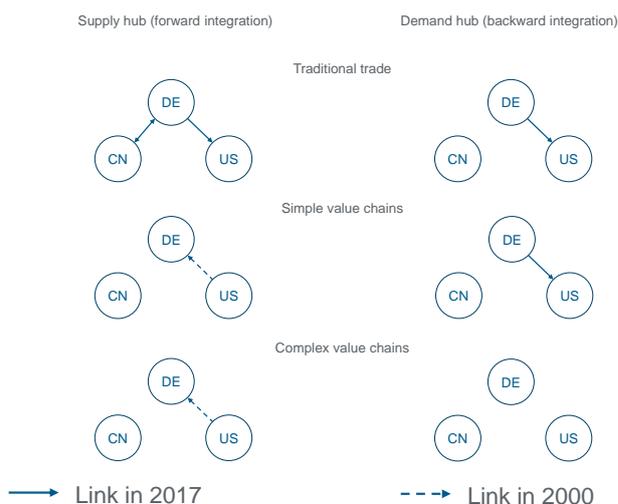
By shifting the focus from the importance of global production networks for a particular country to the importance of a country for the value chains of its partner countries, we can identify supply and demand centres for traditional trade as well as simple and complex global value chains.²⁶ In this respect, China, the US and Germany form the large regional centres in terms of both their forward integration and, thus, their role as a supply hub, and their importance as a centre of demand due to their backward integration.

An analysis in the Global Value Chain Development Report shows that Germany, China and the US as regional supply centres for Europe, Asia and North America, respectively, exist alongside each other with relatively few links.²⁷ Simple and complex value chains are both more regionally concentrated now than in the year 2000 because at the time there was a stronger direct link between the US and Germany (see Figure 11). In traditional trade, on the other hand, China and Germany are mutually connected with each other, while China is an important supplier for the US.

In backward integration and, hence, as demand hubs, the link between Germany, China and the US is slightly closer than their connection in forward integration as supply centres. Here as well, the three countries are relatively unconnected with regard to complex value chains. However, the US is an important demand centre for Germany and China in simple value chains and traditional trade.

Hardly any changes can be observed for Germany as a supply and demand hub in Europe at aggregate level between 2000 and 2017.²⁸ As a supply hub, Germany was able to further expand its position with respect to the number of linked countries, both in terms of traditional trade and with respect to global value chains. As a demand hub, on the other hand, Germany has lost some links,²⁹ particularly with respect to traditional trade with European countries. However, more countries now participate in complex backward integration.

Figure 11: Global value chain links between the regional centres Germany, China and US.



Sources: Illustration based on World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2019), Technological innovation, supply chain trade, and workers in a globalized world, Global Value Chain Development Report, Washington, DC: World Bank.

More trade and global production networks for more prosperity and employment?

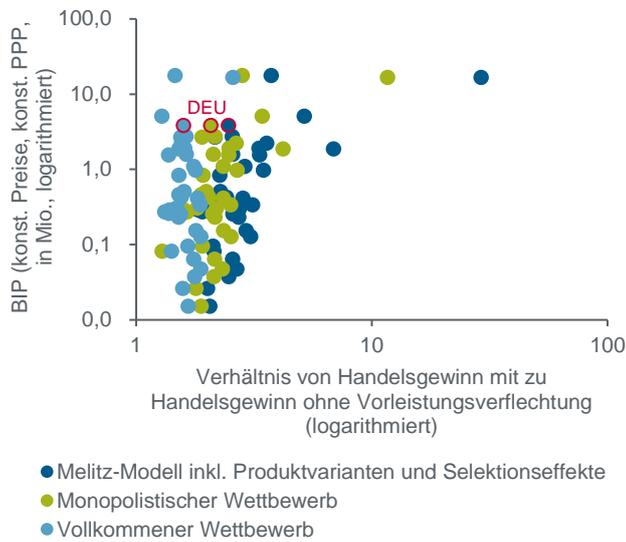
On the one hand, global trade and global value chain links deliver gains in prosperity.³⁰ Consumers benefit from lower prices and greater variety of products, and global competition forces producers to innovate and become more efficient. On the other hand, they force economies to adapt, and they raise questions about how those gains are distributed. This becomes clear when we look at the effects which external trade has on welfare and labour markets.

It is a statistical reality of the expenditure side of gross domestic product that, all other things being equal, higher net exports result in higher economic growth. However, the question whether more exports or greater openness to international trade lead to higher economic growth is much more difficult to answer. For one thing, the degree of openness must be appropriately specified and for another, it must be identified whether trade generates more growth or vice versa, or whether there is a common cause for the increase in both variables.³¹ Empirical studies tend to find that openness to trade has a positive effect on economic growth.³² In particular, trade liberalisation also contributes to productivity increases because it promotes the structural transformation of the economy.³³

Global value chains increase the gains in prosperity from international trade – in short, gains from trade. The determined extent of these gains varies, depending on the analysis approach taken.³⁴ Corresponding analyses with different country samples tend to place Germany in mid-range with regard to gains from trade.³⁵ Germany is also close to the median of the 36 analysed countries with regard to gains from input linkages when a model with product variants and selection effects is used (see Figure 12).³⁶ The analyses

mentioned are based on global input-output tables and neglect the influence of technical progress or stronger competition which is likely to boost welfare additionally.

Figure 12: Welfare gains from input linkages

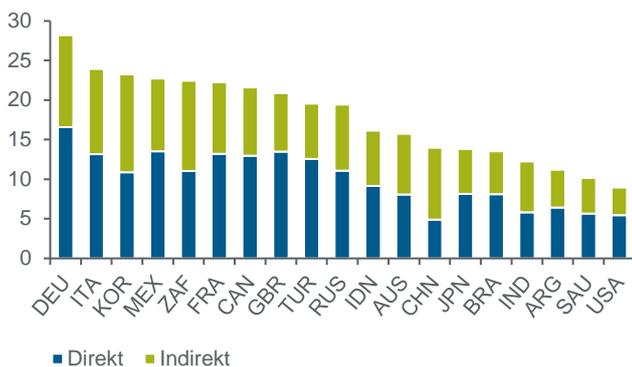


Source: Felbermayr et al. (2017), illustration by KfW Research.

For individuals, the effects of the global division of labour on the job market are also likely to play a role in addition to their role as consumers, in which they benefit from gains in prosperity from global trade in the form of lower prices or a wider selection of products. Germany is the G20 country with the highest share of employment directly or indirectly involved in exports – 28% (see Figure 13). The greater portion of this employment, nearly 60%, flows directly into exports.

Figure 13: Employment participating in exports

In per cent of total domestic employment



Employment directly participating in exports means employment directly used in the manufacture of exported goods and services. Employment indirectly participating in exports refers to employment used in other upstream domestic industries and hence indirectly contained in exports.

Source: OECD, KfW Research.

Global trade and global value chains affect the labour market in many different ways. The effects can differ at local level³⁷ and from one industry to another as well as depending on the occupation, the workers' abilities, skills and level of qualifications, and the content of the activities carried out.³⁸ The resulting changes in demand for labour illustrate the adaptations that need to be made in labour markets and shed light on the distribution effects of globalisation.

Global value chains that involve importing intermediate products which a company could also manufacture itself typically increase the relative demand for qualified labour.³⁹ This also applies to the euro area countries including Germany.⁴⁰ Furthermore, extensive offshoring is associated with a high proportion of workers who perform non-routine and interactive activities.⁴¹ At the same time, it creates employment disadvantages for workers with routine occupations.

Conclusion

For a country of its size, Germany is closely integrated into global trade and global production links. It forms the hub of global value chains for Europe, both as a supply hub and as a demand centre. That potentially makes Germany susceptible to disruptions in global value and supply chains and to international supply and demand shocks. Accordingly, businesses need to prepare for negative shocks in particular, so that they have the flexibility and diversification to absorb them well and recover quickly. Furthermore, there is a continued need to adapt to long-term structural changes at global level – whether it be increasing protectionism, climate change and greater emphasis on sustainability, or technological developments. Policymakers can support this in tried and tested ways by supporting structural change in their own country.

After the criticism against globalisation with its distribution of gains from trade gave rise to closer scrutiny and a redesign of global trade and production links even before the current crisis, the trade conflicts under Trump, the coronavirus crisis and the war in Ukraine have thrown new factors into the mix whose effects are still difficult to assess. They involve the confluence of geopolitical transformations, the quest for greater resilience against shocks and supply chain disruptions, and the desire to protect gains from trade. Possible policy measures aimed at influencing external economic conditions must be carefully weighed while taking into account the potential economic implications.

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¹ Abel-Koch, J. and Ullrich, K. (2021), *What's next for Germany's growth model? Scenarios for globalisation*, Focus on Economics No. 348, KfW Research.

² The G20 includes the countries Argentina, Australia, Brazil, China, Germany, France, India, Indonesia, Italy, Japan, Canada, Mexico, Russia, Saudi Arabia, South Africa, Republic of Korea, Türkiye, USA and the United Kingdom. The EU is also a member of the G20, but only the EU member states that are direct members of the G20 are included in the analysis.

³ ECB (2019), *The impact of global value chains on the euro area economy*, ECB Occasional Paper No. 221, p. 18.

⁴ Data source: UNCTAD, own calculations.

⁵ The Growth Lab at Harvard University. The Atlas of Economic Complexity. <http://www.atlas.cid.harvard.edu>.

⁶ Hidalgo, C. A. and Hausman, R. (2009), The building blocks of economic complexity, PNAS 106 (26) 10570-10575, <https://doi.org/10.1073/pnas.0900943106>

⁷ The Growth Lab at Harvard University. The Atlas of Economic Complexity. <http://www.atlas.cid.harvard.edu>.

⁸ The Growth Lab at Harvard University. The Atlas of Economic Complexity. <http://www.atlas.cid.harvard.edu>.

The most complex products include highly developed machines, electronics and chemicals, while commodities and basic agricultural produce are among the least complex products.

⁹ See [The Atlas of Economic Complexity \(harvard.edu\)](http://www.atlas.cid.harvard.edu), own translation.

¹⁰ State services are not included in the count of commercial services.

¹¹ A distinction is made between the four modes of international trade in services: Mode 1 – cross-border trade, mode 2 – consumption abroad, mode 3 – commercial representation, and mode 4 – temporary stay abroad of natural persons to provide the service. See Foreign Trade Information System, Dictionary of Trade Terms, SICE - Dictionary of trade terms - Services (oas.org), accessed on 16 June 2022.

¹² WTO (2019), The Future of Services Trade, World Trade Report.

¹³ Borin, A. and Mancini, M. (2019), Measuring What Matters in Global Value Chains and Value-Added Trade, World Bank Policy Research Working Paper No. 8804.

¹⁴ ECB (2019), The impact of global value chains on the euro area economy, ECB Occasional Paper No. 221

¹⁵ The World Bank has determined that around half of global trade now takes place as part of global value chains. World Bank (2020), Trading for Development in the Age of Global Value Chains, World Development Report, Washington, DC: World Bank. doi:10.1596/978-1-4648-1457-0.

¹⁶ A whole series of measures exist for mapping global value chain links, see Antrás, P. and Chor, D. (2021), Global Value Chains, NBER Working Paper 28549.

¹⁷ IMF (2022), War sets back the global recovery, World Economic Outlook, April 2022, chapter 4.

¹⁸ Thus, a high domestic share of value added is generally positive for employment of labour and capital. However, imports also contribute to efficiency improvements and, hence, a country's economic growth through international competition.

¹⁹ World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2017), Measuring and Analysing the Impact of GVCs on Economic Development, Global Value Chain Development Report, Washington, DC: World Bank.

²⁰ World Bank (2020), Trading for Development in the Age of Global Value Chains, World Development Report, Washington, DC: World Bank. doi:10.1596/978-1-4648-1457-0, p. 22.

Dutta, S. (2020), Measurement of Global Value Chain (GVC) Participation in World Development Report 2020, MPRA Paper No. 105222.

²¹ ECB (2019), The impact of global value chains on the euro area economy, ECB Occasional Paper No. 221.

²² ECB (2019), The impact of global value chains on the euro area economy, ECB Occasional Paper No. 221

²³ This is also in line with the international trend, see Antrás, P. and Chor, D. (2021), Global Value Chains, NBER Working Paper 28549.

²⁴ UIBE (2017), UIBE Global Value Chain Indexes System – Concept Note, Database_对外经贸大学全球价值链研究院 (uibe.edu.cn).

²⁵ OECD (2021), Global Value Chains: Efficiency and Risks in the Context of COVID-19

²⁶ World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2019), Technological innovation, supply chain trade, and workers in a globalized world, Global Value Chain Development Report, Washington, DC: World Bank.

Two countries are said to have a bilateral link when one of them obtains either the greatest portion or a share of more than 25% from the other. See Meng, B., Xiao, H., Ye, J. and Li, S. (2018), Are global value chains truly global? A new perspective based on the measure of trade in value-added, DIE Discussion Paper No. 736, IDE-JETRO, Chiba City, Japan.

²⁷ World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2019), Technological innovation, supply chain trade, and workers in a globalized world, Global Value Chain Development Report, Washington, DC: World Bank.

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²⁹ While it was still 13 countries in 2000, that figure dropped to 9 in 2017.

³⁰ As the OECD has emphasised, the value added that is generated by domestic businesses in total also matters when assessing global value chains. That is because focusing on the domestic shares of value added in exports ignores, among other things, the positive effects of technology imports and efficiency gains from international competition. See Global value chains and trade - OECD, accessed on 10 June 2022.

³¹ Pursuing Empirical Glasnost, IMF Working Paper No. 07/156.

³² U. a. Billmeier, A. and Nannicini, T. (2007), Trade Openness and Growth: Pursuing Empirical Glasnost, IMF Working Paper No. 07/156,

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Identifying the effects requires a careful estimation strategy. See Busse, M. and Koeniger, J. (2015), Trade and economic growth: A re-examination of the empirical evidence, Economics Bulletin, AccessEcon, vol. 35(4), 2862–2876.

³³ McMillan, M. S. and Rodrik, D. (2011), Globalization, structural change and productivity growth, ed.: WTO, Making Globalization Socially Sustainable, chapter 2.

³⁴ See Antrás, P. and Chor, D. (2021), Global Value Chains, NBER Working Paper 28549.

³⁵ See Antrás, P. and Chor, D. (2021), Global Value Chains, NBER Working Paper 28549, and Felbermayr, G. et al. (2017), Wohlfahrtseffekte der Handelsliberalisierung (*Effects of trade liberalisation on prosperity* – our title translation, in German), study commissioned by the German Council of Economic Experts.

³⁶ Felbermayr, G. et al. (2017), Wohlfahrtseffekte der Handelsliberalisierung (*Effects of trade liberalisation on prosperity* – our title translation, in German), study commissioned by the German Council of Economic Experts.

³⁷ World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2019), Technological innovation, supply chain trade, and workers in a globalized world, Global Value Chain Development Report, Washington, DC: World Bank.

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³⁸ World Bank Group, IDE-JETRO, OECD, UIBE and World Trade Organization (2019), Technological innovation, supply chain trade, and workers in a globalized world, Global Value Chain Development Report, Washington, DC: World Bank.

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The impact on employment is also felt within enterprises.

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