MAPPING GLOBAL VALUE CHAINS

Koen De Backer, Senior Economist, OECD (koen.debacker@oecd.org)
Sébastien Miroudot, Senior Trade Policy Analyst, OECD (sebastien.miroudot@oecd.org)

Abstract

Understanding the complexities of global production is a challenging task. In a world of offshoring, outsourcing and vertical specialisation, activities of firms are spread across countries and national statistics cannot fully account for international production. Building on recent initiatives to provide new statistical and analytical tools on world trade and output, this paper provides indicators on the strength, length and patterns of global value chains (GVCs) across 56 economies. These indicators are calculated at the country and industry level using the recently developed OECD inter-country input-output (ICIO) model. The data are preliminary and tested with two case studies, one in the manufacturing sector (the motor vehicle industry) and one in the services industry (business services).

Keywords: fragmentation of production, global value chains, vertical linkages, vertical specialization, multinational firms.

JEL Classification: F10, F23, L23.

1. Introduction: the rise of global value chains

World trade and production are increasingly structured around “global value chains” (GVCs). A value chain can be simply defined as the “full range of activities that firms and workers do to bring a product from its conception to its end use and beyond” (Gereffi and Fernandez-Stark, 2011). Typically, a value chain includes the following activities: design, production, marketing, distribution and support to the final consumer. These activities can be performed within the same firm or divided among different firms. The fact that they are increasingly spread over several countries explains why the value chain is regarded as “global”.

The concept of GVC was introduced in the early 2000s and has been successful in capturing several characteristics of the world economy:

- The increasing fragmentation of production across countries. Global value chains link geographically dispersed activities in a single industry and help to understand shifting patterns of trade and production. Global value chains are useful to apprehend the interconnectedness of economies.

- The specialisation of countries in tasks and business functions rather than specific products. While most analytical frameworks still assume that goods and services are produced domestically and compete with “foreign” products, the reality is that most goods and an increasing number of services are “made in the world” and that countries compete on economic roles within the value chain.

- The role of networks, global buyers and global suppliers. Global value chain analysis gives insights on economic governance and helps to identify firms and actors that control and coordinate activities in production networks.

For all these reasons, there is a need to better understand how global value chains work and to provide new data and analysis to researchers and policymakers in the field of trade, industry and innovation. This paper takes stock of the growing research on GVCs and develops a series of indicators and case studies, based on newly available data.

The rest of the report is organised as follows. Section 2 provides a brief description of the data used in the project, as well as the methodology. Some stylised facts on the importance of GVCs are presented in Section 3, as well as aggregate results for OECD countries and selected non-OECD economies. Section 4 introduces two case studies, one in the manufacturing sector (the motor vehicle industry) and one in the services industry (business services). Section 5 concludes.

2. Data and methodology

Global value chains challenge the way statistics on trade and output are collected. There is a growing awareness that current statistics can give the wrong picture (Maurer and Degain, 2010). Trade statistics in particular are collected in gross terms and record several times the value of intermediate inputs traded along the value chain. As a consequence, the country of the final producer appears as creating most of the value of goods and services traded, while the role of countries providing inputs upstream is overlooked. Bilateral trade statistics and output measures at the national level make it difficult to visualise the “chain” or the production network.
The OECD Inter-Country Input-Output model

The indicators on global value chains presented in the report are calculated with the OECD Inter-Country Input-Output model. The model consists of three global input-output matrices estimated for the years 1995, 2000 and 2005. Based on national input-output tables harmonised by the OECD, the model covers 56 countries (55 OECD and non-OECD economies plus the “rest of the world”) and 37 industries.

The national input-output tables on which the model is built are those developed by the OECD in the STAN I/O database. They are linked internationally with trade flows decomposed by end-use. The Bilateral Trade Database by Industry and End Use (BTDIxE) covers goods and relies on the Broad Economic Categories (BEC) classification to identify consumption, intermediate and capital goods. Data on services are based on official statistics but are complemented with estimates (using gravity modelling and optimisation techniques) to fill the gaps and decompose trade flows by end-use.

The inter-country input-output matrix is organised as shown on the diagram below:

The model covers the following 56 economies:

- All OECD countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

- Selected non-OECD economies: Argentina, Brazil, Brunei, China, Chinese Taipei, Hong Kong, India, Indonesia, Latvia, Lithuania, Malaysia, Malta, Philippines, Romania, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Viet Nam.

- “Rest of the world” (to account for all other economies not included, representing less than 5% of world output).

The 37 sectors included are defined on the basis of the ISIC Rev. 3 classification and harmonised across countries. See www.oecd.org/sti/inputoutput/ for more details on the aggregation and specific country notes.

---

1. We use a preliminary version of this model and the data will be updated.

2. An extended version of the BEC classification has been developed to deal with specific goods that are not clearly for consumption, intermediate or capital use (Zhu et al. 2011). See Miroudot, Lanz and Ragoussis (2009) for the estimation of bilateral trade flows of intermediate services.
The OECD ICIO model allows the analysis of GVCs from a truly global perspective detailing all transactions between industries and countries for 37 industries. In contrast, previous research often used input-output data for a limited or even single country, hence offering only a partial picture of the GVC reality.

However, there are several assumptions behind the construction of the OECD ICIO model and many gaps in the data. As there is on-going work on the improvement of the tool, one should be aware that the results presented in this paper are preliminary. In addition, such a model can only provide rough estimates of the contribution of each economy to global production. At the level of aggregation where the results are presented, the margin of error remains low. But the more specific results are in terms of countries and industries, the more cautious should the reader be about the nature of the data reported.

**Participation in GVCs**

The first question that comes to mind when thinking about GVCs is to what extent countries are involved in a vertically fragmented production. One way to measure it – and historically the first indicator calculated in the literature – is to measure the vertical specialisation share, which can be understood as the import content of exports. The indicator measures the value of imported inputs in the overall exports of a country (the remainder being the domestic content of exports).
This indicator was first introduced by Hummels et al. (2001) and can be computed on the basis of national input-output tables. More recent work has introduced a value-added approach in the VS share (Koopman et al., 2011; Johnson and Noguera, 2012; Stehrer, 2012). The value of imports used to produce exports and the foreign value-added in exports are different because foreign imports can incorporate domestic value-added. An inter-country inter-industry input-output matrix allows for the calculation of value-added that returns to the domestic economy embodied in foreign inputs.

A limitation with the import content (or foreign value-added content) of exports is that GVC participation is only measured upwards, through the incorporation of foreign inputs. Countries at the beginning of the value chain that export raw materials or inputs to countries that process them have, by definition, a low VS share. Koopman et al. (2011) thus add to the foreign value-added in exports the share of exports made of domestic value added used in third countries to produce other exports. The GVC participation index is then an index based on these two shares, hence giving a more complete picture of the involvement of countries in GVCs. As opposed to the import/foreign VA content of exports, this indicator also takes into account what happens downstream and how goods and services domestically produced are further used in other countries.

Following Koopman et al. (2011), we calculate in the OECD ICIO model the foreign value-added (FV) embodied in gross exports (E) and the domestic value-added embodied in third countries’ gross exports (IV). The GVC participation index for country i and industry k is then:

\[ GVC_{\text{participation}}_{ik} = \frac{IV_{ik}}{E_{ik}} + \frac{FV_{ik}}{E_{ik}} \]

The higher the foreign value-added embodied in gross exports and the higher the value of inputs exported to third countries and used in their exports, the higher the participation of a given country in the value chain.

**Length of GVCs**

The index of the number of production stages is proposed by Fally (2011) and calculated for the US economy with a single country input-output matrix. Using our inter-country inter-industry framework, we calculate our index of the length of GVCs as:

\[ N_{ik} = 1 + \sum_{jI} \mu_{ijkl} N_{jl} \]

---


4. For example, if country A exports an input to country B used to produce another input imported by country A and used by A to produce a final good shipped to C. In this case, the import content of exports in country A includes the value of the input exported from A to B, while in value-added terms, this input is domestic and not part of the foreign value-added.

5. There is still some debate on how to correctly measure FV and IV. We have followed the Koopman et al. (2011) formulas for this exercise, as we believe it is a good approximation of the results. We know that the authors of the paper are now revising their formulas and OECD has also on-going work on the decomposition of value-added in gross exports. See also Stehrer (2012) for a discussion of the issues in such decomposition.
where \( N_{ik} \) is the index for industry \( k \) in country \( i \), \( \mu_{i,jkl} \) is the value of inputs from industry \( l \) in country \( j \) used to produce one dollar of goods in industry \( k \) in country \( i \), and \( N_{jl} \) is the value of the index in industry \( l \) in country \( j \). There is one equation for each industry \( i \) in country \( k \) where the value of \( N \) is a function of \( N \) in all other industries and countries. This forms a system of linear equations that has a unique solution.

The index takes the value of 1 if there is a single production stage in the final industry and its value increases when inputs from the same industry or other industries are used, with a weighted average of the length of the production involved in these sectors. We calculate \( \mu_{i,jkl} \) directly from the ICIO matrix where we have the values of all inputs used by one industry in a given country. In addition, we can distinguish between domestic inputs and foreign inputs, by calculating the index in the country and industry dimension. This is how we decompose the index according to domestic production stages and foreign production stages.

The approach is conceptually close to the calculation of average propagation lengths in the input-output literature (Dietzenbacher and Romero, 2007). One possible bias is related to the number of industries in the input-output matrix. In the above equation, “1” corresponds to a single stage of production in one industry that could be split in two in a more disaggregated input-output table. The value of the index is therefore dependent on the number of industries included in the analysis, but Fally (2011) explains that the results are proportional to the actual number of production stages. If it was possible to compute it with plant-level data, the value of the index would be the actual number of production stages. In a more aggregate framework, we can still compare the length across countries and industries but with values that have no meaning per se but are proportional to the actual ones.

**Distance to final demand**

The distance to final demand is the second indicator suggested by Fally (2011) and calculated in a similar way. For an open economy, the index is defined as:

\[
D_{ik} = 1 + \sum_{j,l} q_{ijkl} D_{jl}
\]

where the coefficient \( q_{ijkl} \) is the fraction of production from industry \( k \) in country \( i \) that is purchased as an intermediate good by industry \( l \) in country \( j \). We have again the data directly in the ICIO matrix and we solve a system of linear equations to retrieve the values of \( D \).

The distance to final demand can be interpreted as the length of the value chain when looking forward and this is why the formula is close to the previous index. A similar index is used by Antràs et al. (2012) and defined as the country’s “upstreamness” in the value chain. The authors show that the results are similar to Fally (2011). And again, one could see a parallel with the backward and forward linkages as defined in the I/O literature.

All of the above indicators are not correlated and emphasize different characteristics of GVCs. Whether countries have a high or low participation rate in GVCs, their position can be upstream or downstream and the length of the GVC does not depend on this position.

**3. Main findings**

Calculated at the country and industry level, the indicators presented in Section 2 provide rich information on the importance, depth and length of global value chains, as well as the specific position of countries in these production networks. We summarize below the most interesting findings.
On Figure 1, the participation index is calculated for OECD economies. Small open economies such as the Czech Republic, Luxembourg or Estonia source more inputs from abroad than large countries, such as the United States or Japan (where due to the size of the economy, a larger share of the value chain is domestic). But for these large economies, this is useful to focus on the participation index rather than the import content of exports. For example, Koopman et al. report that less than 10% of the value of US exports is made of foreign value-added, while taking into account the use of US intermediates in other countries exports, their participation in GVCs rises to more than 40% of gross exports.

**Figure 1. GVC participation index in OECD countries, 2005**

Foreign value-added and domestic value-added used in third countries’ exports, as a share of gross exports (%)

Source: Authors’ calculations using the OECD ICIO model, index based on Koopman et al. (2011).

Comparing OECD and non-OECD economies (Figure 2), the participation in GVCs is of a similar magnitude in the two groups of countries. Large economies, such as China and Brazil, have a lower share of exports made of inputs taking part in vertical trade, as opposed to small economies, such as Singapore or Chinese Taipei. But Figure 2 only includes emerging economies; the participation in GVCs would be lower for least developed countries (LDCs) if data were available to include them in the global input-output model.
While the foreign value-added in imports and the domestic value-added in exported inputs used in third-countries give an idea of the importance of vertical specialisation, they do not indicate how “long” value chains are, i.e. how many production stages are involved. For example, a large share of foreign value-added could correspond to the use of expensive raw materials in a very simple value chain, while conversely a high share of the value could be added in the final stage of the production process. This is why an indication on the “length” of GVCs is useful and complementary.

**Figure 3. Average length of GVCs across all industries**

Source: Authors’ calculations using the OECD ICIO model, index based on Fally (2011). The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.
Figure 3 shows the average length for all industries and highlights the increase in the length of value chains between 1995 and 2005, as well as their internationalisation. At the aggregate level and averaged across all industries, the increase is small but more variation can be observed for specific industries (Figure 4). The five industries with the highest index of fragmentation are: motor vehicles, basic metals, electrical machinery, textile and food. The food industry is less internationalised than the four others. Services industries have on average shorter value chains. Business services and telecommunication services are the activities where the length is the highest in the services sector.

Figure 4. Length of GVCs by industry, 2005

Source: Authors’ calculations based on the OECD ICIO model, index based on Fally (2011). The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.

Once the depth and length of particular GVCs is assessed, the important question is where countries are located in the value chain. A country can be upstream or downstream, depending on its specialisation. Countries upstream produce the raw materials or intangibles involved at the beginning of the production process (e.g., research, design), while countries downstream do the assembly of processed products or specialise in customer services.

The average value of distance to final demand, by country and over all industries, is presented in Figure 5 for selected OECD countries and non-OECD economies. Looking at the change in the value of the index between 1995 and 2005, Figure 5 only includes economies where the value has increased (or decreased) by more than 10%. These economies are the ones that have changed the most the structure of their trade and output as a consequence of the fragmentation of production.

In this group, there is an increase in the “upstreamness” for all economies, with the exception of South Africa. A higher index means that these economies are now more specialised in the production of inputs at the beginning of the value chain. The increase in the index is very high for economies such as Estonia, Singapore and Turkey and related to their successful integration into global value chains.

Source: Authors’ calculations based on the OECD ICIO model, index based on Fally (2011). The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.
There are very few countries where the distance to final demand has decreased, a notable exception being the United States (Fally, 2011). The fact that, on average, most countries move upstream is consistent with the overall increase in the length of GVCs and the outsourcing phenomenon. When the production of some inputs is outsourced, their value-added is moved backward to the industries supplying intermediate inputs and the distance to final demand increases.

4. Analysis of specific GVCs

Case study 1: the motor vehicle industry

The industry “Motor vehicles” is an industry where the unbundling of production has already been taken place for decades; hence, outsourcing/offshoring by companies have pushed the international fragmentation of production quite far in this industry. The value chain of motor vehicles is largely organised through a hierarchical structure, with the large automotive manufacturers positioned on top of the pyramid as lead firms responsible for design, branding, and final assembly. One level down, first-tier suppliers produce complete subsystems by cooperating with a large network of lower tier suppliers and subcontractors.

Close relationships have developed especially between car assemblers and first tier suppliers as these last ones have taken up a larger role in the whole production process, including design. These suppliers have increasingly developed into global suppliers since lead firms increasingly demand that their largest suppliers have a global presence and system design capabilities as a precondition to being considered as a source for a complex part or subsystem (Sturgeon and Florida, 2004).

Notwithstanding the global activities of lead firms and first tier suppliers, regional production is still very important in the motor vehicle industry. High transportation costs make intercontinental shipping very costly especially in downstream activities, e.g. complete cars or subsystems. In addition, political pressure may also motivate lead firms to locate production close to end markets; the high cost and visibility of automotive products can create the risk of a political backlash if imported vehicles become too large a
share of total vehicles sold. This in turn creates pressure for supplier co-location within regional production systems for operational reasons, such as just-in-time production, design collaboration and the support of globally produced vehicle platforms (Van Biesebroeck and Sturgeon, 2010). As a result, the supplier network in the motor vehicle industry consists of a large number of suppliers, some of them pure local suppliers (typically lower tier suppliers), others global suppliers with a local presence (top tier suppliers).

GVCs are very prominent in the motor vehicle industry, which is reflected in the index of the length of GVCs (Figure 6). Except for a couple of countries, the index of the “number of production stages” is above 2.5 (recall that the index for a final industry without production stages equals 1) illustrating the importance of vertical linkages between the motor vehicle industry and other industries. On average, almost half of these stages are located abroad, underlining the international (although regional instead of truly global) character of these motor vehicle chains. Smaller countries display on average more international production stages, illustrating the fact that these countries depend more on (directly and indirectly) imported intermediates. The growing importance of Central European countries like Hungary, Slovak Republic and Estonia as locations for car assembly of imported intermediates is clearly illustrated.

Korea is an example of an economy where the motor vehicle industry is organised completely differently: it shows the largest number of production stages across all economies, but most of these stages are executed within Korea. This reflects very well the domestic organisation structure of the large conglomerates tied in a large network of domestic suppliers. In more recent years, this structure has become more internationally oriented. China and Japan are also characterised by a strong domestic focus of the production process.

Figure 6. Index of the length of the motor vehicle industry's GVC, 2005

Source: Authors’ calculations using the OECD ICIO model, index based on Fally (2011).

The participation of countries in motor vehicles’ GVCs seems to be strongly driven by the importance of imported intermediates. Figure 7 shows large participation indexes especially for smaller economies with important car assembly activities: again Hungary, the Slovak republic, Estonia but also Belgium, Portugal, and Vietnam.
The overall participation of larger countries in motor vehicles’ GVCs is more limited, as these countries source relatively less intermediates from abroad. The participation of these countries having important activities in the motor vehicle industry, like e.g. the United States, seems to be relatively more explained by the use of US intermediates in the production of other countries. Companies in the United States are often located at the higher levels in the supplier networks of automotive industry, meaning that intermediates that are produced in the United States are exported to other countries and included there in more downstream production activities. However, because of transportation costs these intermediates are only shipped to (a limited number of) countries nearby.

Figure 7 also presents the indicator measuring the distance to final demand; overall this index is rather low and shows only a limited variability across economies, which is likely to be explained by the strong regional concentration of production in motor vehicles. As the production of motor vehicles is located close to end markets, most economies are only a couple of stages “away” from the final customer.

Some additional insights about the main players in the motor vehicles’ GVCs are provided by the results of a preliminary network analysis of the trade flows of intermediates in this industry (Figure 8). The actors in the network are the importing/exporting countries, while the network relations are determined by the intensity (i.e. the export and import values of intermediates) of bilateral trade.

The regional organisation of the production process is clearly demonstrated when distinguishing the source country of the imported intermediates: intra-regional sourcing within the 3 main regional blocks is important in the motor vehicle industry. EU countries source the majority of their intermediates from other European countries, while North American Free Trade Agreement (NAFTA) partners largely source from within NAFTA. Also in Asia a clear regional integration has developed through the sourcing of intermediates largely from within the region. Nevertheless, one also observes the important trade links between these 3 regional producing/trading blocs on Figure 8.
The size of the bubbles is proportional to the average trade volume of the individual countries, and hence identifies the main actors in this industry. The strong position of Germany within Europe is clearly illustrated, not only because of its large volumes of exports and imports, but also because most EU countries are directly and strongly linked with Germany. The important car assembly activities of German car manufacturers in countries like Poland and Hungary are clear examples of this.

Within the NAFTA region, there is a network being formed around the United States, with important links to Canada as well as Mexico. A central role within Asia is occupied by Japan with important links China, Thailand and other South East Asian countries. Korea displays a somewhat distinct (sub) network within the Asian GVCs in the motor vehicle industry. These insights are confirmed by calculating some specific network analysis metrics: indicators on centrality, closeness, node out/in strength all show the central positions of Germany, the United States, Japan and to a lesser degree France.

**Figure 8. Trade network of intermediates, motor vehicle industry, 2009**

Note: the size of the bubbles is related to the average of total imports and exports by country; the (dark) colour of the network relations between countries relates to the intensity of the bilateral trade between countries.

Source: Authors’ calculations based on the OECD Bilateral Trade by Industry and End-Use Category database.

**Case study 2: the business services value chain**

In Section 3, there was some evidence that services are generally less produced through GVCs. A large part of the services sector is made up of small domestic companies that provide services directly to domestic consumers with very limited (foreign) inputs. But it would be wrong to assume that this is the
case for all services industries. The fragmentation of production takes place in the services sector as well and a good example is the business services sector. As firms have redefined their boundaries and focused on their core competencies, an increasing number of business services previously supplied within companies have been outsourced and offshored. Looking at the OECD Trade in Services by Partner (TISP) database, computer services, legal, accounting, management consulting and public relations services, as well as miscellaneous business, professional and technical services represent a higher share of total trade in services today as opposed to 10 years ago. Business services are an integral part of the global value chain and to some extent what ties it together.

As described by Gereffi and Fernandez-Stark (2010), business services can be horizontal, i.e. provided across all industries, or industry-specific. Horizontal activities include services that are needed by any type of company: information technology services (e.g. software research and development, IT consulting), knowledge process outsourcing (KPO) services (e.g. market intelligence, legal services), business process outsourcing (BPO) services (e.g. accounting services, human resource management, supply chain management). Vertical activities correspond to services that are part of a specific value chain in the manufacturing sector (e.g. clinical trials in the pharmaceuticals value chain) or in another services industry (e.g. private equity research or risk management analysis in the banking and insurance industries).

The market for business services is concentrated in high-income countries where most firms operate and in particular have their headquarter activities. But the industry has become global with the offshoring of some of these services to developing economies where the skills and talents can be found at a lower cost. The model of lead firms in the industry is the “global delivery model” (Sako, 2009). Firms create a network of support offices in the countries where their customers are located. Specialised delivery centres are then located in lower cost countries, such as India or the Philippines. All activities are coordinated from the headquarters. This “spider-type” of network ensures the close contact with clients while achieving scale economies.

Based on the indicators previously presented, we can characterise the role of specific countries in the business services value chain for two segments: “computer and related activities” and “other business services”. The first category covers most of the information technology outsourcing (ITO), software and infrastructure services, while the second corresponds to all other horizontal activities (KPO, BPO) and includes some industry-specific services.

On Figure 9 are represented the participation and distance to final demand indexes in order to characterize the position of specific countries. With respect to computer services, there are marked differences across economies. India, one of the main exporters for this type of services, is positioned really downstream. Indian companies serve mainly final producers at the end of the value chain. The participation of India in the computer GVC is as a consequence relatively low. Such a result should not be interpreted negatively. An economy can be very strong in exporting services as part of a short value chain close to final consumers. This is because India is specialised in horizontal activities and exports computer services mainly to companies in other services sectors (where the fragmentation of production is lower) that its GVC participation and distance to final demand are on average lower. Israel, another important exporter of computer services, is placed next to India with similar results.
At the opposite side of Figure 9 for computer services, there are economies like Chinese Taipei and Estonia, specialised more upstream and in services that are produced and traded in the context of GVCs. This is the case in particular of IT services supporting specific industries. Such services are inputs that companies need upstream when they research and design new products or find solutions for their customers. The value of these IT services then “trickles down” all along manufacturing and other services value chains, explaining the higher distance to final demand and the higher participation rate. Gereffi and
Fernandez-Stark (2010) provide as an example of an economy specialised in industry-specific vertical activities, the Czech Republic. This country is also shown with a relatively high distance to final demand and high participation rate, a result consistent with their observation.

Turning now to “other business services”, there are fewer differences across economies in the second half of Figure 9. Because a wide variety of services are included in this category, the results tend unfortunately to be averaged and are less interesting than for computer services. But still there is a contrast between economies specialised upstream and downstream. This time, India is among upstream countries. For business services not related to computers, the country is further from final demand and participates more in long GVCs. The country replacing India downstream is the Philippines. Again, the results are consistent with the analysis of Gereffi and Fernandez-Stark (2010) indicating a specialisation of the Philippines in BPO services provided horizontally to all types of companies in all sectors.

Figure 9 highlights the potential of global value chain analysis in the context of policymaking. The fact that strong exporters can be placed downstream or upstream has for example consequences for their trade strategy and the transmission of macro-economic shocks. Countries placed upstream and more involved in GVCs face trade barriers all along the chain and the demand for their products depends on final demand in third countries, while countries downstream are more affected by direct barriers to their exports in the countries of final consumers. For example, the literature has identified a “bullwhip effect”, where the impact of the 2008-09 trade collapse was amplified along the value chain (Altomonte et al., 2011).

5. Concluding remarks

The increasing importance of GVCs during the past two decades has significantly reshaped the global economy. Hence GVCs are also expected to generate substantial impacts on national economies. The size and direction of these effects are, however, not yet fully understood, since the empirical evidence on GVCs remains limited and largely falls short of capturing their impact on national economies. The last years have witnessed a growing number of case studies on the globally integrated value chain at the product level, but of course these analyses only depict the situation for a specific product.

More aggregate evidence has also been developed in order to get a more comprehensive picture of GVCs. The OECD has, in co-operation with the WTO, launched an ambitious project on the measurement of trade in value-added terms. Inter-country input-output tables and a full matrix of bilateral trade flows are used to determine the trade in value-added data. Since these data capture the domestic value that countries are adding to goods and services, the results will give a better picture of the integration and position of countries in GVCs.

Policy makers everywhere are looking for more and better policy evidence to examine the position of countries within international production networks. This paper has developed a number of indicators that we hope can help policy makers assessing the role of their country in these GVCs and exploring which policies are needed to optimally benefit from the new international organisation of productive activities.

From the data presented in this paper, we can emphasise the following stylised facts:

- Even at the aggregate level, empirical data on trade and output confirm the fragmentation of production and the emergence of global value chains. Recent indicators introduced in the literature gives a better understanding of the depth of the phenomenon. On average more than half of the value of exports is made up of products traded in the context of global value chains.

- Global value chains are not limited to Asia, all OECD economies show a comparable level of participation in GVCs, differences being between large economies that rely less on international
trade and production and small open economies more inserted in global production networks. While most studies on GVCs have focused on Asia, Europe shows a comparable if not higher level of participation in GVCs.

- Successful emerging economies have become more specialised in intermediate inputs and generally increased their “upstreamness”. This can be seen in Asia (with Singapore, Chinese Taipei and the Philippines), in Europe (with Estonia and Turkey), as well as in the Americas (with Chile and Mexico).

As the results are based on a preliminary version of the OECD inter-country input-output model, we will update these indicators and they are presented for a discussion of methodological aspects. These indicators can then be used in analytical work to further understand the impact of GVCs on trade, growth and employment. In particular, once the position and participation of countries in the GVC have been identified, the next step is to understand what determines this position and participation and what the policies are that have a positive or negative impact on the gains expected from GVCs.
REFERENCES


