Box 1

HOW HAVE GLOBAL VALUE CHAINS AFFECTED WORLD TRADE PATTERNS?

In recent decades, global trade has undergone profound changes. Relative to global output, trade has risen sharply and cross-country linkages have increased in size and complexity, in particular through the growing role of global supply chains. These shifts in the global trade landscape matter when one seeks to understand the international environment and, ultimately, global demand for euro area exports. To assess foreign demand, one needs to take into account the changing trade environment, such as the rise in intra-regional trade (e.g. among Asian countries) and the increasing importance of indirect trade links. Recently, two new datasets have been published that support such an analysis by providing a global input-output perspective on the network of trade links across countries.[1] Based on these data, this box illustrates the importance of supply chains to global trade and their effect on euro area exports.

Understanding the different channels of global demand for euro area exports

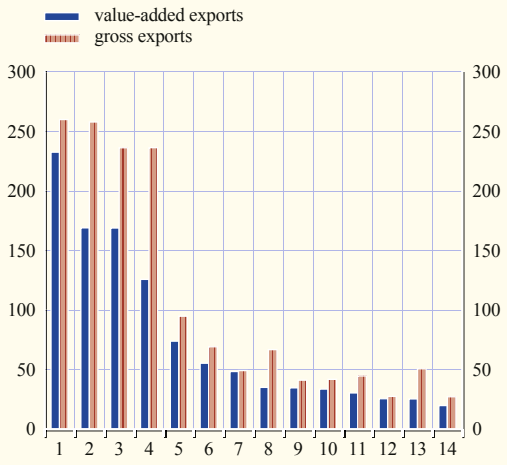
An important benefit of input-output tables is that they allow a distinction to be made between gross trade and trade in domestic value-added terms. Within a supply chain, each producer purchases inputs and then adds value, which is passed on to the next stage of production. As official trade statistics are measured in gross terms and include both "intermediate" and "final" products, they "double count", as they record the value of intermediate inputs several times as they cross international borders along the value chain. The distinction between gross and value-added trade can make a sizeable difference to the statistics, especially vis-à-vis the euro area's main trading partners. Chart A shows gross euro area exports to a selected set of extra-euro area

1 The World Input-Output Database provides annual, integrated input-output tables for 41 countries across 35 sectors, from 1995 to 2009. The first release of the separate Trade in Value Added initiative, a collaboration between the OECD and the World Trade Organization, provides indicators based on global input-output tables for 2005, 2008 and 2009.

countries in 2009, compared with exports in value-added terms, which exclude the foreign content (i.e. the import content) of euro area exports and take account of trade linkages via third countries. The results show that gross exports to the United Kingdom are 53% higher than exports in value-added terms, while for China they are 40% higher. Moreover, gross exports to central and eastern Europe[2] are 88% higher than exports in value-added terms.

Chart A Euro area value-added and gross exports in 2009

(USD billions)



Sources: World Input-Output Database and ECB calculations.
Note: "Other emerging Asia" refers to India, Indonesia, South Korea and Taiwan.

The main reason for the difference is the integration of global value chains. In this context, it is helpful to think about four channels of trade, where trade refers to euro area value-added exports of goods and services.[3] First, there are final goods which are consumed directly in the importing country (e.g. champagne, which is produced in France and consumed in an importing country). Second, there are intermediate goods that are processed and then consumed in the importing country (e.g. cocoa, which is imported to make chocolate and then consumed in that country). Third, there are intermediate goods that are processed in an importing country but then re-exported elsewhere (e.g. semiconductors imported from Japan to China and sent onwards in the form of electronic goods). And, finally, there are intermediate goods which are exported to another country, processed there and then eventually re-imported by the original country (e.g. the iPhone, which is assembled in China but contains some added value from the United States).

For each of these four channels, the table shows the top ten export destinations (measured in domestic value-added terms) for the euro area. The United Kingdom, the United States and, to a lesser extent, China, are the largest importers, in value-added terms, of euro area final goods (and services). The same three countries are also the largest importers of euro area exports of intermediate goods that are processed and then consumed in the importing country. As regards the main trading partners for euro area intermediate goods that undergo further processing and are then re-exported to third countries, China leads the way, followed by the United Kingdom, the Czech Republic and Poland. China, the United Kingdom and central and eastern Europe are the main processing centres for these intermediate goods. The proportion of exports that return to the euro area (e.g. the euro area components of the iPhone) is very small.

This distinction between channels provides a deeper understanding of demand shocks across the world. A domestic demand shock in a country that directly absorbs a large amount of euro

2 Central and eastern Europe covers Bulgaria, Latvia, Lithuania, Hungary, Poland and Romania.
3 This box elaborates on the methodology and findings of Koopman, R., Powers, W., Wang, Z. and Wei, S., "Give Credit Where Credit Is Due: Tracing Value Added in Global Production Chains", *NBER Working Paper*, No 16426, The National Bureau of Economic Research, Cambridge, Massachusetts, September 2010.

Top ten export destinations for euro area goods in 2009

(ranked by nominal euro area value-added exports in US dollars)

a) Final goods

Ranking in 2009		Ranking in 1995	Percentage of total exports
1	United States	2	3.3
2	United Kingdom	1	3.3
3	China	7	2.1
4	Russia	4	1.3
5	Poland	14	0.8
6	Japan	3	0.8
7	Sweden	5	0.7
8	Turkey	13	0.5
9	Czech Republic	12	0.5
10	Denmark	6	0.5

b) Intermediate goods absorbed in the country

Ranking in 2009		Ranking in 1995	Percentage of total exports
1	United States	1	3.6
2	China	8	3.3
3	United Kingdom	2	2.7
4	Poland	14	0.8
5	Brazil	4	0.8
6	Russia	7	0.5
7	Sweden	5	0.5
8	Czech Republic	17	0.5
9	Canada	13	0.5
10	Turkey	9	0.5

c) Intermediate goods re-exported to third countries

Ranking in 2009		Ranking in 1995	Percentage of total exports
1	China	10	1.7
2	United Kingdom	1	1.2
3	Czech Republic	7	0.7
4	Poland	11	0.6
5	Sweden	3	0.6
6	Denmark	4	0.6
7	United States	2	0.6
8	Hungary	14	0.5
9	South Korea	8	0.4
10	Canada	6	0.2

d) Intermediate goods returning to the euro area

Ranking in 2009		Ranking in 1995	Percentage of total exports
1	Czech Republic	2	0.1
2	Poland	5	0.1
3	United Kingdom	1	0.1
4	China	13	0.1
5	Hungary	7	0.1
6	Denmark	4	0.0
7	Sweden	3	0.0
8	United States	6	0.0
9	Turkey	8	0.0
10	Romania	11	0.0

Sources: World Input-Output Database and ECB calculations.
Notes: The tables distinguish between channels of trade according to the domestic value-added component of gross exports (see Koopman et al., 2010). The final column of each table shows the percentage of total euro area (value-added) exports accounted for by exports to specific countries via the channel concerned. Thus, to see the percentage of total euro area (value-added) exports accounted for by exports to the United States, for example, the four values for the United States must be added together. Furthermore, one component of gross exports which is not shown is the proportion of euro area gross exports that represents the value-added exports of other countries (i.e. through imported intermediate goods which are subsequently re-exported). Given the high import content of euro area exports, this foreign value-added component can be large.

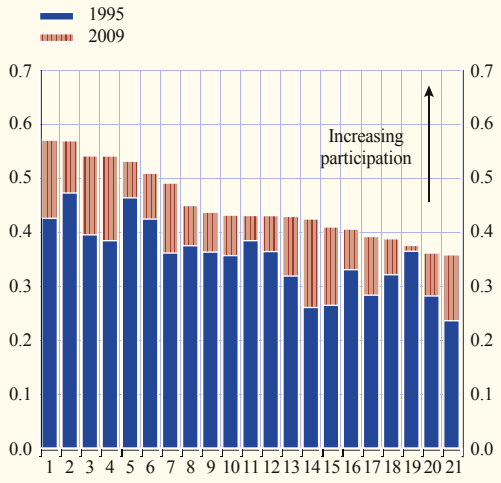
area exports (i.e. through the first and second channels), such as the United States, will have a stronger impact on the euro area than a domestic demand shock of a similar size in a country that acts, to a significant extent, as a processing centre for euro area intermediate goods (i.e. through the third and fourth channels), such as the Czech Republic and Poland. This is due to the fact that, for countries that act as processing centres, import demand depends more on the demand of its export partners than on domestic demand.

Characterising global value chains

Input-output tables can also be used to characterise the global value chain phenomenon more broadly, and to describe how countries participate in such supply chains. Participation in global value chains involves both "upstream" and "downstream" activities. An upstream supplier exports intermediate goods to a downstream producer, who adds value to these intermediate goods for further export. A country's high participation in global supply chains can thus be characterised in one of two ways: either its exports have a high import content (if it is a downstream producer), or it supplies intermediate goods for further export by

Chart B Participation in global value chains

(ratio)

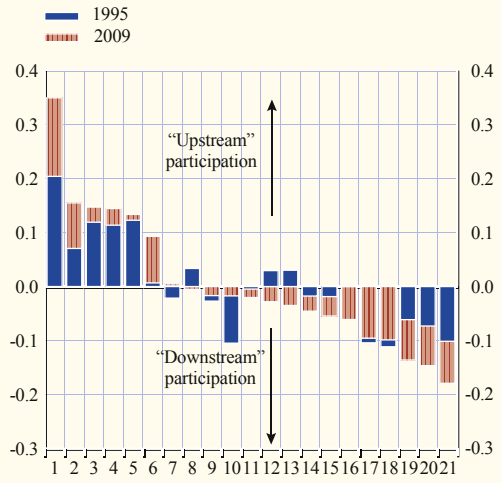


1 Hungary	8 United Kingdom	15 Turkey
2 Czech Republic	9 Germany	16 Italy
3 South Korea	10 Spain	17 China
4 Russia	11 Mexico	18 United States
5 Netherlands	12 France	19 Canada
6 Finland	13 Australia	20 Brazil
7 Poland	14 Japan	21 India

Sources: World Input-Output Database and ECB calculations.
Note: The chart shows the ratio of the sum of foreign value added in a country's gross exports and domestic value added of intermediate inputs in other countries' gross exports to the country's gross exports.

Chart C Position in global value chains

(ratio)



1 Russia	8 Germany	15 China
2 Australia	9 Spain	16 Turkey
3 United States	10 Canada	17 Mexico
4 Brazil	11 France	18 Netherlands
5 Japan	12 India	19 South Korea
6 United Kingdom	13 Poland	20 Czech Republic
7 Italy	14 Finland	21 Hungary

Sources: World Input-Output Database and ECB calculations.
Note: The chart shows the log ratio of a measure of domestic value added of intermediate inputs in other countries' gross exports to foreign value added in a country's gross exports.

other countries (if it is an upstream producer). A country's position in a supply chain can be summarised by comparing its upstream and downstream activities. Using these concepts, Chart B illustrates the high participation of central and eastern European countries in global supply chains.[4] Perhaps surprisingly, according to this measure the involvement of China is comparatively low. This emphasises the fact that, while China is an important exporter in the global economy, it also has a large number of small firms that use domestic inputs to a substantial extent. Between 1995 and 2009, participation in global value chains increased across all countries. Finally, Chart C, which measures the position of countries in global value chains, shows that countries that predominantly produce raw materials (e.g. Russia, Brazil and Australia) and intermediate components (e.g. Japan) are further upstream, while countries that focus on processing or compiling products (e.g. central and eastern European countries, and South Korea) are further downstream. Between 1995 and 2009, upstream countries moved slightly further upstream, whereas downstream countries moved further downstream.

Conclusion

While there are some caveats to this form of analysis with respect to how the data is compiled and the assumptions underlying the measures used, this box shows the potential for these data

4 For more details, see Rahman, J. and Zhao, T., "Export Performance in Europe: What Do We Know from Supply Links?", *IMF Working Paper*, No 13/62, International Monetary Fund, Washington, DC, March 2013.

to improve understanding of global trade flows and the implications of trade shocks across the world. Splitting euro area foreign demand into four trade channels shows that measures of bilateral trade in value-added terms can deviate significantly from measures of trade in gross terms. Most countries' participation in global supply chains has increased over time, while the change in relative position within those supply chains has varied across countries.