

Articles

Transmission of output shocks – the role of cross-border production chains

Globalisation has led to a rapid increase in euro area trade and facilitated the build-up of global production chains. Although these developments boost welfare as they increase the international division of labour (which drives growth and productivity), they also pose some challenges. Depending on the position of the euro area and its trading partners in these chains, economic disturbances from other parts of the world can be transmitted to the euro area in a more complex manner than traditional trade statistics can capture. This article describes global value chains in which the euro area participates and explores their role in the transmission of economic output shocks. If the final destination of euro area exports is considered, value added produced in the euro area (including that which is further processed and re-exported by large trading partners) is largely absorbed by advanced economies, notably the United States. Thus the euro area is likely to be relatively strongly affected by demand developments in the United States but less affected by developments in China, for example, which re-exports a proportion of euro area exports.

1 Introduction

The world has become increasingly interconnected following several decades of rapid globalisation, which has facilitated the development of international production chains. This has made it possible for firms to specialise their production in several stages across different countries and benefit from an increase in the international division of labour. While increasing links across the global economy is a positive development – as it improves growth by reducing production costs and transmitting know-how across countries and regions – it may also change the way foreign shocks are transmitted to the euro area.

Gross trade figures in part double-count trade flows, as a portion of exports consists of imported inputs and a part of exported output is later imported back into the country of origin.¹ This implies that any analysis based on gross trade data may overestimate the importance of some trading partners and underestimate the importance of others. This article uses data from the World

¹ See Koopman, R., Wang, Z. and Wei, S.J., “Tracing Value-Added and Double Counting in Gross Exports”, *American Economic Review*, Vol. 104, No 2, 2014, pp. 459-94, and Johnson, R. C. and Noguera, G., “Accounting for Intermediates: Production Sharing and Trade in Value Added”, *Journal of International Economics*, Vol. 86, No 2, 2012, pp. 224-36.

Input-Output Database² to calculate several measures of trade links identified by the literature on global value chains and value added in trade, and examines role of global production chains in transmitting foreign output shocks to the euro area. To streamline the analysis, the focus is on trade with four major trading partners of the euro area, namely the United States, China, the United Kingdom and Russia, which are also interesting cases to consider because they are important for different types of trade. Section 1 provides an overview of trends in euro area trade, focusing on the participation of the euro area in global value chains and outlining different trade measures used in the subsequent analysis. Section 2 discusses the increased importance of external developments for the euro area by tracing euro area value added through the global value chains to its final destination. Section 3 estimates the implications for the transmission of output shocks on the basis of the different trade measures, and Section 4 provides concluding remarks.

2 Characteristics of euro area trade and global value chain participation

The past few decades have seen global trade boosted by technological and policy developments, with intra-euro area trade benefiting from the advent of Economic and Monetary Union. Global trade has expanded substantially over the past few decades as a result of technological advances lowering transportation and communication costs. Furthermore, economic policy in many countries has been directed broadly towards removing trade barriers and reaching trade agreements. Large and previously relatively closed countries such as China have opened up their economies and become important players in international trade. The further integration of the European Union with the establishment of Economic and Monetary Union in 1999 has strengthened the Internal Market for euro area exporters and facilitated cross-border transactions.

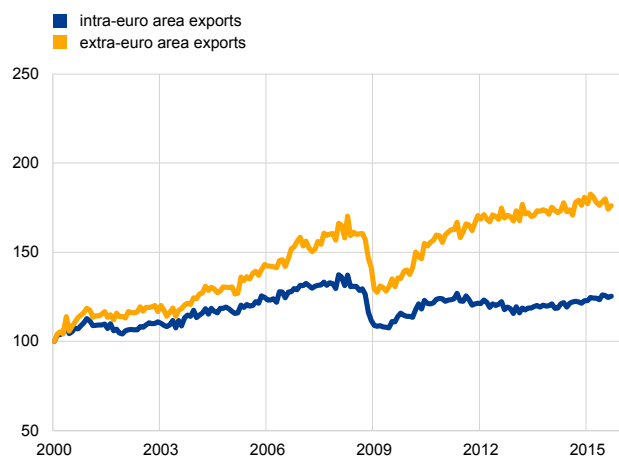
Trade within the euro area and the euro area's external trade have both expanded, and the euro area has consequently become increasingly reliant on foreign economic developments. From 2000 to the end of 2015, intra-euro area goods exports increased by around 25%, while extra-euro area goods exports increased by almost 75% (see Chart 1). During this period, the euro area also became increasingly reliant on foreign economic developments, which reflects stronger growth in world imports of goods than in euro area domestic demand (see Chart 2).

Technological advancements and policy agreements have also stimulated the build-up of international production chains. The emergence of global value chains as an important way of organising production is one of the most prominent

² The World Input-Output Database is a result of a project funded by the European Commission and carried out by a large number of research institutions. For more detailed information on the database, see Timmer, M.P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G.J., "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", *Review of International Economics*, Vol. 23, 2015, pp. 575-605.

Chart 1**Euro area goods exports**

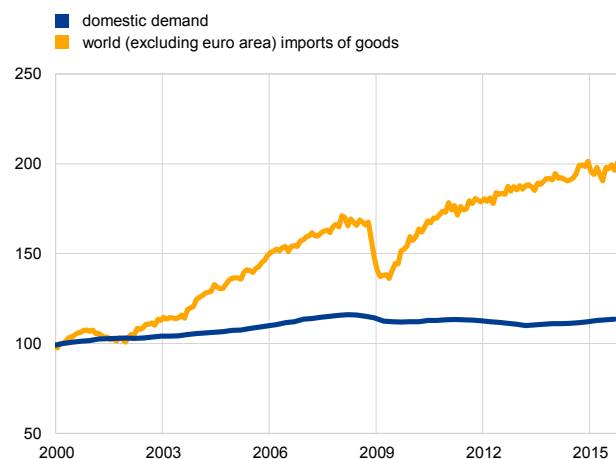
(index: January 2000 = 100)



Sources: Eurostat and ECB calculations.
 Note: Exports are in volumes.

Chart 2**World imports and euro area domestic demand**

(index: Q1 2000 = 100)



Sources: Eurostat, CPB Netherlands Bureau for Economic Policy Analysis and ECB calculations.
 Note: Domestic demand comprises total investment, private consumption and government consumption.

features of globalisation.³ While global production has always been a part of international trade, the rapid integration of firms in global value chains seen during the past few decades is something entirely new. Previously, global trade usually implied simply that production was located away from consumption of the final product. In global value chains, the various parts of a production process can also be divided among different regions of the world, making it possible to take advantage of the gains from increased specialisation in individual tasks.

In the euro area, global value chain participation has increased for most countries since the mid-1990s. This mainly reflects the increasing vertical specialisation of euro area countries, i.e. the increasing import content of their exports (see Box 1). While the participation of euro area countries in global value chains has generally increased, larger euro area countries usually have less foreign value added in their exports. This can partly be explained by the scale of their domestic markets, which enables them to source more intermediary products internally.⁴

Box 1**Different measures of bilateral trade**

This box reviews different measures of bilateral trade that can provide a clearer picture of trade relations than offered by gross export figures alone. The literature on global value chains and value added in trade shows that compiling gross trade data entails a partial double counting

³ See for example Amador, J. and Cabral, S., “Global value chains: surveying drivers and measures”, *Working Paper Series*, No 1739, ECB, 2014, or Elms, D.K. and Low, P. (eds.), *Global value chains in a changing world*, World Trade Organization, Geneva, 2013.

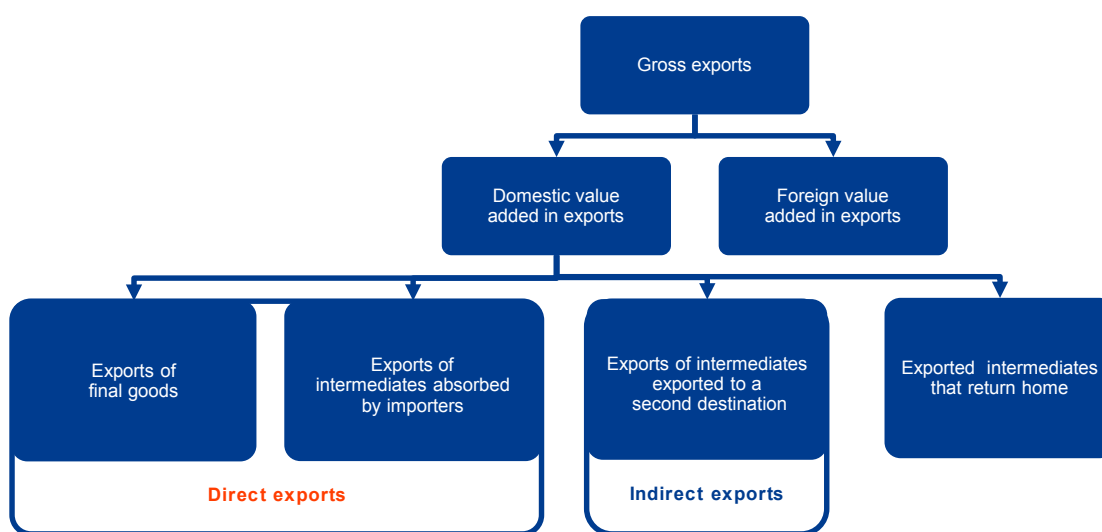
⁴ It is important to note that a number of factors explain the extent of a country’s participation in global value chains. In addition to market size, factors include the country’s level of economic development, industrial structure, trade policies and quality of infrastructure.

of trade flows. Exports consist in part of imported foreign value added and domestic value added that is later imported back into the country of origin or exported further by a trading partner. These components mean that gross export figures overstate the implications of bilateral trade links and do not necessarily capture the importance of final exports to one country for another country. Lately, efforts have been made to construct a practical framework for decomposing gross exports into its value added components, notably by Koopman et al. (see footnote 1).

Chart A presents a simplified illustration of gross exports and its decomposition, based on Koopman et al. In Chart A gross exports consists of domestic value added and foreign value added, which is roughly the import content of exports and reflects how a country uses foreign inputs in its exports. Domestic value added in exports represents the contribution of domestic factors of production such as labour (compensation of employees) and capital (gross operating surplus) to exports. It consists of i) direct exports, i.e. final goods exports and intermediate exports that are consumed at the receiving destination; ii) indirect exports, i.e. value added that is exported to one destination (where further value is added) and later sent on to a second (final) destination; and iii) value added that is later returned to the country of origin as imports.

Chart A

Schematic view of gross exports and its decomposition into value added



Source: Based on Koopman, Wang and Wei, "Tracing Value-Added and Double Counting in Gross Exports" (see footnote 1).

From this decomposition, it is possible to construct indicators of global value chain participation and highlight different kinds of trade. For example, direct and indirect exports reflect different relations between two economies. Direct exports captures the direct importance of one trade partner for another, as all finished and intermediate products that are exported are absorbed and therefore directly linked to domestic demand in the importing country. Indirect exports, meanwhile, is connected not directly to the domestic economy of the importing country but to final demand elsewhere. The two concepts thus capture different trade links, depending on the role of the partner country in the global value chain (direct importer versus re-exporter).

While the concepts in Chart A are important to a better understanding of trade links, corresponding data are rarely available through traditional sources and the different concepts often require large amounts of data to construct. To address this issue, several

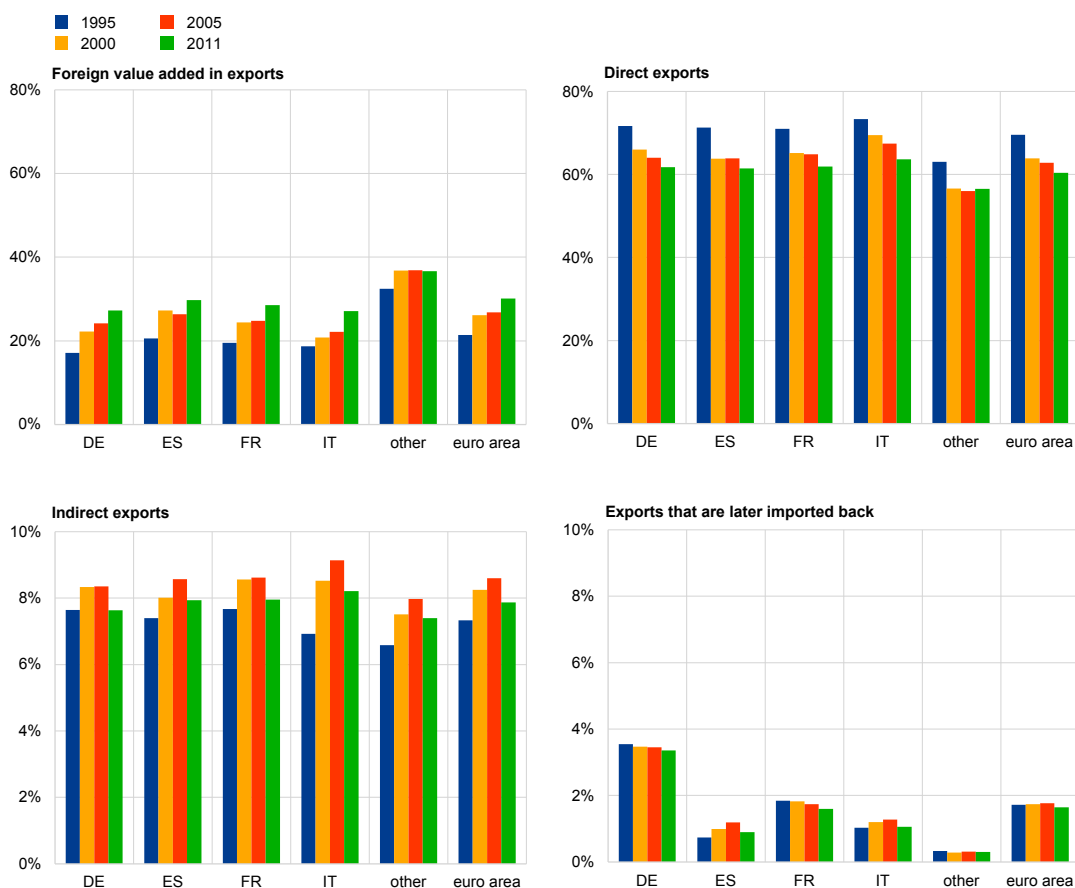
research initiatives have been dedicated to constructing global input-output tables.⁵ In this article, the concepts in Chart A are derived from the publically available World Input-Output Tables.⁶

National input-output tables show transactions between sectors in an economy, while the World Input-Output Tables connect national tables with international trade flows. Through national input-output tables, it is possible to assess the importance of one sector as a supplier for another sector’s final output. Building on national input-output tables, the World Input-Output Tables connect countries and sectors together through international trade flows, making it possible to trace the importance of a supplying industry in one country for an industry in another country. The tables cover 40 countries and 35 sectors from 1995 to 2011 and cover around 85% of world GDP, making them an indispensable tool for bilateral trade analysis.

Chart B

Decomposition of gross exports in the euro area into value added components

(percentages of gross exports)



Sources: World Input-Output Tables and Stehrer, R., "Accounting Relations in Bilateral Value Added Trade", wiiw Working Paper, No 101, Vienna Institute for International Economic Studies (wiiw), May 2013.
Notes: The chart includes intra-euro area trade flows. Latest available data: 2011.

⁵ For example, the World Input-Output Database, the WTO-OECD Trade in Value Added (TIVA) database or the Global Trade Analysis Project (GTAP) Database.

⁶ See www.wiod.org

Foreign value added in exports and indirect exports have grown in importance for most large euro area economies. The development of the components of gross exports illustrated in Chart A is shown in Chart B, where they are calculated using the World Input-Output Tables up to 2011. Since 1995 foreign value added has increased as a share of gross exports in the four largest euro area countries, reflecting the growing vertical specialisation of euro area exporters vis-à-vis both other euro area countries and countries outside the euro area.⁷ The share of direct exports has decreased over time. Indirect exports increased in the 2000s as a share of exports, although they were slightly lower in 2011 for the largest euro area countries. Exports of intermediate inputs that return to the euro area, which represent a relatively small share of gross exports in most countries (with the notable exception of Germany), have declined since 1995 in Germany and France while, they increased in Spain and Italy until 2005 before falling again up to 2011.

3 Direct trade links and trade through global value chains – tracing euro area value added

Participation in global value chains affects how output shocks are transmitted to the euro area. Since, in global production chains, cross-border signals regarding supply and demand might be transmitted faster, the production system as a whole may be more susceptible to the transmission of external shocks, which can be amplified as they pass through the system. A supply shock would normally propagate downstream in a production network, whereas a demand shock is transmitted up the supply chain.⁸ For example, if an industry supplying intermediate products is hit by a supply shock (a production plant is destroyed by a natural disaster), the effect would affect the downstream industries, as they are dependent on inputs from the first industry hit by the shock, as was the case after the tsunami that hit Japan in 2011.⁹ How the effect builds up along the supply chain depends in part on the substitutability of the inputs for the purchasing industries. In the case of a demand shock, amplification up the supply chain could be due to a “bullwhip” effect¹⁰, which induces firms to adjust their inventories to new expected levels of demand along the supply chain.¹⁰ While the length of the value chain matters for how a shock might be amplified, the focus here is on the position in a global value chain. Whether or not the euro area is more susceptible or more resilient to output shocks affecting a trading partner would depend on its role in the global value chains and the type of shock hitting the economy.

⁷ See for example Amador, J., Cappariello, R. and Stehrer, R., “Global value chains: a view from the euro area,” *Working Paper Series*, No 1761, ECB, 2015.

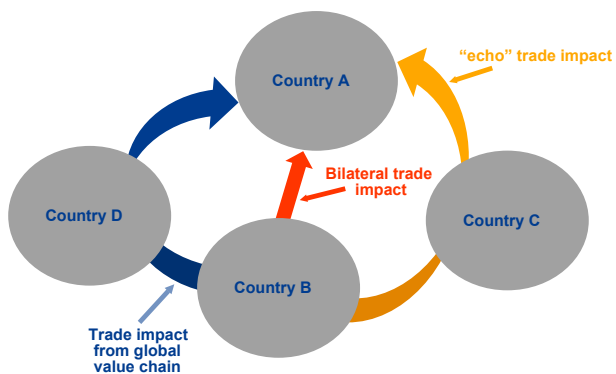
⁸ See Acemoglu, D., Akcigit, U. and Kerr, W., “Networks and the Macroeconomy: An Empirical Exploration”, *NBER Working Paper Series*, No 21344, 2015.

⁹ See, for example, *Interconnected Economies: Benefiting from Global Value Chains*, OECD, 2013.

¹⁰ The “bullwhip” is, in short, an effect where a final demand shock causes large changes in demand for parts and components and firms adjust their inventories along the supply chain to new expected levels of demand. For empirical evidence of this effect, see, for example, Alessandria, G., Kaboski, J.P. and Midrigan, V., “US Trade and Inventory Dynamics”, *American Economic Review*, Vol. 101(3), or Altomonte, C., Di Mauro, F., Ottaviano, G., Rungi, A. and Vicard, V., “Global value chains during the great trade collapse: a bullwhip effect?”, *Working Paper Series*, No 1412, ECB, 2012.

Chart 3

An illustration of the transmission of demand shocks through trade



Source: ECB.

Note: The chart illustrates a demand shock that originates in country B and its impact through the various trade channels on country A.

Foreign demand shocks are transmitted via different trade channels depending on the nature of the trade links.

In Chart 3, this is illustrated using a four country example, which, for the purpose of simplification, considers only partial, first-round trade effects of a demand shock; possible general equilibrium effects are not considered. In this stylised example, countries A and C have direct exports to B and country C has direct exports to A. Country A also exports indirectly to B via country D.

The impact of a demand shock in country B on country A would be transmitted through several channels.

First, the bilateral trade impact would be through a change in demand for country A's exports to country B (orange arrow). Second, country A would be impacted by an "echo" effect (yellow arrow) from a change in exports to country C, as country C's

demand for country A's exports changed following the shock in country B.¹¹ Third, country A would be further affected (blue arrow) by the shock in country B through its participation in global value chains with country D, which processes value added from country A and exports it onward to B. This example shows that there are a number of trade links that need consideration when assessing the possible impact of a foreign demand shock on euro area activity. The following paragraphs describe euro area trade links in more detail, elaborating on the nature of trade and identifying some of the most important trading partners.¹² In addition, euro area value added is traced through the exports of its major trading partners to its final destination.

The euro area has substantial direct exports to the United States, while China and the United Kingdom are more important for indirect exports that are re-exported to other destinations.

Charts 4 and 5 compare euro area exports to four major trading partners, the United States, China, the United Kingdom and Russia, on the basis of their respective shares in direct exports and indirect exports. For direct exports, the United States is the most important destination, whereas China and the United Kingdom account for a larger share of indirect exports. This suggests that the euro area is relatively closely linked to domestic developments in the United States, while China and the United Kingdom act to a larger extent as intermediaries for euro area exports that are destined for other countries. As regards Russia, direct exports are more important than indirect exports.

China and the United Kingdom source more than a fifth of their gross exports from outside the respective country.

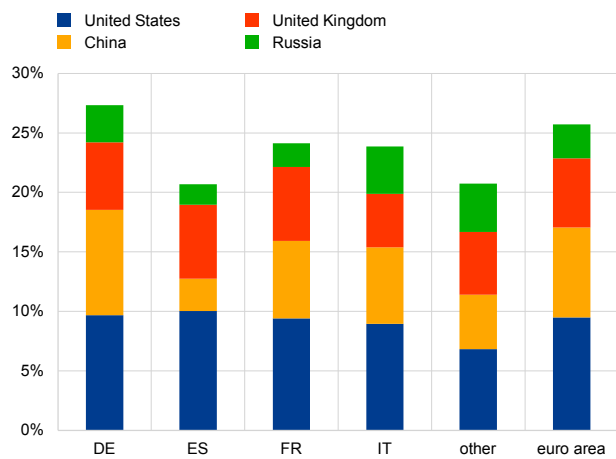
In China, the import content of exports increased from an average 14% in the second half of the 1990s to 22% in the period

¹¹ An "echo effect" is the spillover effect on the impacted country via other trade partners which are also affected by the shock. See Dées S. and Vansteenkiste I., "The transmission of US cyclical developments to the rest of the world", Working Paper Series, No 798, ECB, 2007.

¹² The four trading partners (the United States, the United Kingdom, China and Russia) are among the most important for the euro area and also relevant for different types of trade (i.e. exports of final products, exports of intermediate inputs that are re-exported to other destinations or exports that are processed and later sent back to the euro area).

Chart 4**Direct exports of the euro area**

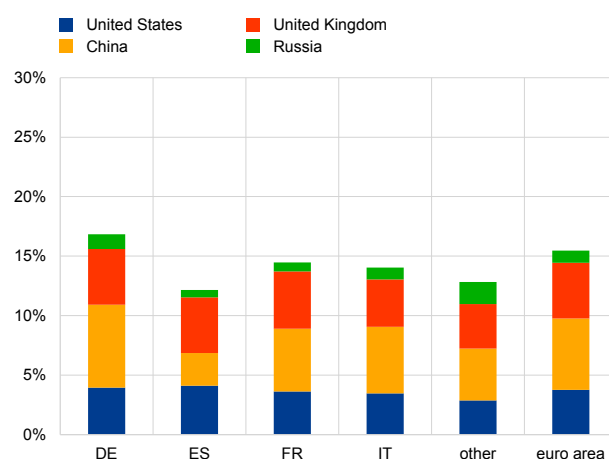
(percentages of direct exports)



Sources: World Input-Output Tables and ECB calculations.
 Note: "Other" is an average of the shares of the remaining euro area countries. Latest available data: 2011.

Chart 5**Indirect exports of the euro area**

(percentages of indirect exports)



Sources: World Input-Output Tables and ECB calculations.
 Note: "Other" is an average of the shares of the remaining euro area countries. Latest available data: 2011.

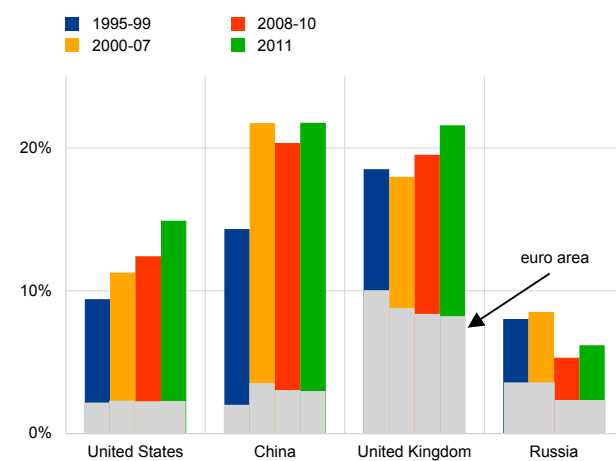
leading up to the 2008-09 recession (Chart 6). While declining somewhat during the crisis years, foreign value added in exports rebounded in 2011. For both the United Kingdom and the United States, the import content of exports increased during the crisis years and also in 2011 compared with the pre-crisis period. In Russia, by contrast, foreign value added in exports declined throughout the 2000s and stood at 6% in 2011.

Value added sourced from the euro area accounts for a relatively large share of the gross exports of the United Kingdom, but a smaller share for China, Russia and the United States.

The United Kingdom sources a relatively large share of its exports from the euro area (see the grey bars in Chart 6). However, this share has become smaller over time and does not follow the general trend of increasing foreign value added in exports. In China, by contrast, euro area value added increased during the pre-crisis period compared with the mid-1990s and has been broadly stable in the post-crisis period at around 3% of gross exports. In the United States, the share of euro area value added in exports has been stable at around 2% throughout the period covered in the World Input-Output Tables. For Russia, the share declined from almost 4% in the 1990s and the pre-crisis period to 2% thereafter.

Chart 6**Foreign value added in exports of large trading partners of the euro area**

(percentage of total gross exports)



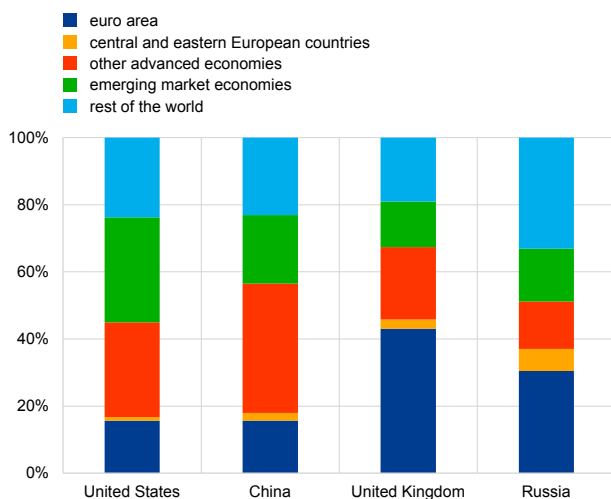
Sources: World Input-Output Tables and ECB calculations.
 Note: The grey bars refer to the respective shares of foreign value added sourced from the euro area. Latest available data: 2011.

To properly account for all trade links of the euro area, it is necessary to also consider the final destination of the euro area's indirect exports via its large trading partners. For China, which is a relatively important intermediary for such exports, the largest portion of value added originating in the

Chart 7

Final destination of value added originating in the euro area and further exported by large trading partners

(percentages of total foreign value added in exports)



Sources: World Input-Output Tables and ECB calculations.

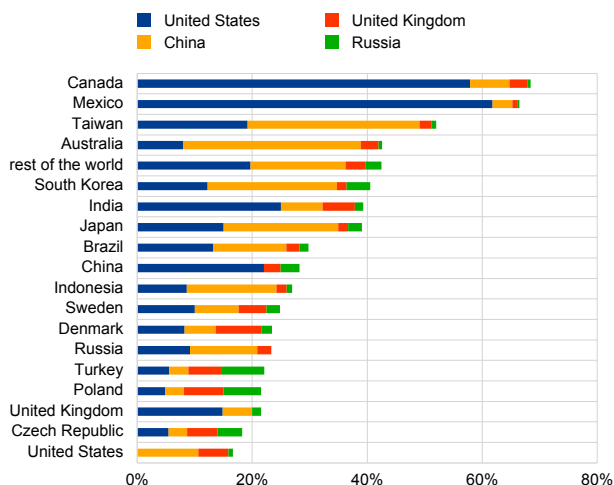
Note: The "rest of the world" is a grouping of all countries not explicitly identified in the World Input-Output Tables.

Latest available data: 2011.

Chart 8

The relevance of large trading partners for non-euro area countries

(percentages of direct exports)



Sources: World Input-Output Tables and ECB calculations.

Notes: Percentages indicate the share of the respective country's total direct exports to the United States, the United Kingdom, China and Russia, which are large trading partners of the euro area. The "rest of the world" is a grouping of all countries not explicitly identified in the World Input-Output Tables.

Latest available data: 2011.

euro area is destined for other advanced economies (see orange bars in Chart 7) such as the United States and Japan. For the United Kingdom, around 43% of the value added originating in the euro area is exported back for final use (dark blue bars in Chart 7) and hence dependent on domestic demand in the euro area. In addition, 22% is exported to other advanced economies, of which the United States accounts for the largest share. The final destinations of euro area value added that is exported further by the United States are relatively evenly spread between advanced economies and emerging market economies on the American continent (such as Canada, Mexico and Brazil). In Russia, the value added originating in the euro area is predominantly exported back to the euro area or exported further to the "rest of the world" (dark blue and light blue bars, respectively, in Chart 7), while re-exports to other advanced economies and emerging market economies account for a smaller share.

The trade impact on the euro area from a demand disturbance in the United States is likely to be substantial through both bilateral trade effects and echo effects, while a similar shock in China would have less impact on euro area activity. Demand from the United States represents a substantial driver of many countries' direct exports (Chart 8). Many of these economies (China, the United Kingdom and the "rest of the world") are also important destinations for euro area direct exports. Hence, the trade impact on the euro area from a demand disturbance in the United States is likely to be substantial, through both bilateral trade effects and echo effects. Moreover, the final demand for euro area indirect exports via other countries would also be affected. Demand disturbances in China, on the other hand, would likely have a smaller impact on euro area activity, since China is an important destination for euro area indirect exports. A large portion of these exports are subsequently re-exported to the United States and are hence affected by demand developments there.

While other Asian countries (and Australia) have large direct exports to China, they account only for a small share of euro area direct exports.

4 Measuring global value chains – implications for the transmission of output shocks

Taking into account the final destination of euro area exports provides a more detailed picture of global shock transmission. By taking into account the different types of trade link and by identifying the final destination of euro area exports, it is possible to assess and quantify each of the different trade channels and their potential for shock transmission (as illustrated in Chart 3).

Using trade elasticities and the different trade measures captures cross-country linkages via the bilateral trade impact, the impact via global value chains and echo effects via other trading partners. In Box 2 the total trade impact from an (unidentified) output shock emanating from one of the largest trading partners is first quantified using traditional gross trade flows. Thereafter, only the relevant channels are considered, namely, the bilateral trade impact, the impact through global value chains and the echo effects via other trading partners. The results suggest that the total impact from each of the four trading partners considered is somewhat smaller than suggested by traditional gross trade flows, which is consistent with the view that gross exports represents some double counting.

The type of output disturbance also affects the way shocks are propagated. For example, a demand shock (such as changed consumer preferences or increased government spending) in the United States would probably have a large impact on the euro area. A supply shock (such as a natural disaster disrupting production) would have smaller ramifications, as the United States is less significant as a destination for indirect exports of the euro area. For China, the relationship is the reverse. A demand shock would probably have a smaller impact, while a supply shock would be of greater importance for the euro area.

Box 2

Output shock transmission to the euro area via bilateral trade, global value chains and echo effects

The aim of this box is to quantify the effect of a foreign output shock on the euro area by differentiating between the bilateral trade impact, the impact via global value chains and the echo effect through other trading partners. The three effects presented in Chart 3 are considered, namely: 1) the bilateral trade impact of a shock from changed consumption of direct exports; 2) the impact via indirect exports (through another trading partner) to the country in which the shock originates; and 3) the echo effect via other trading partners.

This approach focuses on euro area value added finally consumed in the trading partner country in question. Unlike gross trade figures, this approach does not consider value added which originated in other countries (foreign value added) and the exports that ultimately return to the euro area but does take into account indirect exports that are finally absorbed by the partner country.

The impact is computed for each of the three channels. On the one hand, the trade effect of a shock in a partner country depends on the elasticity of euro area GDP to imports. On the other hand, the impact varies with exposure of the euro area to that country and the elasticity of euro area imports to the country's GDP. Furthermore, the effect stemming from the bilateral trade links is accompanied by an echo effect, which is the spillover effect on the euro area via other trade partners which are also affected by the shock. The shares of gross, direct and indirect imports and exports in GDP are computed as the respective measure divided by GDP. The demand elasticity to GDP is assumed to be 0.6 for all countries and the country-specific import elasticities are assigned the values used in Déés and Vansteenkiste (see footnote 11).¹³

The impact of a GDP shock differs when direct and indirect trade are considered instead of gross trade. The table compares the total contemporaneous impact of a 1% GDP shock in each of the four major trading partners on the euro area on the basis of gross trade with the combined impact of direct and indirect trade.¹⁴ The difference between the two impacts depends on the contribution of the individual trade components. For instance, in the case of China and the United Kingdom, using gross trade as a measure of trade links would overstate the effect of a GDP shock as compared with the sum of direct and indirect trade. This can be explained by the fact that a large share of euro area exports to these countries represents indirect exports that are re-exported to other destinations and hence not absorbed in China and the United Kingdom. The United States, on the other hand, is a major final destination for euro area indirect exports that are re-exported by other trading partners. Therefore, the overall impact of a GDP shock in China, the United Kingdom and Russia on the euro area declines when direct and indirect trade are considered instead of gross trade. For the United States, the decline is much smaller (and the impact even increases for Germany).

Table

Comparison of trade impacts – gross trade versus direct and indirect trade

(percentage responses to a 1% GDP shock)

	United States		China		United Kingdom		Russia	
	Gross trade	Direct and indirect trade	Gross trade	Direct and indirect trade	Gross trade	Direct and indirect trade	Gross trade	Direct and indirect trade
Germany	0.34	0.36	0.15	0.12	0.12	0.10	0.04	0.04
France	0.24	0.22	0.09	0.06	0.09	0.07	0.03	0.02
Italy	0.23	0.22	0.10	0.06	0.08	0.06	0.04	0.03
Spain	0.22	0.19	0.07	0.04	0.08	0.06	0.02	0.02
Euro area	0.28	0.28	0.11	0.08	0.10	0.08	0.04	0.03

Source: ECB calculations.

Notes: Data are the overall impact of a 1% shock in the country shown in the respective column heading. Euro area impacts are weighted averages of the impacts on member countries, weighted by GDP at purchasing power parity.

The chart shows the decomposed trade impact of a 1% GDP shock in the four major euro area trading partners. A shock originating in the United States affects the euro area mainly via other trading partners (the echo impact, yellow bars) and through bilateral trade (orange bars). This shows the importance of the United States as an export destination for the euro area but

¹³ The import elasticities of the few economies not included in the sample analysed in Déés and Vansteenkiste (see footnote 11) are approximated by the values for countries of similar size in the same region included in their sample.

¹⁴ These estimates are based on the contemporaneous impact. The overall estimated impact could be larger when dynamic effects are also considered.

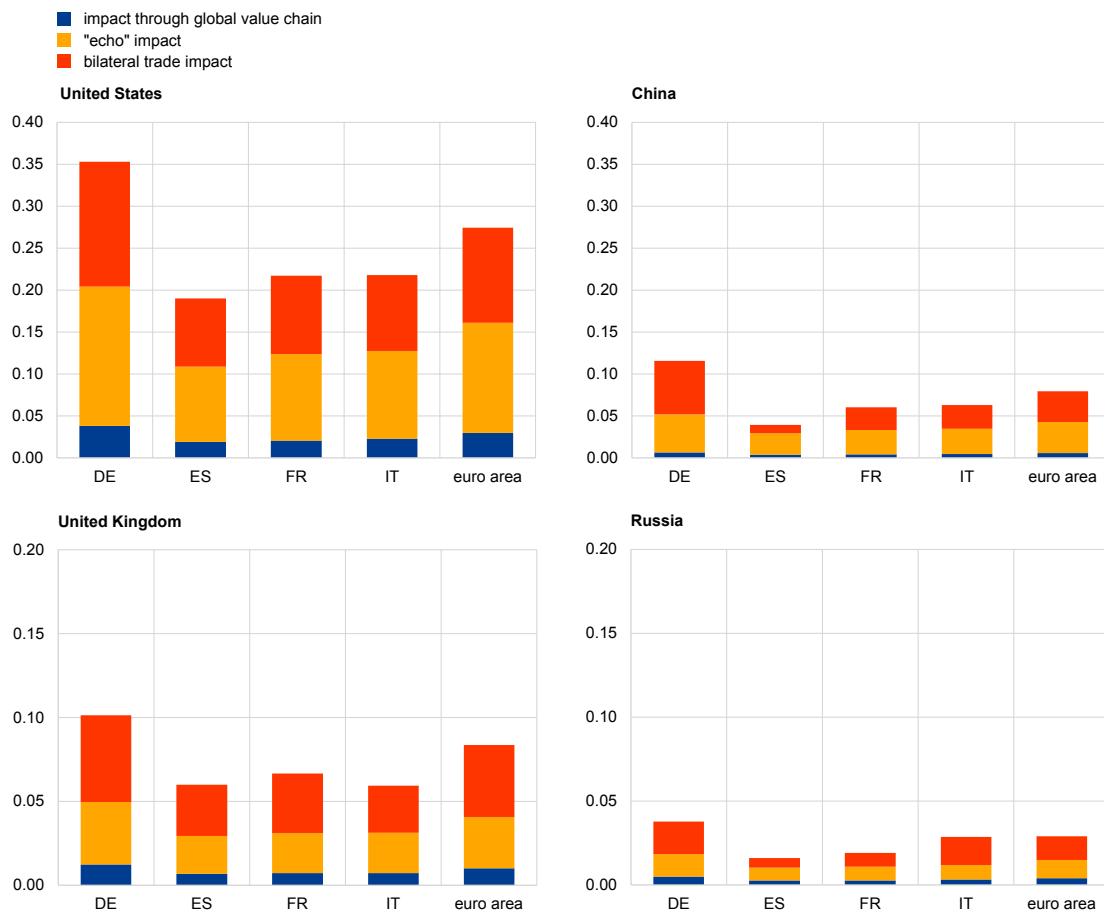
also for many of the latter's trading partners. Moreover, the euro area would also be impacted by the change in demand for its indirect exports that are passed on to the United States via trading partners (blue bars). In China, the bilateral and echo impacts are fairly equal in size, with an additional small impact through global value chains that accounts for less than a tenth of the total impact. For a shock originating in the United Kingdom or Russia, slightly more than half of the effect stems from the bilateral trade impact and more than a third from echo effects, with the rest stemming from global value chains.

Among the four largest euro area economies, Germany faces the largest impact from a GDP shock in any of the four major trading partners. This may be explained by Germany's greater trade openness compared with other European countries. Shocks transmitted via both direct and indirect trade effects are bigger for Germany than for the euro area as a whole.

Chart

Trade impact of a 1% real GDP shock in major trading partners

(percentage points)



Source: ECB calculations.

Notes: The country from which the real GDP shock originates is indicated in the title of each panel. Data for the euro area are averages of the impacts on member countries, weighted by GDP at purchasing power parity.

While this exercise outlines the importance of taking into account different trade links and the final destination of euro area exports, some caveats should be highlighted. First, the size of the impact is dependent on the underlying country-specific trade to GDP elasticities.

Recently, aggregate global trade elasticities have been on a declining path.¹⁵ If this is a result of declining elasticities in the various trading partners and not of a changing composition of trade within the global economy, it would reduce the estimated impact of an output shock on the euro area. Second, it is possible that different kinds of trade have different trade elasticities, depending on the sectoral composition and the degree of substitutability of the products being imported. In this example, the same trade elasticities are used for all kinds of trade. Third, the data underlying this analysis is only available up to 2011, and it is possible that the nature of trade has changed since then, which would affect the relationships captured in the chart.¹⁶ Moreover, the analysis only considers shocks via trade and does not take into account other transmission channels, such as the financial channel or confidence effects among firms and households. Notwithstanding these caveats, the exercise in this box serves to show how gross trade may provide a misleading picture of the importance of trading partners and the importance of different trade channels.

5 Concluding remarks

The euro area has become increasingly integrated in global trade and cross-border production chains. The nature of these trade links varies across its main trading partners. For example, the euro area has very strong direct trade links with the United States, while China and the United Kingdom are more important as intermediaries of euro area exports. This suggests that euro area activity is relatively strongly affected via trade by domestic demand developments in the United States, while less so by developments in China and the United Kingdom. In the case of China, euro area value added is mostly re-exported to the United States, but also to Japan and South Korea. As regards the United Kingdom and Russia, their role as intermediaries mainly reflects their role in processing euro area value added which is later exported back to the euro area, to other advanced economies or the “rest of the world” (see Chart 7).

The role of the euro area’s trading partners in global value chains affects the way output shocks are transmitted to the euro area. First, the bilateral trade impact on the euro area following a foreign output shock would be through direct exports to the trading partner. Second, there would be an echo trade impact, which would depend on how other trading partners are impacted and change their demand for euro area exports. Third, there would be an additional impact via trade in global value chains, as a share of euro area exports is indirect exports through a trading partner to the final destination. The final impact on the euro area following an output shock would depend on the combined effect of these different trade channels.

Quantifying these different impacts suggests a somewhat smaller effect than indicated by gross trade figures for some trading partners. This is because

¹⁵ See the article entitled “Understanding the weakness in world trade”, *Economic Bulletin*, Issue 3, ECB, 2015.

¹⁶ For example, trade in intermediate goods, which can be closely linked to increases in vertical specialisation, seems to have slowed in 2012 and 2013. See the article cited in footnote 15.

value added which originated in other countries and the exports that return to the euro area are excluded. Moreover, bilateral trade seems to account for slightly less than half of the total impact from most countries, while the echo effect is of a similar magnitude (i.e. around half). Effects through global value chains seem to account for around a tenth of the overall impact, depending on the trading partner.

Given the continual change in cross-border production structures, it is necessary to monitor these developments on an ongoing basis.

The World Input-Output Tables are an indispensable tool for analysing global value chain developments in a very granular manner. As time passes, however, data beyond 2011 will be needed to correctly assess the implications of global value chains (and their development) for the euro area economy. Therefore, initiatives encouraging the expansion or regular updates of databases such as the World Input-Output Database (or, alternatively, reliance on survey or firm-level data) will be increasingly required in the future.