

C. The rise of global value chains

Fragmentation of global production is not a new phenomenon, but its importance has been growing over time. This trend has resulted from technological innovations in communication and transportation, which have lowered coordination costs, allowing countries to specialize in production of specific tasks or components, rather than entire final products.

This section looks at how the nature, scale and scope of global value chains (GVCs) have changed dramatically during the last two decades.

It examines how GVCs can offer developing countries opportunities to integrate into the world economy at lower costs but highlights that gains from GVC integration are not automatic. It considers the risks posed by GVC participation and how various policies are correlated with countries' participation in GVCs.

Contents

1	Unbundling production: new patterns	80
2	GVCs: opportunities and challenges for development	94
3	Risks related to GVC participation	108
4	Policies affecting GVCs	113
5	Conclusions	121
6	Appendix Table C.1	127

Some key facts and findings

- Global value chains (GVCs) can provide an opportunity for countries to integrate into the global economy at lower costs by producing only certain components or tasks rather than complete final products.
- More than half of developing country exports in value-added terms involve GVCs. The share of trade in parts and components between developing countries has quadrupled over the last 25 years. Services play a central role and constitute more than one-quarter of exports from developing countries. Developing economies are becoming important sources and recipients of foreign direct investment (FDI).
- Initial integration into GVCs typically leads to a productivity-enhancing movement of labour from agriculture to manufacturing and services. When a country gets sufficiently close to having the capacity to produce at world-standard quality and efficiency levels, technology and knowledge transfers – often facilitated through FDI – can catapult it over these thresholds. At later stages of development, upgrading to higher value-added tasks in GVCs can help to drive development.
- Participation in GVCs may however involve risks. For example, while it may make industrialization easier to achieve, competitive advantage can become more fleeting, increasing vulnerabilities to relocation of firms.
- Countries with a favourable business environment and low tariffs participate to a greater extent in GVCs. Aid for Trade facilitation can help address some obstacles, such as lack of infrastructure and customs barriers. Trade in intermediate goods is associated with the integration of trade partners beyond tariffs: more than 40 per cent of trade agreements in force today include provisions related to competition policy, investment, standards and intellectual property rights.

GVCs are often thought of as a relationship between the North (developed countries) and the South (developing countries), but data show that developing countries are increasingly engaging in international production, boosting South-South trade. The deepening of services links and their complementarity with manufacturing play a key role, enabling the efficient combination of the various fragments of the production processes (see Section C.1).

GVCs can offer developing countries opportunities to integrate into the world economy at lower costs – but gains from GVC integration are not automatic. Initial integration into GVCs typically leads to favourable structural transformation as labour is moved to higher productivity activities. But not all countries manage to join GVCs; only those sufficiently close to being able to produce at world standard quality and efficiency levels are able to participate. In these cases, knowledge and technology transfers, which are often facilitated through foreign direct investment (FDI) and openness to new imports, can trigger initial integration. However, developing countries initially join GVCs in low-skill tasks that can be easily shifted to competing countries, and thus their value capture can remain limited. Upgrading within GVCs can then constitute a way to underpin development thereafter. Yet, upgrading to more sophisticated tasks with high value capture, such as R&D, design, or branding, can be hard to achieve (see Section C.2).

GVC participation also holds various risks. It typically heightens vulnerability to global business cycles and supply disruptions. Also, it may adversely affect income inequality within countries and the risks increase when firms quickly relocate, which can cause social displacement. Further risks relate to labour and the environment and a narrow field of learning, which is the outcome when the capabilities that are acquired cannot be easily transferred to other, higher value-added activities (see Section C.3).

The literature and the data suggest that various policies are correlated with countries' participation in GVCs. These include country-specific domestic policies to improve the business environment, tariff reductions, especially on intermediate goods trade, and deep integration aimed at regulatory convergence (see Section C.4).

1. Unbundling production: new patterns

Historical evidence confirms that globalization is not a new phenomenon, as has been discussed in Section A. International fragmentation of production has become increasingly pronounced since the mid-1980s (Baldwin and Martin, 1999; Baldwin, 2006; Baldwin, 2011b). However, interest in GVCs has significantly increased over the last ten years (see Table C.1). This section highlights the new patterns in GVCs in order to understand why economists and policy makers increasingly focus their attention on this phenomenon.¹

Table C.1: Results from a Google Scholar search of "global value chains", 1980–2013

	Number of results
1980–89	6
1990–93	3
1994–97	17
1998–2001	156
2002–05	1,310
2006–09	4,200
2010–13	7,210

Source: <http://scholar.google.ch/>

Note: Number of entries of scholarly literature as a result of a Google Scholar search of the exact phrase "global value chains". Similar outcomes are achieved by searching for other terms capturing the phenomenon of internationalization of production. Search conducted on 10 December 2013.

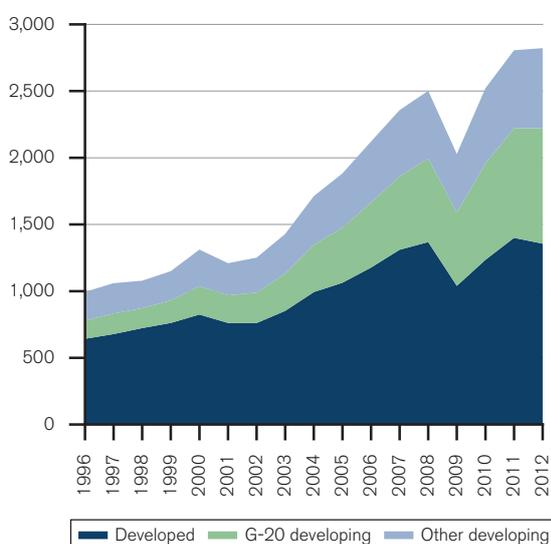
The prominence of production through GVCs requires particular statistics to measure international trade. Throughout this section, two complementary measures will be used to illustrate the new patterns of trade that originate from the diffusion of GVCs. The simplest way to capture the importance of GVCs is based on traditional trade statistics. The share of imports of parts and components gives an approximate idea of the involvement of countries in international production networks. Nonetheless, this measure bears an important limitation. As will be explained in detail later, traditional gross measures of trade are flawed by double counting the value of intermediate goods in international transactions.

In order to deal with the problem of double counting, a more sophisticated way to calculate how much countries and industries are integrated into GVCs is to compute a participation index based on novel measures of trade in value-added terms. The concept and construction of the GVC participation index is described in more detail in Box C.1. The objective of this participation index is to capture backward and forward engagement in GVCs. A limitation of this index is the assumption that the production network is composed of at least three different stages or steps performed sequentially in different countries. The participation index does not capture the involvement in GVCs of countries that, for example, import intermediate goods that are assembled into final goods consumed domestically.² This section reports descriptive statistics and results using both measures in order to give a more complete picture of GVCs.

(a) The increasing role of developing countries in GVCs

International trade has been characterized by the growing interconnectedness of production processes across countries, with each country specializing

Figure C.1: Imports of parts and components by country group, 1996–2012 (US\$ billion)



Source: UN Comtrade database, WTO Secretariat.

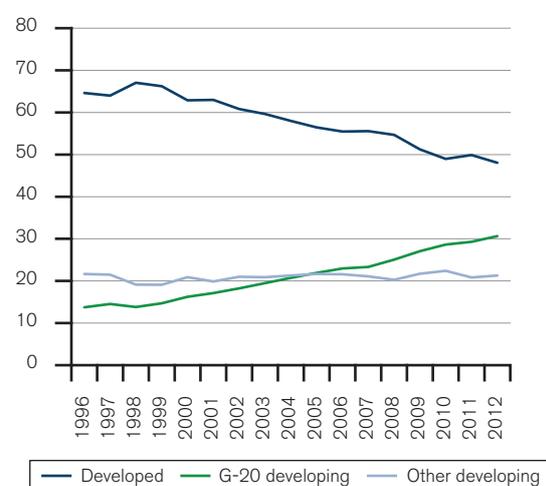
Note: "Parts and components" are defined as the Standard International Trade Classification (SITC) equivalent of Broad Economic Category (BEC) parts and components plus unfinished textiles in SITC section division 65. The category "other developing" also includes least-developed countries (LDCs), which represent a very small share.

in particular stages of production. Communication and coordination technology together with low transportation costs have permitted the unbundling of production. World imports of parts and components have steadily increased over the past decades (see Figure C.1). Today, more than one quarter of world imports in manufactured goods are represented by intermediate imports (parts and components). The only exception is the sharp decline of trade in parts and components in 2009 following the financial crisis (for more discussion on this, see Section E).

The increase in trade in parts and components has been very similar to the growth of total imports. Therefore, the share of imports of parts and components within total imports remained relatively constant between 25 and 29 per cent from 1996 to 2012. The value of imports of parts and components by LDCs as a share of their total imports is lower and remained relatively constant at around 18 per cent until 2007. In 2008, this share declined to 10 per cent and it remained low until 2012.

Figure C.2 illustrates how the contribution to trade in parts and components of different groups of countries has changed over time. Developed economies contributed to almost two-thirds of the world imports of intermediate inputs in 1996 but less than a half in 2012. The decrease in advanced economies' share of trade in parts and components is mainly due to the increase of imports of G-20 developing economies. China is the main driver of

Figure C.2: Share in imports of parts and components by country group, 1996–2012 (per cent)



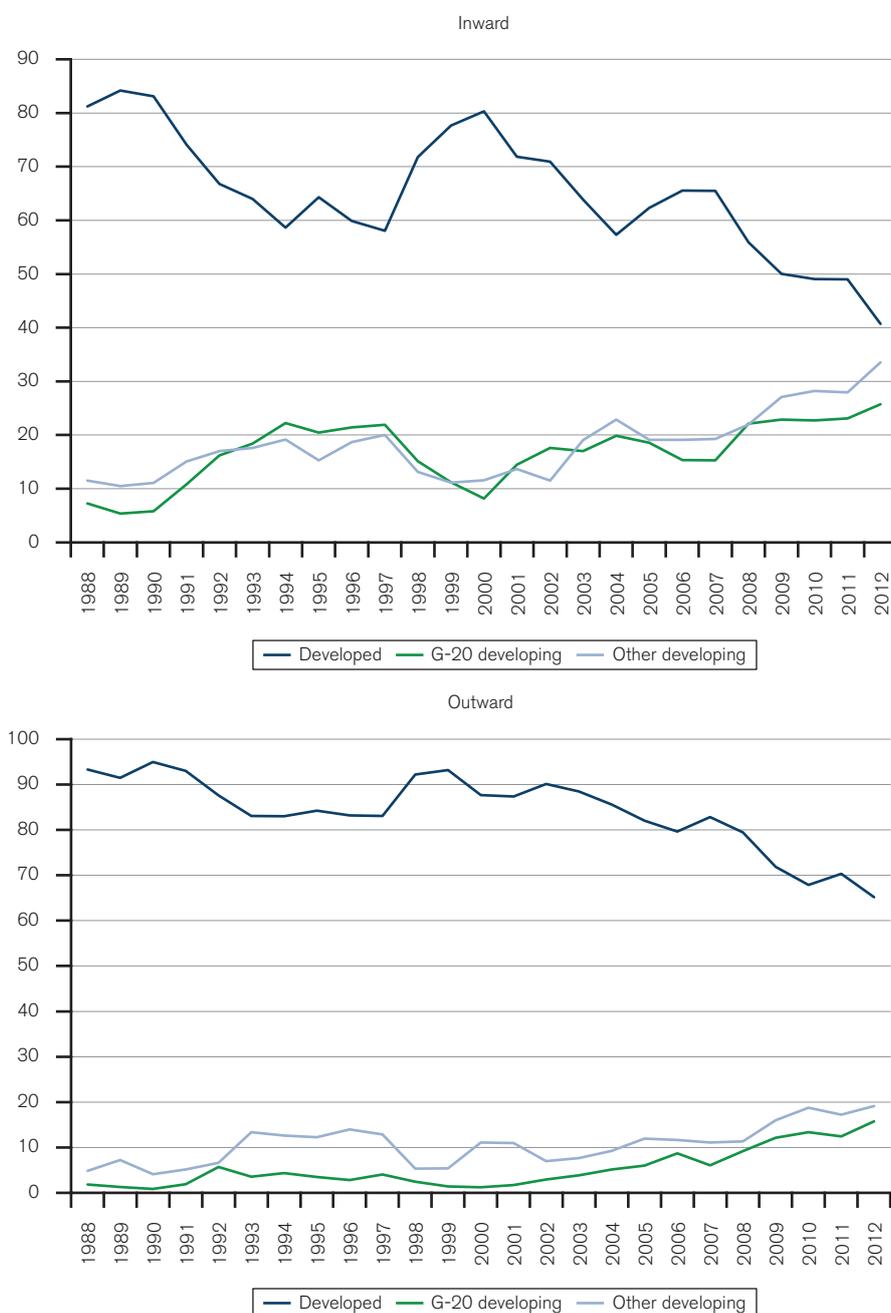
Source: UN Comtrade, WTO Secretariat.

the increase in the share of trade in parts and components of G-20 developing countries. Its share increased almost fivefold, from around 3 per cent in 1996 to more than 15 per cent in 2012. The share of parts and components imports of LDCs within world imports of intermediate inputs is negligible.

Developing economies are also increasingly recipients and sources of FDI. They absorbed more than half of global FDI inflows in 2012, versus less than 20 per cent in 2000. FDI outflows from developing countries and in particular from emerging economies also increased significantly during the 2000s. The share of FDI outflows from developing countries grew from 7 per cent at the end of the 1980s to 34 per cent in 2012 (see Figure C.3).

As already mentioned, gross values of trade in parts and components give an indication of GVCs trade but, in a world where production processes are interconnected across countries, standard gross trade flows record the value of intermediate goods along the production network multiple times. Imagine, for example, that country A exports intermediate goods to country B for a value of 100 units; country B further processes the intermediate goods and exports a final good worth 110 units to country C. Total gross trade between these countries is equal to 210 units of value. However, the value that has been added is only 110 units. In fact, country A generated 100 units of value added while country B generated only 10 units, which is the difference between the value of final goods (110) and the value of inputs (100) used in the production. Conventional measures would also show that C has a trade deficit of 110 with B, and no trade at all with A. If instead we look at value-added content, C's trade deficit with B reduces to 10 and it runs a deficit of 100 with A.

Figure C.3: Share of outflows and inflows of FDI, 1988–2012
(percentage of total world)



Source: Calculations based on UNCTADstat.

The previous simple example illustrates why it is desirable to develop more accurate ways to collect trade statistics (see Maurer and Degain, 2010). Box C.1 explains how participation in GVCs can be measured using a new dataset of trade in value added (TiVA) produced by the OECD and the WTO.³ An unfortunate drawback is that data requirements to devise TiVA statistics are significant, and so are not currently available for many smaller developing countries, including LDCs and small, vulnerable economies (SVEs).

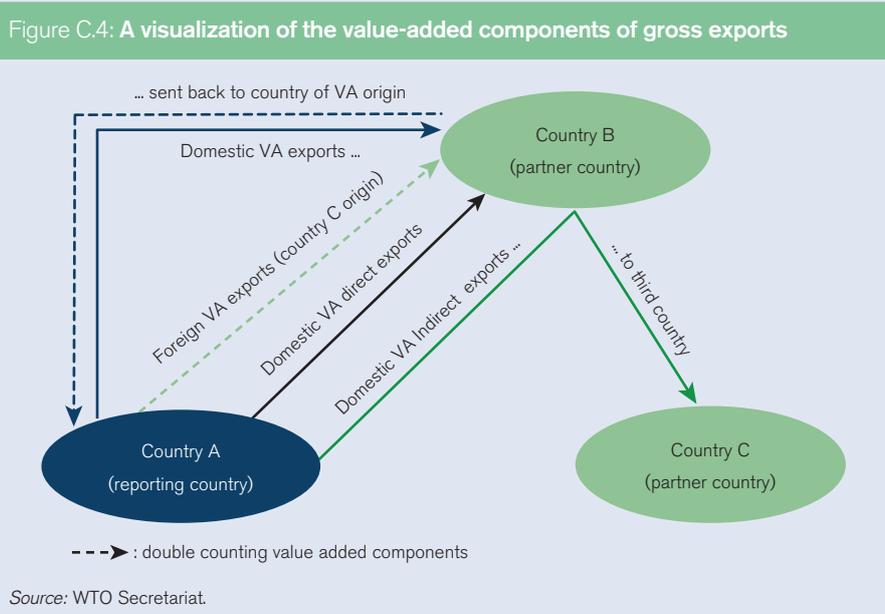
When measured in value-added terms, world participation in global value chains is higher than when it is measured with trade in parts and components and represents almost 49 per cent of total gross exports. Table C.2 shows that the participation of developing countries in GVCs is slightly higher: 51 per cent of gross exports of developing countries in 2009 relates to their participation in international production networks. Furthermore, the prominence of GVCs has slightly increased since the mid-1990s.

Box C.1: How to measure GVC participation

The recent research activity on trade in value-added terms mainly derives from the notion of vertical specialization developed by Hummels et al. (2001) and defined as “the value of imported intermediates embodied in a country’s exports”, or import content of exports.⁴ This measure captures participation in GVCs only partially. It ignores the steps of production that do not utilize foreign inputs.

Koopman et al. (2010) propose a GVC participation index that captures the import content of exports (backward participation) and how much domestic value added is embodied as intermediate inputs in third countries’ gross exports (forward participation). The participation index is defined as the sum of the foreign value added (FVA) embodied in a country’s exports and the indirect value-added (IVA) exports (i.e. value of inputs produced domestically that are used in other countries’ exports) expressed as a percentage of gross exports.⁵ This index captures both backward and forward participation. This report calculates this participation index using the TiVA database.⁶

Figure C.4 illustrates different value-added components of gross exports. The solid straight black arrow between Countries A and B in the figure reflects the value created domestically in Country A that is actually consumed directly in Country B. The angled green arrow beginning at Country A and ending at Country C represents the value created in Country A and embedded in the exports of goods from A to B, which are further processed and exported to Country C. It represents the domestic value added that is indirectly exported to Country C. The solid angled blue arrow represents the domestic value added of Country A that is re-imported through goods from Country B. Finally, the dashed green arrow beginning at Country A and ending at Country B represents FVA embodied in a country’s exports. It measures the value of exports from Country A to Country B that has been originated in a third country. Thus, it reflects the import content of exports.



The following example can help in the understanding of these concepts. Imagine Country A being an exporter of tyres to Country B. If Country A imports rubber from a third country, the value of rubber embedded in the exports of tyres from A to B is included in the FVA component of gross exports from A to B. If those tyres are used in the production of cars in Country B that are further exported to Country C, then the value added in the production of tyres in Country A follows the angled green arrow beginning at Country A and ending at Country C. The sum of these two flows is the numerator of the participation index. If, instead, the vehicle produced in Country B using tyres imported from A is consumed domestically (in Country B), the value of tyres is the domestic value added of direct exports (the solid blue straight arrow between Countries A and B). Finally, if the car produced in Country B is exported to Country A, the value added in the production of tyres in Country A is part of re-imports.

Figure C.5 presents the participation index in GVCs across economies in 1995 and 2008.⁷ In 2008, the top three positions with respect to supply chain participation were held by developing economies: Chinese Taipei, Singapore and the Philippines – whereas in 1995 the top

three were Singapore, Malaysia and Hong Kong, China. The ranking of big countries such as the United States, China, and India suggests that the participation index depicts only a partial view of GVCs. The value attributed to large economies may be relatively low because their

Table C.2: GVC participation index, 1995–2009

GVC participation index:	1995	2000	2005	2008	2009
All	39.8	46.2	51.0	51.9	48.5
Developed	39.6	46.3	49.9	50.7	47.2
Developing	40.5	45.9	53.5	54.4	50.9

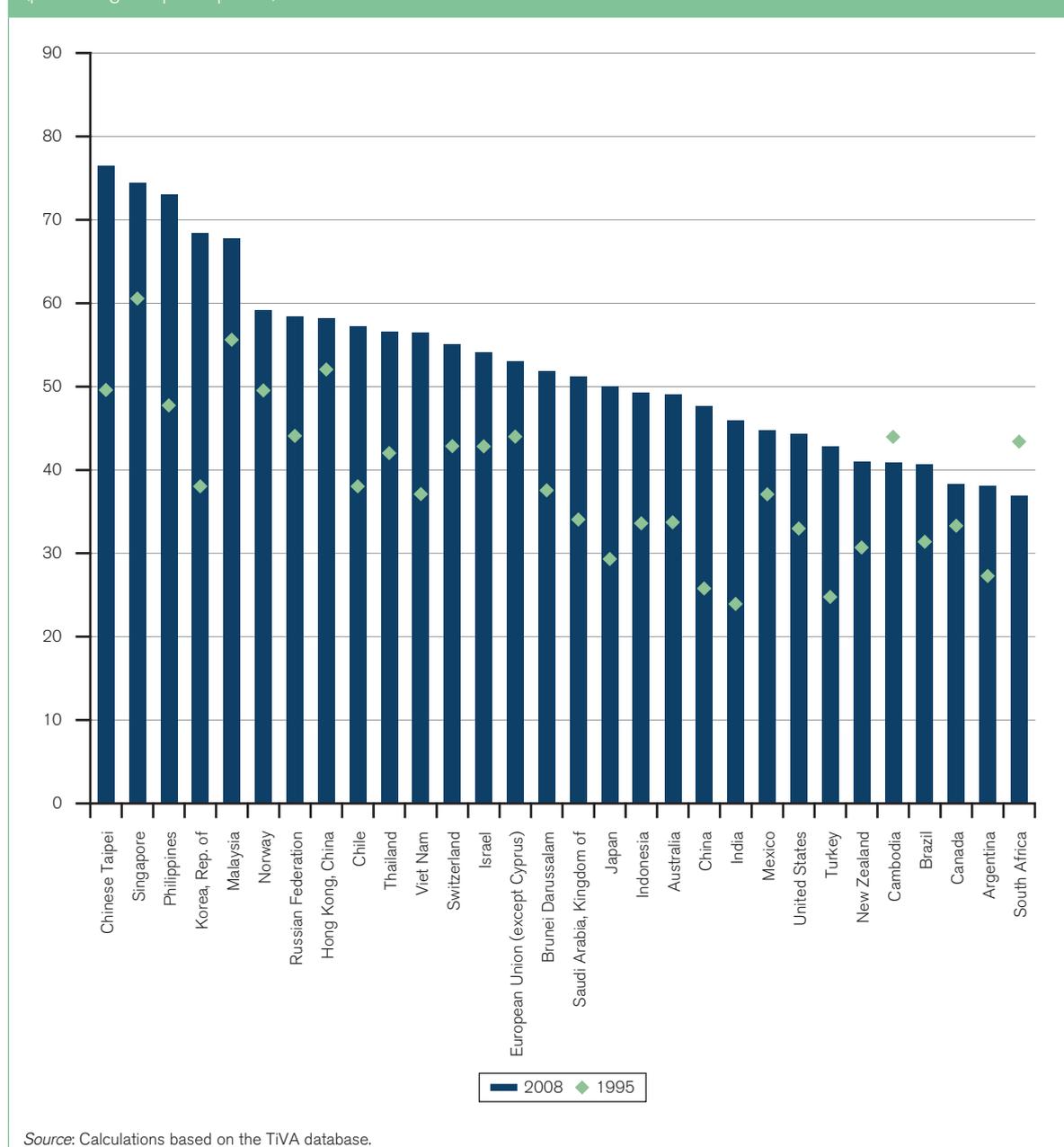
Source: TiVA database.

Note: Developed economies included in the TiVA dataset are: Australia, Canada, EU members except Cyprus, Japan, Norway, New Zealand, and the United States. Developing economies are: Argentina; Brazil; Brunei Darussalam; Chile; China; Hong Kong, China; India; Indonesia; Israel; Republic of Korea; Malaysia; Mexico; the Philippines; the Kingdom of Saudi Arabia; Singapore; South Africa; Chinese Taipei; Thailand; Turkey; and Viet Nam. Cambodia and Russia are also included in the calculation of the participation index.

size enables them to produce domestically a wider set of intermediate goods, resulting in lower imports of intermediates. Moreover, domestic production may be directed towards final goods, which implies that their forward participation is lower.

Looking at the changes across time, all economies apart from South Africa and Cambodia increased their participation in GVCs. The Republic of Korea, Chinese Taipei, the Philippines, India and China increased their participation the most. The increasing importance of China in GVCs can also be seen through an alternative analysis of the network structure of GVCs presented in Box C.2.

Figure C.5: Participation index in GVCs, 1995 and 2008
(percentage of participation)



Source: Calculations based on the TiVA database.

Box C.2: Mapping and measuring global trade in value-added networks

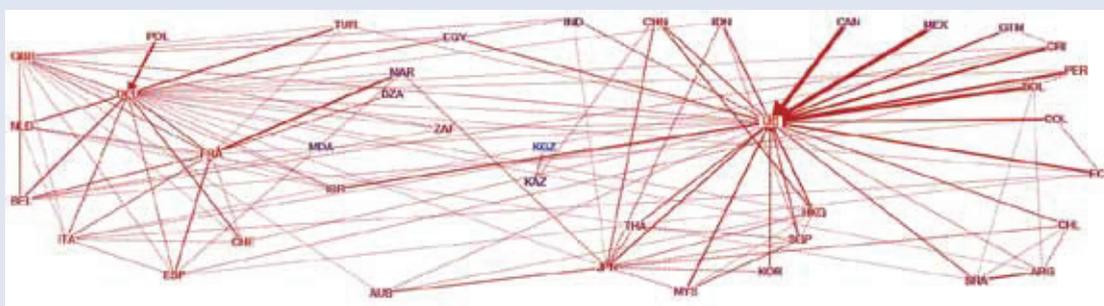
Mapping trade in intermediate goods is a first step in analysing the network of inter-industry trade in intermediate goods that most typically characterizes today's trade in tasks. The flows of intermediate goods connect the countries/sectors, revealing degrees of vertical specialization as well as the geography of the networks. Comparing this type of business-to-business (B2B) trade with trade in final goods (consumption and investment) shows the differences in the topology of the supply and demand sides of global value chains. Using a selection of countries based on their importance as traders and their regional distribution, Figure C.6 plots the flows of final and processed intermediate goods in 1995 and 2012.

Trade in final goods is clearly organized towards well-defined market destinations, mainly the United States, the largest EU economies and Japan. The United States imports a large percentage of its partners' final goods exports, especially from the rest of the Americas. The demand drivers in Europe are concentrated in three major markets: the United Kingdom, Germany and France. Looking at the evolution of the graph over time, the main change is the increasing role of China as importer of final goods (nine arrows point towards China in 2012 against only two in 1995).⁸ No other large changes appear between 1995 and 2012.

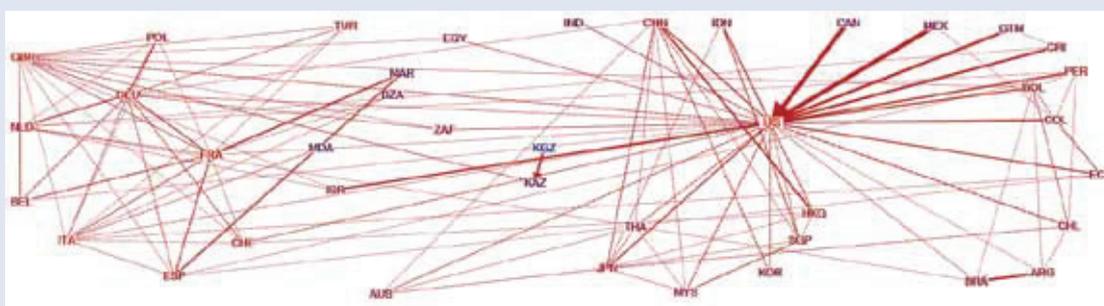
The network of business-to-business (B2B) trade in processed intermediate goods (excluding raw materials) is more diffuse than in the case of final goods. Even if the United States still plays the main role as a market of destination, its position in trade in intermediate goods is less dominant. Here again, the role of China as a market of destination of intermediate goods increases between 1995 and 2012 (16 arrows point towards China in 2012, twice as many as in 1995). Some countries, such as Switzerland, have a larger role as importers of intermediate goods relative to their role in the global market of final goods. This may indicate a higher profile in global value chains, considering the role of intermediate goods in trade in tasks.

Figure C.6: Trade flows in final and processed intermediate goods, 1995 and 2012

(a) Final goods, 1995



Final goods, 2012



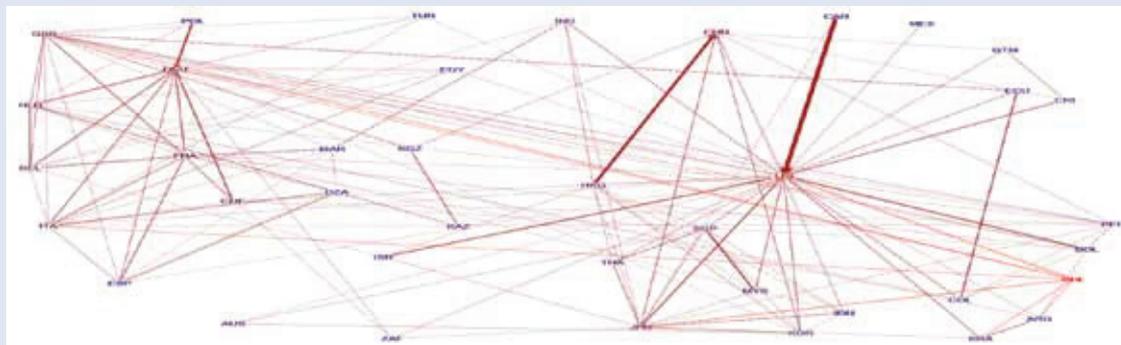
Source: Based on UN Comtrade and BEC.

Note: Flows are normalized as a percentage of each country's total exports for the respective categories (final or intermediate goods). Flows smaller than 5 per cent are not plotted; the higher the share, the thicker the arrow.

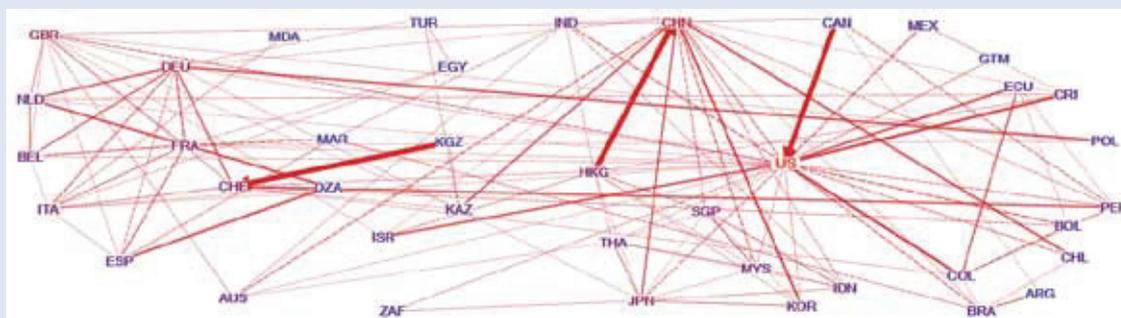
Box C.2: Mapping and measuring the global trade in value-added networks (continued)

Figure C.6: Trade flows in final and processed intermediate goods, 1995 and 2012 (continued)

(b) Intermediate goods (processed), 1995



Intermediate goods (processed), 2012



Sources: Based on UN Comtrade and BEC.

Note: See note to Figure C.6(a).

Baldwin and Lopez-Gonzalez (2013) study the geography of production networks and highlight that GVCs in manufacturing products are a regional phenomenon.⁹ The authors identify three main regions where supply chains are taking place: factory Europe, factory America and factory Asia. The structure of GVCs varies across regions. North American and European supply chains present a hub-spoke structure. In contrast, the processing of final goods in Asian supply chains often involves stops in multiple countries, generating the so-called triangle trade (Baldwin and Lopez-Gonzalez, 2013).

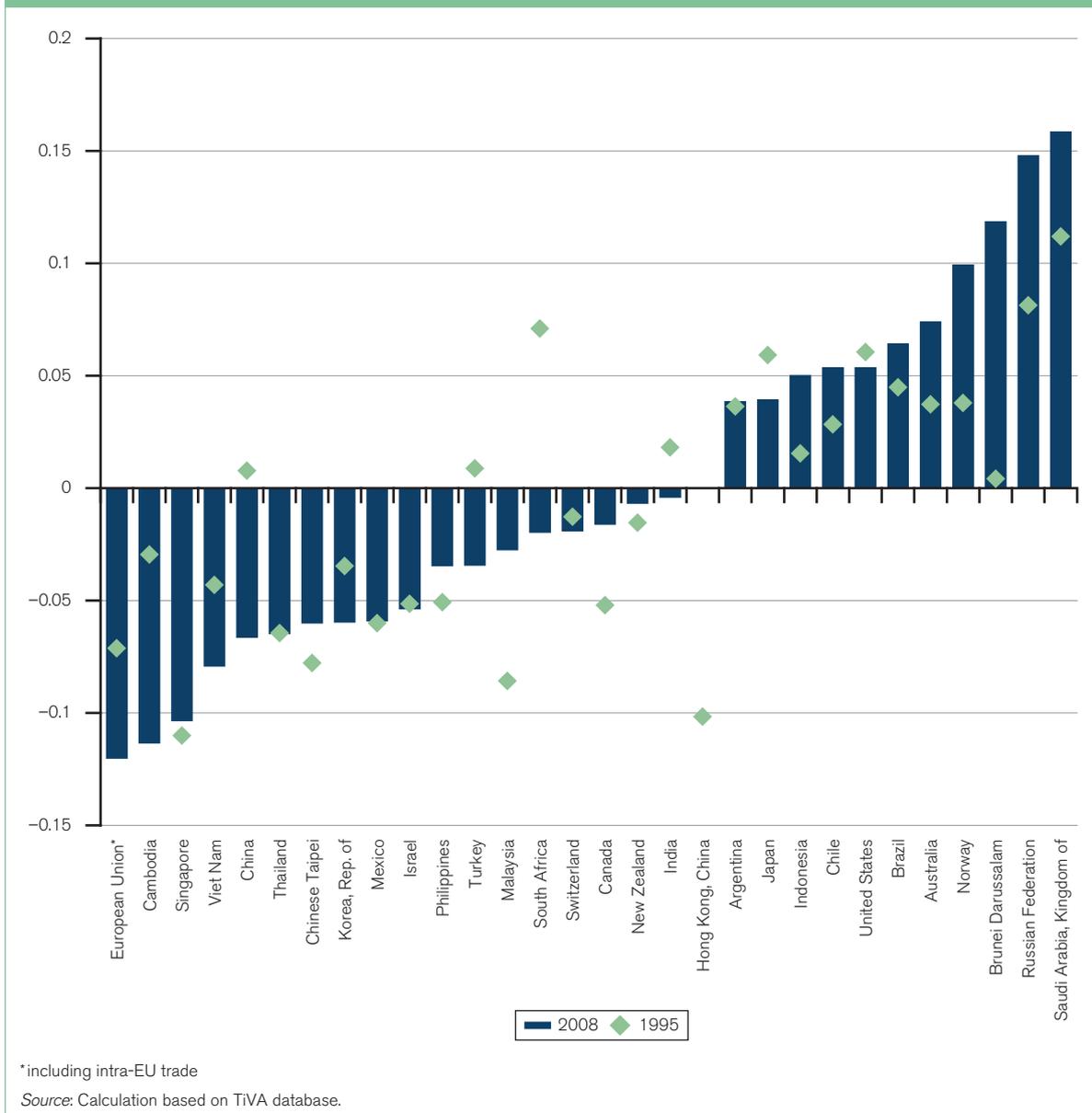
Using a series of alternative exploratory data analysis techniques, Escaith and Gaudin (2014) identify different clusters of exporters.¹⁰ The first cluster is made of large countries, well-endowed in natural resources and able to register a trade surplus by specializing in exports of value added sourced from their primary sectors. The centre of this cluster is well represented by South American countries such as Argentina. A second cluster includes small exporters incorporating a higher content of manufacturing value added in their exports and investing in research and development (R&D). Typically, Central European countries are found in this group. A third group of countries, typically the larger European economies, have relatively high shares in both manufactured goods and services. Ireland and Luxembourg form their own special group due to their small size and deep integration in EU value chains. The fourth cluster regroups countries with a high share of services content in the domestic exports of value added and a low share of manufactured goods. This group is relatively diverse, as it contains economies as different as the United States, Japan and Greece.

As already explained in Box C.1, the GVC participation index is computed as the sum of the share of foreign value added (backward participation) in gross exports and the share of domestic value added of indirect exports (forward participation) in gross exports. Given the definition of the participation index, two countries can have identical participation in GVCs but their position along the supply chain

may be significantly different. In other words, countries can participate in a GVC by specializing in activities upstream or downstream in the production network.

Koopman et al. (2010) propose a GVC position index that indicates if a country specializes in the first or the last steps of production.¹¹ If a country is upstream in the production

Figure C.7: GVC position index for selected economies, 1995 and 2008



network (first stages of production), it is likely that it has a high value of forward participation relative to backward. If a country specializes in the last steps of production (downstream), it is likely that it imports a lot of intermediate goods from abroad and therefore it has high backward participation. The GVC position index is constructed in such a way that countries with high forward relative to backward participation record a positive value. These countries lie relatively more upstream in a supply chain.

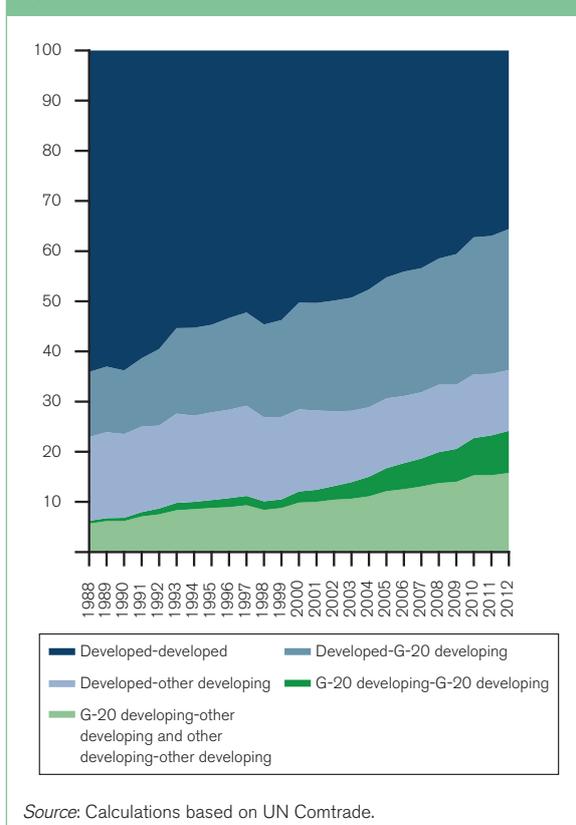
sample. Comparing the position of countries across time, the experiences of China, Turkey, India and South Africa are very interesting. These countries moved from being relatively upstream to downstream, with the case of China being particularly striking.¹²

(b) Increasing importance of South-South GVCs

Figure C.7 reports the values of the position index in 1995 and 2008 for the available economies. The Kingdom of Saudi Arabia, the Russian Federation and Brunei Darussalam are the economies that lie relatively more upstream in 2008. As expected, other natural resource-abundant countries, such as Brazil, Australia and Norway, lie upstream too. Cambodia, Singapore and Viet Nam are the most downstream developing countries in the

The economic literature on supply chains often takes a North-South perspective. However, data show a significant increase of GVCs between developing economies. The share of trade in parts and components between developing countries rose from around 6 per cent in 1988 to almost 25 per cent in 2013. Such an increase is not due to a decrease in the importance of developed-developing value chains. The share of trade in intermediate goods

Figure C.8: Share of imports in parts and components, 1988–2012 (per cent)



between developed and developing countries increased from 30 to 40 per cent over this period. In contrast, trade in parts and components between developed countries decreased by almost a half.

Figure C.8 shows that the increase in the share of trade in intermediate goods between developed and developing countries is mainly due to an intensification of the GVC activities that involve developed and G-20 developing countries. Although on a smaller scale, activities between G-20 developing economies also increased, especially in the 2000s. The role of G-20 developing countries in GVCs is therefore becoming more and more prominent, while LDCs remain at the margin of GVCs.

Developing countries have increased their contribution to value added in the GVCs of other developing countries over time: between 1995 and 2008, the foreign value added originating in G-20 developing countries and other developing economies as a share of gross exports increased for almost all countries (see Appendix Table C.1). G-20 developing economies, in particular, are importing more inputs from abroad and they are contributing more to the exports of almost all developing countries in the sample. In contrast, developed countries today contribute a lower share of value to the exports of almost all G-20 developing countries and other developing countries.

As to FDI flows, developing countries are already the source of much of the world's savings. They hold US\$ 1.8 trillion in FDI abroad (Kharas and Rogerson, 2012). At present, most of these savings are directed towards developed economies but they are shifting towards developing economies. Developing countries are, thus, gradually becoming a growing source of FDI in the South. Malaysia, China and India were among the top five investors in Africa in 2013 together with France and the United States (see UNCTAD, 2013b). Bera and Gupta (2009) show that, in the case of India, FDI from other developing countries is as significant as FDI from the developed world.

(c) Role of services in GVCs

Services trade in GVCs occurs in two ways. Services are traded directly across borders, but to a lesser extent than goods. Secondly, services are embodied in goods and are traded indirectly through them. For example, domestic engineering services, logistics services or financial services that are part of the production of a car will subsequently be exported indirectly, i.e. embodied in the car.

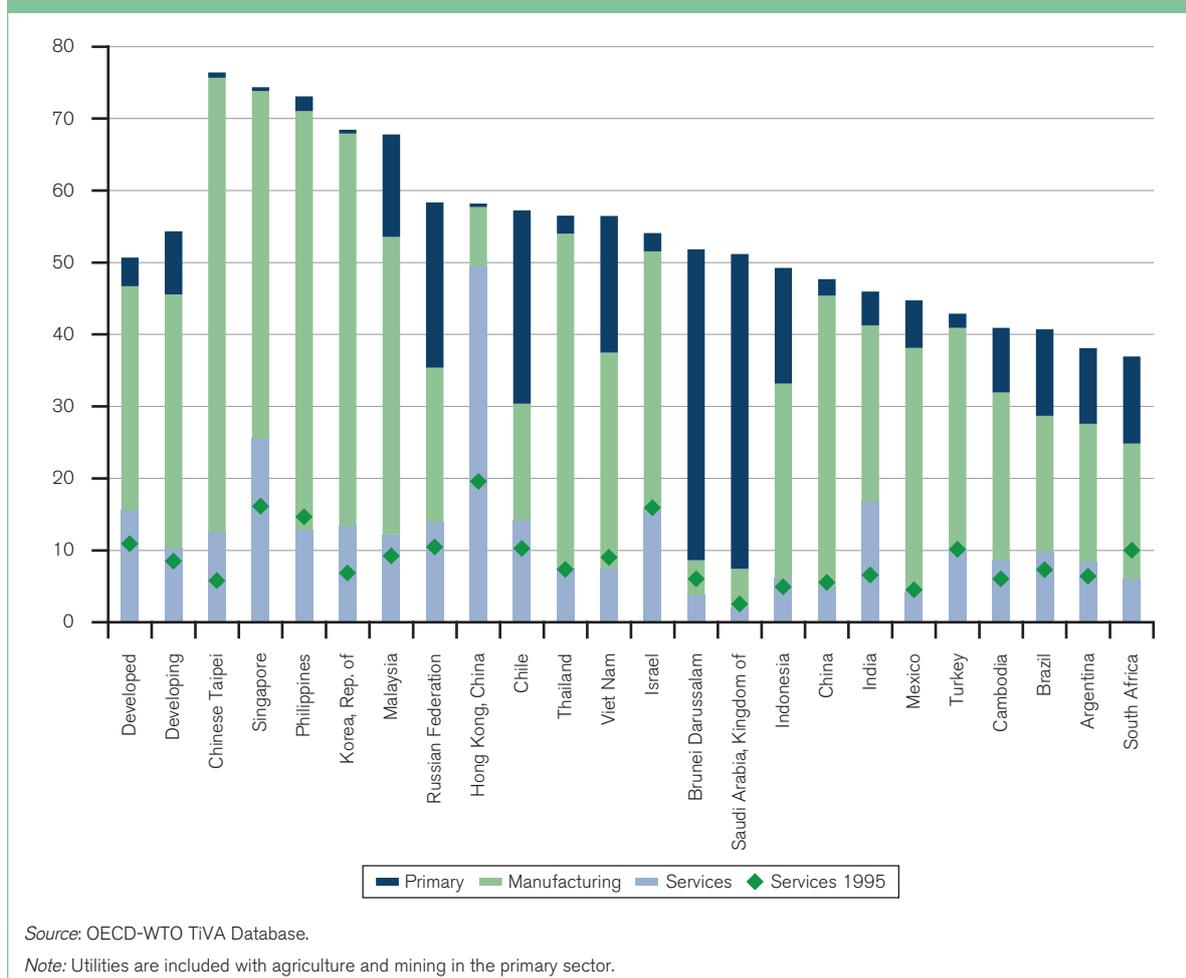
Figure C.9 provides a breakdown of the GVC participation index into three broad sectors: services, manufacturing and primary. The services part of the GVC participation index captures backward (foreign content of services exports) and forward (domestic content of services exports used in total third-country exports) linkages of direct service exports.¹³

Trade in services within GVCs accounts for almost 16 per cent of developed country exports and slightly more than 10 per cent of developing country exports, respectively. Hong Kong (China), Singapore and India show the highest shares (50 per cent, 26 per cent and 17 per cent, respectively). Services trade within GVCs has increased for the majority of developing countries and also slightly for the aggregate between 1995 and 2008. However, for most economies, trade in manufacturing products accounts for the majority of GVC trade, concentrated in the electrical equipment and the chemicals and minerals sectors.

While the decomposition shown in Figure C.9 captures the international backward and forward linkages of services exports, it may underestimate the importance of services for GVCs, as services embodied in manufacturing exports are assigned to the manufacturing part of the index. However, it is also possible to decompose the index differently to measure the services value added that is traded within value chains. In particular, the measure for backward linkages is then defined as the foreign services content of total exports, whereas the measure for forward linkages is defined as domestic services content in total third-country exports.

Figure C.10¹⁴ shows that the services value added traded within value chains constitutes 17 per cent of developing countries' exports, compared with 21 per cent in the case

Figure C.9: Contribution of services, manufacturing and primary exports to the GVC participation by economy, 1995 and 2008 (per cent)



of manufacturing value added. Meanwhile, in developed countries, services value added traded within GVCs accounts for 22 per cent of exports, compared with the 19 per cent of manufacturing value added. Hence, while direct services exports within GVCs are considerably lower than manufacturing exports, exported services value added, which covers services embodied in manufacturing exports, is only slightly lower than exported manufacturing value added in developing countries and even higher in developed countries.

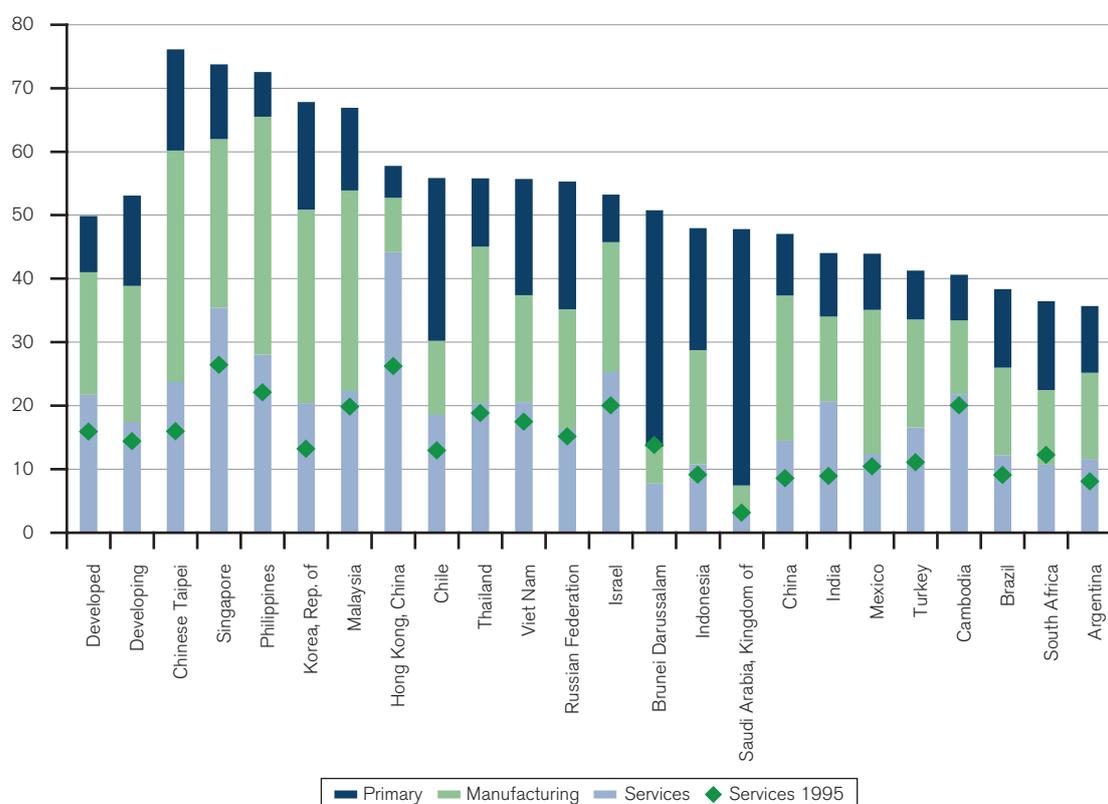
Box C.3 provides more insights regarding indirect services trade, i.e. services embodied in manufacturing exports, which arises from the so-called “servicification” of manufacturing.

Another way to assess direct services trade within GVCs is by looking at services offshoring, which denotes the relocation of service activities from a domestic to a foreign economy. Services offshoring therefore covers both the activities of an independent supplier (arising from offshore outsourcing) and the in-house activities conducted by a foreign affiliate (arising from foreign direct investment).

Traditional trade statistics do not measure trade flows relating to services offshoring because, in contrast to goods, no classification is available to distinguish between intermediate and final products.¹⁵ However, many so-called offshore services fall into the balance of payments items for computer and information and other business services. In the aggregate exports of both these items, the developing countries’ share increased from around 25 per cent to more than 31 per cent between 2005 and 2012, illustrating the relative competitiveness of developing countries and their increasing participation in GVCs. Box C.4 provides examples of developing countries that have successfully engaged in IT offshoring.

LDC participation in value chains through exports of services is limited – for example, the UNCTAD-EORA dataset reveals that the foreign content of LDC exports is 14 per cent compared with a world average of 25 per cent (Escaith and Tamenu, 2013).¹⁶ Looking instead at standard cross-border trade data, the share of LDCs’ in world exports in the two “offshore proxies” computer and information and other business services doubled from 0.16 per cent in 2005 to 0.33 per cent in 2013, which is still

Figure C.10: Contribution of services, manufacturing and primary value added to the GVC participation by economy, 1995 and 2008 (per cent)



Source: OECD-WTO TiVA Database.

Box C.3: "Servicification" of manufacturing

The increased use of services in manufacturing, both in terms of production processes and sales, has been described as the "servicification" of manufacturing, also termed "servicizing" or "manuservice" (Low, 2013). In other words, "services are often integrated or bundled with goods and traded indirectly as intermediate inputs into merchandise production" (Pacific Economic Cooperation Council (PECC), 2011).

Figure C.11 illustrates this servicification of manufacturing through services for operating the supply chain (embodied) and customer delivery/services (embedded). While embodied and embedded services can often be found in the trade literature, this distinction is not clear-cut as the same service can enter the value chain at different stages. What is more important for trade statistics in value-added terms and hence for analytical purposes is whether the service is supplied internally or at arm's length (Low, 2013).

Value-added flows are best suited to capturing the phenomenon of the servicification of manufacturing by allowing the measurement of indirect exports of services, whose service value added is embodied in the exported good.¹⁷ Such indirect exports of services can be particularly relevant for domestic small and medium-sized enterprises (SMEs), which often specialize in niche functions and do not have the capability to export directly. Embodied services often allow SMEs to participate in global value chains as direct or indirect suppliers to multinational companies.

Figure C.12 shows the services value-added content of exports of manufacturing industries. Services value added accounts for about one-third of manufacturing exports (32 per cent) in developed countries, which is considerably higher than in developing countries, where it accounts for 26 per cent. Among developing countries, Brunei Darussalam (37 per cent), India (36 per cent), Cambodia (36 per cent) and Hong Kong, China (34 per cent) have the highest services content of manufacturing exports.

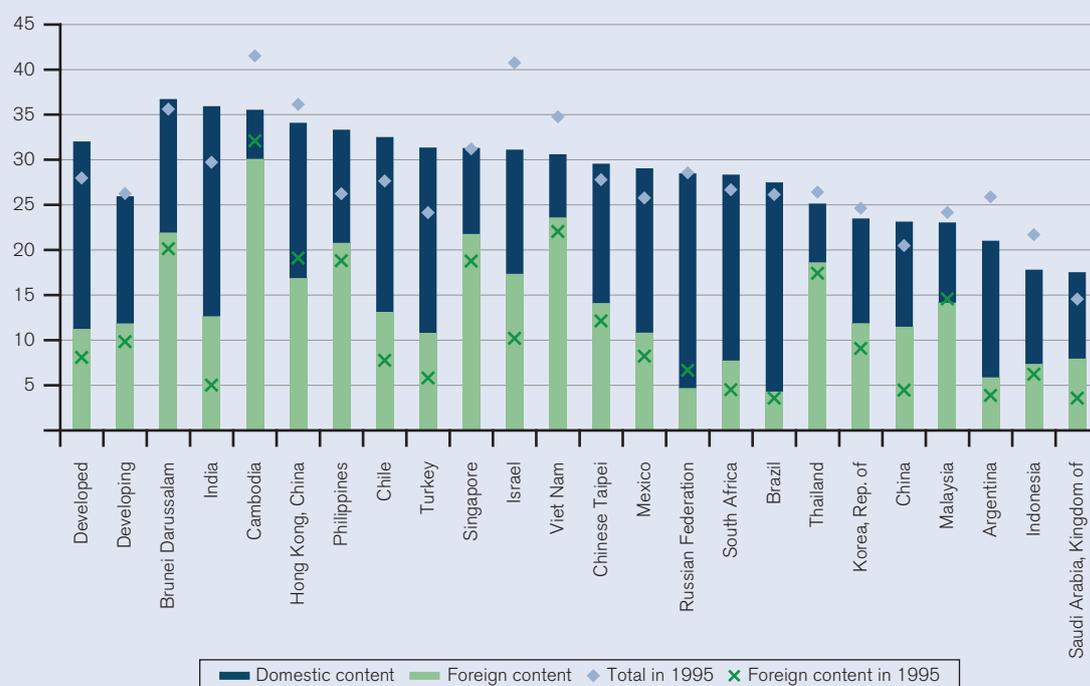
The lower services value-added content in developing countries' manufacturing exports compared with developed countries' manufacturing exports, is mainly due to lower domestic services value added in developing countries. In contrast, the share of foreign services value added in manufacturing exports, which captures the international backward

Figure C.11: Examples of services along the value chain



Source: WTO Secretariat.

Figure C.12: Services value-added content of manufacturing exports, 1995 and 2008 (per cent)



Source: OECD-WTO TiVA Database.

Note: Country data are aggregated to calculate the domestic and foreign content of exports for developing and developing economies. The services content of exports for the developed and developing group is slightly lower if based on a simple average across economies.

linkages of manufacturing with respect to services, is similar in developed and developing countries, i.e. between 11 and 12 per cent. Furthermore, the share of foreign services content in developing countries' manufacturing exports increased between 1995 and 2008.

The high share of services value-added content in manufacturing exports underscores the importance of imported and domestic services inputs for the export competitiveness of manufacturing in developing countries. Reforms in services trade across all services are therefore important to improve strategies for enhancing firms' competitiveness (Arnold et al., 2011). Services trade reform will affect both the foreign and domestic value-added content of manufacturing exports, as services trade covers not only the cross-border supply of services (mode 1 as defined by the WTO's General Agreement on Trade in Services (GATS)), but also the supply through a "commercial presence" (mode 3 – a foreign company setting up subsidiaries or branches to provide services in another country) and the "presence of natural persons" (mode 4 – individuals travelling from their own country to supply services in another).

Box C.4: Developing countries and IT offshoring

The increase in IT offshoring over the last two decades has been facilitated by factors such as the proliferation of the Internet and other advances in technology, the language and IT skills of the workforce and the WTO's Information and Technology Agreement (ITA), concluded in 1996, which provides for participants to completely eliminate duties on IT products covered by the Agreement. The ITA has allowed the electronics sector to produce cheaper IT products, which in turn has helped to improve the countries' competitiveness. Examples include Ireland, Israel and India. India's imports have grown much faster than exports, suggesting that these products are used by domestic industries to improve productivity – for example, in the services industry. As a consequence, India's software services exports have increased 11-fold since 2000 (WTO, 2012a) and India has become the predominant player in IT services offshoring, accounting for almost 60 per cent of the global offshoring market (UNCTAD, 2012a).

Table C.3 provides further evidence on the positive trade performance of India and other developing economies such as the Philippines, Malaysia and Costa Rica in the computer services industry. India exported US\$ 33 billion of computer services in 2009, accounting for about 20 per cent of world exports. India is also highly specialized in the export of computer services. The revealed comparative advantage (RCA) measure indicates that its world market share in the export of computer services is 5.49 times higher than its share in total exports of services.

Table C.3 also shows that exports of computer services in several developing economies have been growing at higher rates than in developed economies. Growth has been particularly high in the Philippines, with exports rising from US\$ 89 million in 2005 to US\$ 1.9 billion in 2010 (an annual rate of 85 per cent), suggesting the emergence of a comparative advantage for the country in computer services. Similar success stories can be observed in Malaysia, as well as in two Latin American economies, Argentina and Costa Rica.

Costa Rica experienced an average yearly growth rate of more than 35 per cent from 2005 onwards, exporting more than US\$ 1.2 billion in 2010. Furthermore, a RCA index of 5.28 reflects the fact that Costa Rica specializes in computer services and is hence competitive in exports of these services. Costa Rica is often mentioned as an example of strong integration into international supply chains. Monge-Ariño (2011) states that more than 40 per cent of the country's total exports are related to GVCs. Locally provided services and supplies are important contributors to these GVC-induced trade flows (see also Box C.5).

Table C.3: Top five exporters of computer services by economy grouping, 2005–10
(per cent and US\$ thousand)

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005–2010	2010	2010	2005	2010	2005–2010	2010	2010
Least developed countries (LDCs)										
Bangladesh	18,557	37,440	15	0.02	0.61	3,792	4,873	5	0.01	0.04
Uganda	32,825	37,407	3	0.02	0.70	22,191	32,579	8	0.04	0.54
Mozambique	121	5,237	112	0.00	0.18	2,659	691	-24	0.00	0.02
Tanzania	265	4,634	77	0.00	0.04	4,597	9,561	16	0.01	0.16
Samoa	n.a.	972	n.a.	0.00	0.12	n.a.	n.a.	n.a.	n.a.	n.a.
Other developing economies										
Israel	4,528,500	7,699,500	11	4.59	6.24	n.a.	n.a.	n.a.	n.a.	n.a.
Philippines	89,000	1,928,000	85	1.15	2.69	62,000	109,000	12	0.13	0.30
Malaysia	435,260	1,453,770	35	0.87	0.81	379,295	1,206,030	34	1.44	1.34
Costa Rica	254,378	1,216,190	37	0.72	5.56	10,721	20,844	14	0.02	0.36
Hong Kong, China	207,000	812,000	31	0.48	0.15	371,000	488,000	6	0.58	0.30
Developing country G20 members										
India	n.a.	33,383,179	n.a.	19.89	5.76	1,048,870	2,175,840	16	2.59	0.58
Russian Federation	374,570	1,273,280	28	0.76	0.56	378,620	1,637,450	34	1.95	0.71
Argentina	235,210	1,237,340	39	0.74	1.88	190,730	445,356	18	0.53	1.00
Brazil	80,223	195,100	19	0.12	0.13	1,656,840	3,414,480	16	4.07	1.76
Korea, Republic of	n.a.	149,000	n.a.	0.09	0.03	n.a.	170,600	n.a.	0.20	0.06
Developed economies										
Ireland	19,369,000	37,196,458	14	22.17	7.51	378,053	752,273	15	0.90	0.22
Germany	8,415,411	16,304,988	14	9.72	1.37	8,587,027	14,066,711	10	16.76	1.66
United Kingdom	8,476,394	9,952,424	3	5.93	0.79	3,330,921	5,256,661	10	6.26	1.01
United States	3,554,000	8,771,000	20	5.23	0.32	2,000,000	18,394,000	56	21.91	1.54
Sweden	2,608,025	6,813,995	21	4.06	2.04	1,384,166	2,341,998	11	2.79	1.50

Source: WTO Secretariat, based on WTO trade in services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in computer services exports (imports) to its world market share in total services exports (imports). China was not included due to lack of disaggregated data.

significantly lower than the share of LDCs in world exports of commercial services (0.65 per cent) and merchandise (1.14 per cent) in 2013.¹⁸

While transport services (22 per cent) and communication services (8 per cent) are the second- and third-biggest components of LDCs' commercial services exports, the former are dominated by travel services, i.e. tourism, which grew by 7 per cent to US\$ 5.9 billion in 2012, representing 45 per cent of LDCs' receipts. Box C.5 illustrates how the tourism value chain can play a role for the development of LDCs and small, vulnerable economies (SVEs).¹⁹

In general, one obstacle to the participation of LDCs and other developing countries in supply chains is high transport

costs. For remote or landlocked countries, in particular, services might offer a greater potential for participation in GVCs, if they can be supplied via information and communication technologies (ICT) such as IT services, financial services or many business services. As Box C.4 has illustrated, India and the Philippines are examples of developing countries that have, despite being distant from large European and US markets, become major offshore locations for computer and other business services. In a ranking of the top 100 outsourcing destinations for these services, the top eight cities are either located in India (six cities) or the Philippines (two cities) (Tholons, 2013).

The measure of regional intensity (RI) of exports provides an indication of the extent to which services

Box C.5: The tourism value chain as an opportunity for development

The tourism value chain includes services related to travel organization, which often involves international travel agents and tour operators, international transport and a variety of services and goods provided in the destination country (see Table C.4). Furthermore, tourism indirectly benefits the domestic economy by contributing to the development of other sectors, such as agriculture (e.g. food supply to hotels), construction, communications, utilities (e.g. supply of electricity and water to hotels), and conference and events management. The demand for these services, some of which are labour intensive, creates employment opportunities, especially for semi-skilled people in rural areas within LDCs.

Table C.4: A simplified tourism value chain

Accommodation	Food and beverages	Souvenirs and Entertainment	Transportation	Excursions
Hotel	Restaurant	Souvenir shop	Regional and local	Guides
Resort	Bar	Market	Bus, taxi, car rental	Tour operators
Guesthouse	Food stall	Sellers	etc.	Travel agencies
Lodge	Market	Craftsmen		etc.
etc.	etc.	Festivals		
		Theme parks		

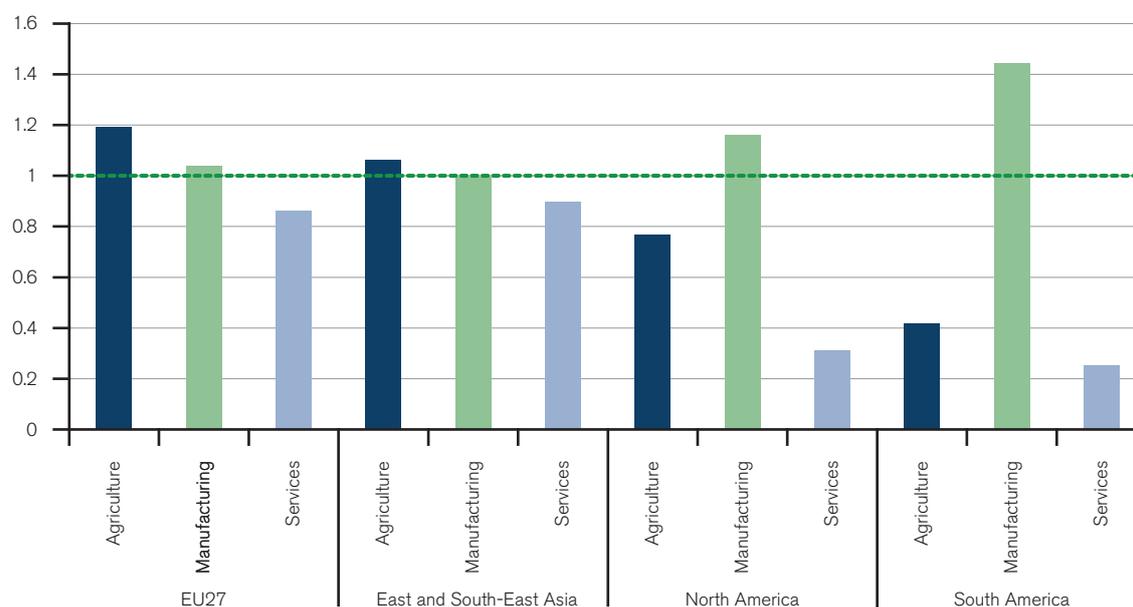
Source: International Trade Centre (ITC).

Cambodia, Tanzania and Uganda are the largest LDC exporters of tourism services, accounting for 15, 14 and 9 per cent respectively of LDCs' travel exports. Tourism receipts are also of particular importance to many small islands in the African, Caribbean and Pacific (ACP) group of countries, such as Vanuatu and Samoa. For instance, tourism played an important role in the graduation from LDC status of Cabo Verde and the Maldives in 2007 and 2011, respectively (Honeck, 2012). In addition to the Maldives, a number of small, vulnerable economies are tourism-oriented. These include the Dominican Republic, Fiji, Grenada, Honduras, Jamaica and Nicaragua, as well as numerous small Caribbean islands in the Lesser Antilles.

Tourism-oriented LDCs have attempted to measure the contribution of various factors in the tourism value chain. For example, in Tanzania, hotel accommodation accounted for 25.3 per cent of tourists' total spending in 2010, followed by shopping (17.8 per cent) and food and beverages (16.8 per cent). Mountain-climbing represented an additional 13.5 per cent. In Uganda, a visitor exit survey showed that, in 2011, accommodation was the largest expenditure category (44 per cent), followed by souvenirs (16 per cent), food and beverages (15 per cent), transport (12 per cent) and excursions (8 per cent).

Christian et al. (2011) identify four ways in which countries can upgrade within tourism value chains. First, they can aim to attract FDI to upgrade the size and quality of their hotels. Secondly, tour operators can functionally upgrade their services, from being local guides to excursion operators, to local or national organizers for an incoming agent. Thirdly, the use of IT renders Internet-based marketing and the use of online reservation systems possible. Finally, countries can deepen or expand tourism products, such as eco-tourism, cultural tourism or "sea, sand and surf" holidays.

Figure C.13: Regional intensity of exports by aggregate industries for selected regions, 2008
(ratio of shares)



Source: Authors' calculation based on the OECD-WTO TiVA database.

Note: The following economies are covered by regional aggregates: *EU27*: All EU countries except Cyprus (and Croatia) are covered; *East and South-East Asia*: Brunei Darussalam; Hong Kong, China; Indonesia; Japan; Cambodia; Republic of Korea; Malaysia; the Philippines; Singapore; Thailand; Chinese Taipei; Viet Nam; *North America*: Canada, Mexico, the United States; *South America*: Argentina, Brazil and Chile. A regional intensity indicator larger (smaller) than 1 indicates that a particular industry is traded more (less) regionally relative to overall trade.

offer opportunities for remote developing countries to participate in GVCs by showing whether services are traded more globally than goods.^{20,21} In particular, a RI indicator larger (smaller) than 1 indicates that a particular industry is traded more (less) regionally relative to overall trade.

Figure C.13 shows the RI indicators for gross exports in agriculture, manufacturing and services for four regions.²² In all four regions, i.e. the European Union, East and South-East Asia, North America and South America, intra-regional trade is relatively more important for agriculture and manufacturing than for services. In particular, in all four regions, manufacturing trade is more regionalized than overall trade, while services tend to be traded more globally, i.e. exported to countries outside the region. Evidence for less regionalism in services trade within GVCs is also provided by Baldwin and Lopez-Gonzalez (2013), who show that much of the value chain trade between the United States and the European Union is trans-Atlantic, which is likely to reflect the activities of multinational enterprises.

While market proximity might be less relevant for offshoring services, other factors, as explained in Section C.4, such as language and IT-related skills of the workforce, ICT infrastructure, a sound business environment and government support, are still significant factors for developing countries wishing to enter and move up GVCs. Furthermore, while delivery costs might

be low, barriers to trade in services typically come in the form of behind-the-border regulations, which are still significant in many sectors such as professional services or financial services (Borchert et al., 2012).

Findings from gravity modelling suggest that higher trade costs hold back services from exploiting their full trade potential. Using a measure of bilateral trade cost based on the ratio of external to internal trade, Miroudout et al. (2013) find that trade costs are much higher for services than for goods. Focusing on bilateral trade between Canadian provinces and the United States and the rest of the world, Anderson et al. (2013a) find that the incidence of geographical barriers for services trade, calculated as the ratio of predicted to hypothetical frictionless international services trade, is approximately seven times larger than for goods trade.

2. GVCs: opportunities and challenges for development

Before the mid-1980s, achieving industrialization was largely synonymous with building the whole supply chain within one economy. This was done successfully by early entrants, such as Japan, the Republic of Korea and Chinese Taipei. Requiring decade-long learning by doing, this road led to durable industrialization. Nowadays, unbundled production implies that economies can specialize in specific tasks instead of products or industries.

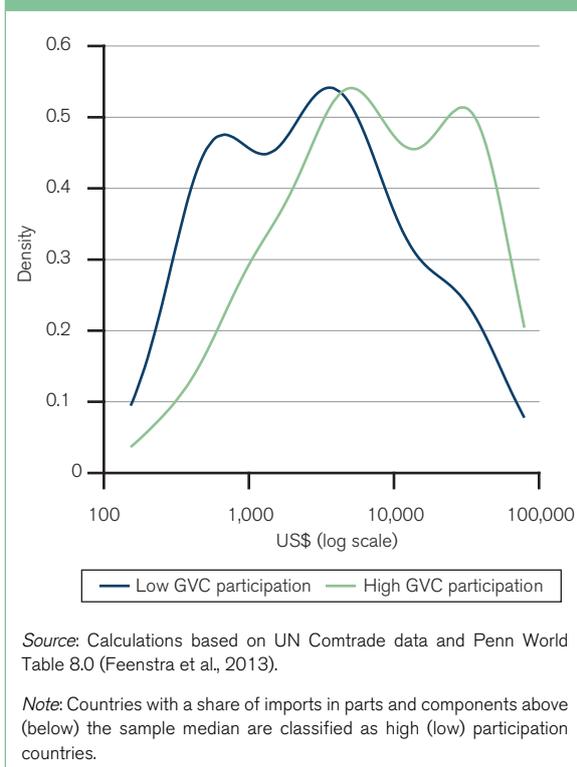
Baldwin (2011b) argues that because the learning process involved is less complex, industrialization is easier to achieve but it might also be less durable because capabilities are now narrower and therefore easier for competitors to replicate. Nonetheless, the author argues that resisting GVC participation may be ineffective, because it hinders domestic firms in accessing inexpensive or more sophisticated inputs, thereby potentially causing their products to be uncompetitive in world markets. Consequently, he suggests that economies may now be better advised to learn from experiences of those that have industrialized through GVCs, such as Thailand from the late 1980s, rather than from the early entrants mentioned above.

Some uncertainty still remains regarding the ultimate impact of GVCs on development. The literature on GVCs is still evolving and has some limitations in the sense that it is not clear whether its results generalize from the sector or firm level to favourable development outcomes at the country level. In addition, it has not been shown whether GVC participation *causes* growth. Finally, it is uncertain whether development successes through GVC integration, such as for instance the experiences in East Asia, can be replicated in a similar fashion elsewhere. It is still mostly unclear how differences in underlying conditions among countries affect the nature of their GVC participation. For instance, network and agglomeration effects are likely to work in favour of large countries or countries close to them. This makes it difficult to generalize their experiences, especially when considering small and remote countries.

Yet, evidence is accumulating which suggests that GVC participation may at least be *associated* with higher growth. The International Monetary Fund (IMF) (2013) finds that output growth is associated with more exporting and importing of value added, which proxies for GVC participation. Also, data comparing incomes of countries with low and high participation in GVCs tend to confirm this association. High-participation countries are generally richer than those with low participation. Their distribution of incomes lies further to the right in Figure C.14. Furthermore, GDP growth rates tend to increase as countries increase their participation in GVCs (UNCTAD, 2013a). Case study evidence also generally suggests that countries which adapted to the new GVC trend instead of pursuing domestically-based industrialization experienced better outcomes in the activities and sectors studied.²³

This section explores the results of the literature on GVCs from the viewpoint of a developing country in a chronological manner. It highlights that GVCs offer an opportunity to developing countries to integrate into the world economy at lower costs. But gains from GVC participation are not automatic. While initial integration into GVCs can have considerable development benefits, competition is fierce in low-capacity tasks in which such initial integration is typically achieved. Therefore, developing countries' gains

Figure C.14: Distribution of GDP per capita by high and low participation in GVCs, 2012



capture is typically low initially. To address this, upgrading of activities performed, aimed at increasing the value added supplied, is often posited as a possible way to underpin further development through GVCs.

(a) Integrating into GVCs

Integration into GVCs exposes a country to trade and foreign investment, which can result in development benefits through knowledge and technology spillovers. However, not all countries may achieve integration right away. To integrate into a GVC, a country needs to be – or quickly become – competitive in world markets in the activity it performs. If integration is achieved, it typically triggers favourable structural transformation by relocating labour from agriculture to higher-productivity and higher-paying jobs in manufacturing or services.²⁴

(i) *Technology and knowledge transfers through imports and FDI*

Integration into GVCs constitutes a way for countries to reap dynamic gains from trade. Physical and human capital, institutions and technology are key drivers of growth (see Section B.1). GVC integration in turn has an impact on these drivers. The focus here will be mainly on technology and knowledge transfers, which Piermartini and Rubinova (2014) have shown to be higher across countries linked through GVCs. Technology and knowledge transfers are affected in two ways by GVC participation (WTO, 2008).²⁵

First, to the extent that knowledge about the production technology travels in the exchange of goods, these spillovers will be created. Secondly, technology can also be transferred if foreign firms invest directly in the domestic economy.²⁶ Consequently, the empirical literature has focused on the effects of imports and FDI to analyse these spillovers.

Technology transfers are stronger for imports of intermediate goods – which tend to rise with GVC participation – than for imports of final products (Amiti and Konings, 2007). Furthermore, spillovers are higher when these imports are sourced from industrialized countries because they presumably embody a higher technological content than imports from developing countries (Keller, 2000). This suggests that integration, particularly with industrialized countries, through GVCs may benefit developing countries.

FDI is the second key channel for technology spillovers in GVCs. These spillovers are stronger for imports often associated with FDI, such as capital goods, machinery and ICT goods (Acharya and Keller, 2009). Blalock and Gertler (2008) find that foreign firms have an incentive to generate these spillovers. Once they have invested in the domestic economy, they typically make production technologies widely available to avoid hold-up by any single domestic supplier. Thereby, higher FDI tends to increase the quality of exports in developing countries (Harding and Javorcik, 2012). Furthermore, FDI spurs domestic investment by lowering the costs of adopting new technologies (Borenszstein et al., 1998) and by increasing competition in the domestic market (Iacovone et al., 2011).²⁷ Mileva (2008), for instance, shows for ten countries in the Commonwealth of Independent States and Albania that FDI flows indeed led to domestic investment.

(ii) *Capability building: adapting knowledge and technology to local conditions*

Capabilities refer to the ability to operationalize knowledge and technology efficiently in prevailing conditions and they determine whether and how a developing country can integrate into GVCs (Lall and Pietrobelli, 2002; 2003; 2005). Capabilities are a broad concept and include organizational methods, managerial quality, work practices, ability to meet international standards, product placement and knowing where to source and how to best combine inputs in a cost-effective way in a specific location.²⁸ In turn, GVC integration can create incentives to build capabilities when access to large world markets creates profitable opportunities.

Capabilities can be built through various channels. These include worker training, interaction with suppliers or reverse engineering (Morrison et al., 2008). Useful organizations in this respect are those providing technology diffusion services such as metrology, standards, testing and quality assurance as well as technical and organizational

consultancies. Developing countries' policies and institutions affecting international flows of equipment and services, human capital and foreign investments are crucial in facilitating this capability building.

Furthermore, some capabilities can only be acquired through direct interaction with foreign clients. Through these interactions, GVCs provide information on the global market's requirements in terms of products, processes, technology and standards (Pietrobelli and Rabellotti, 2011). This information is so valuable that local firms striving to become suppliers to multinational corporations in GVCs often enter into loss-making contracts initially with those multinationals. During these initial contracts, they learn to produce to the specifications of the multinational. This type of investment in capabilities yields two pay-offs: (i) productivity gains, allowing the local firm to produce at lower prices (Blalock and Gertler, 2008); and (ii) positive reputation effects of being a preferred supplier to a well-known multinational, which facilitates establishment of other business relationships (Sutton, 2012). These investments in capabilities naturally require capital while not generating tangible collateral. Consequently, it is not surprising that availability of financing is perceived as a main obstacle to GVC integration by many firms (see Section C.4).

Successful capability building leads to competitive advantage i.e. firm level competitiveness in markets where above-average profits may be earned because some firms' capabilities are hard to replicate. Costa Rica has managed to build considerable competitive advantage in a variety of sectors and constitutes a much cited example of capability building through FDI (see Box C.6).

Capability building remains an ongoing process. As a country develops and wages rise, its advantage in labour-intensive activities will fade, therefore requiring a gradual reorientation of its industrial structure. Hanson et al. (2013) illustrate that the main export products of most successful developing countries have changed in the past 20 years. For instance, China's top two export products were apparel and textile products 20 years ago, while they are now office machines and electric machinery.

The stakes are high in capability building because only countries able to produce a minimum acceptable quality level will be able to integrate into GVCs. Sutton (2012) highlights that, because inputs have a world market price, a country has to be able to produce a good from those inputs that has a world market price of at least the sum of the input costs. If this is not the case, the country will not be able to sell, even if wages are reduced to zero. As a result, only countries close enough to the "window" of competitiveness will be able to join GVCs (see Box C.7). This implies that developing countries will have to reach certain threshold levels of efficiency and quality to become attractive offshoring destinations, even if their wages are low.

Box C.6: Capability building and spillovers through FDI in Costa Rica

Rodriguez-Clare (2001) provides extensive and detailed evidence of Costa Rica's early success in capability building. He ascribes particular importance to its investments in education, widespread knowledge of English, stable political situation, low corruption level and tax incentives.²⁹ Incentives were not aimed at any specific company but rather at developing a "cluster" of investors. The country is known for attracting large FDI flows from computer chip manufacturer Intel, which by late 1999, within less than three years of its first investment in Costa Rica, had invested US\$ 390 million in the country. This accounted for 60 per cent of GDP growth and 40 per cent of export growth in that year and allowed Costa Rica to turn its trade balance into surplus. Intel's employment impact was also considerable, creating 2,200 jobs in a country with a labour force of roughly 2 million. Costa Rica's ability to attract Intel, however, was not only driven by the reasons listed above but by the fact that a group of Costa Rican representatives had set out to convince Intel to invest in their country when Intel decided to diversify away from East Asia.

The positive feedback from foreign companies already present in Costa Rica, such as the medical equipment manufacturer Baxter, was crucial for Intel's decision. While the existing foreign-owned companies helped to attract Intel, its arrival in turn gave a boost to the creation of a cluster of FDI from electronics manufacturers (Remec, Sawtek, Conair, Reliability, Protek, Sensortronics and Colorplast). It also helped to strengthen the medical devices sector, showing how precision-manufacturing skills can be transferred across sectors. Baxter decided to expand its production and a competitor, Abbott, established a plant. Bamber and Gereffi (2013) document how, during the last decade, Costa Rica has further diversified its exports of medical devices from simple to more complex products. However, R&D activities have not yet been attracted, as foreign companies prefer to keep these close to their headquarters. Capabilities built through these relationships have been diffused throughout the economy. All senior managers in the medical devices sector surveyed by these authors were Costa Rican and other firms benefited from spillovers when employees of these leading firms switched jobs.

However, the 2014 announcement by Intel to move its Costa Rican manufacturing operations to Asia highlights relocation risks to which GVCs can expose even those countries which have successfully leveraged GVCs for their development (see Section C.3 for more details). Intel will retain roughly half of its workforce in Costa Rica, working mainly on service operations (Inside Costa Rica, 2014).

Box C.7: GVCs, competitiveness and trade integration

Baldwin (2011) provides an intuitive description of how the rise of supply chains has changed world trade and countries' integration into the global economy. He first notes that tariff (τ), transport (T), and coordination costs (χ) impose a wedge between the world price of a good (p^w) and its domestic price. Thus, imports will cost $p^w\chi\tau T$, i.e. more than the world price.³⁰ Analogously, a country will only be able to be competitive with an export product in foreign markets if it produces the good at a cost lower than $p^w(\chi\tau T)$ to make up for the trade costs.

The ascending line in Figure C.15 shows that the country can produce some intermediate products at a low cost; these are at the left end of the x-axis, while others, which are costly to make domestically, are at the right end of the x-axis. The solid horizontal lines portray the initial situation with high trade costs. The country is not efficient enough to export anything in this case and imports products at the far right, where the ascending line exceeds the upper solid line. Now, with the advent of the ICT revolution, trade and coordination costs decrease, bringing the horizontal dotted lines closer together. As a result, the country now starts exporting, but also imports more. Now assume in addition that there is a final product requiring two intermediate inputs, Part 1 and Part 2. In a GVC world, the country can now participate in the production of this good by exporting Part 1. Meanwhile, it is very costly for the country to produce Part 2. Attempting to produce domestically Part 2 to export the final good would likely be an ill-fated strategy; its competitiveness would suffer from Part 2's high price.

Figure C.16 illustrates an initial situation in which a country has such low capabilities that the local production cost of all intermediate goods is higher than the world price plus trade costs required for importing. This country would thus import all intermediate goods. Given its high local production costs, it is not profitable to export anything. However, the country's capabilities are sufficiently developed that an additional investment, e.g. by a foreign company, in technology transfer and capability building can lower the cost for certain activities to such a degree that the country becomes competitive in the world market. Sutton (2012) argues that some low-income economies in Africa are now in precisely this situation. Central and Eastern European (CEE) countries were in the same situation in the early 1990s.

Box C.7: GVCs, competitiveness and trade integration (continued)

The fall of the Berlin Wall in 1989 made Western products available for the first time, rendering many local production techniques and products utterly uncompetitive. Many CEE factories had to close because their end products effectively were worth less in the market now than embedded inputs' value at Western factories' gates. Consequently, the first half of the 1990s was marked by deindustrialization and high unemployment in these countries. They only started reaping the benefits of trade opening in the late 1990s, when they acquired – alongside FDI flows – the technology and capabilities to transform these inputs in an efficient manner that was valued in the world market. This gradually shifted ever-larger parts of their cost curve down.

Figure C.15: Lower trade costs and resulting international integration through GVCs

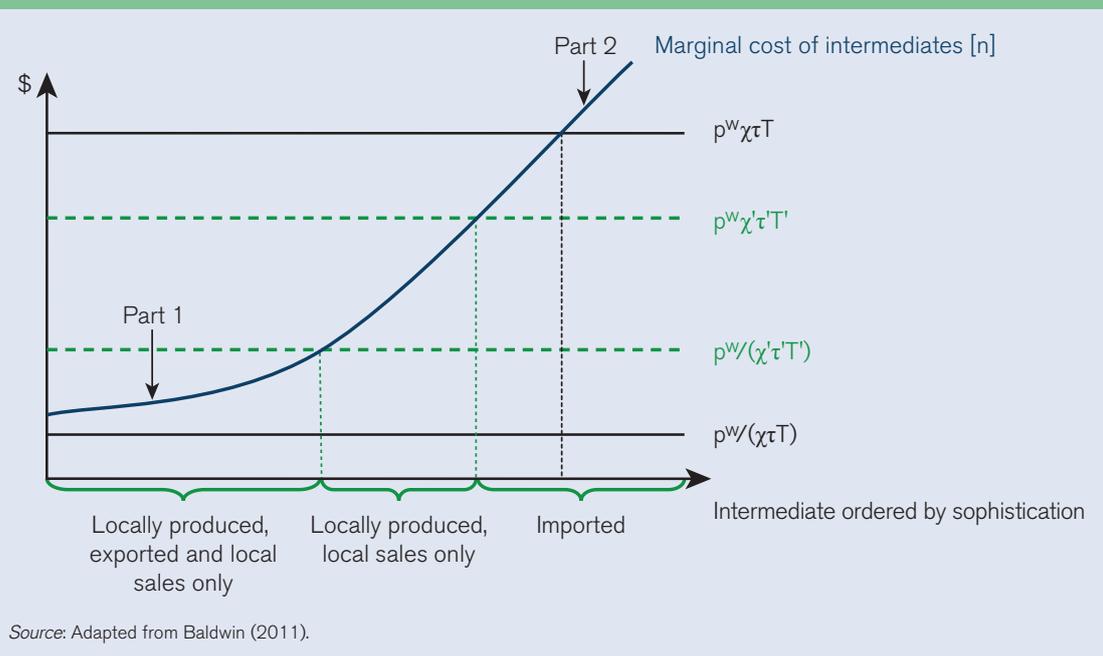
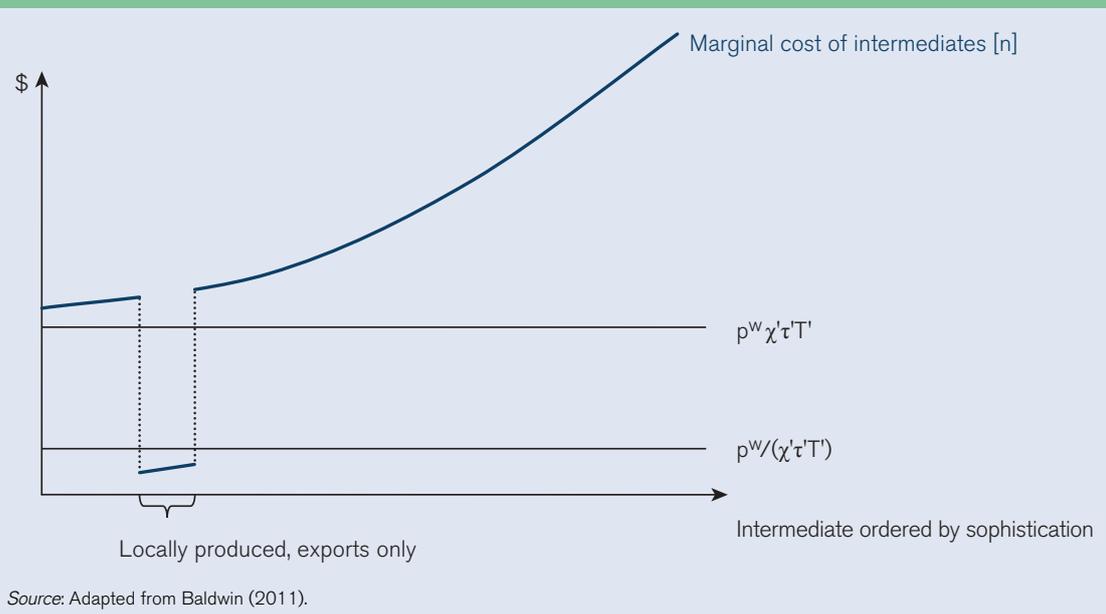


Figure C.16: Integrating a country into GVCs through technology transfer



(iii) Initial integration into GVCs: from agriculture to manufacturing and services

Initial integration into GVCs often triggers beneficial structural transformation. This tends to be the case for countries at early stages of development during which large parts of the population are employed in subsistence agriculture. Initial GVC integration is typically associated with large productivity and welfare gains in these countries because labour is moved into manufacturing or services. Although activities in the latter sectors also tend to be labour intensive and low skill in the early stages of development, their productivity is generally higher.³¹

The growth of China until one decade ago could be viewed as a process of moving large swathes of the workforce into basic manufacturing. Indeed, shares of manufacturing income in total income have been rising for many emerging markets as they have developed (Timmer et al., 2013). In this regard, integration into GVCs is quite similar to the industrialization experienced by other countries prior to the “second unbundling” (i.e. the unbundling of factories and offices, meaning that not only goods but also tasks are traded). The main difference is that GVCs can make industrialization easier to achieve as initially only certain limited tasks have to be perfected to international quality levels.

Typical beachhead sectors for initial GVC integration are those where capabilities can be acquired easily. In manufacturing, the apparel sector is a typical first beachhead for many countries in initial stages of development. It is generally accepted that the clothing industry played a leading role in East Asia’s early export growth, and participation has created new jobs and contributed to capability building.³² However, the skills needed to manufacture a product to international standards in the sector are ubiquitous, and consequently value added in the manufacturing stage is low (but higher than in subsistence agriculture). Remuneration of labour involved in manufacturing generally amounts to less than one-tenth of the value of the final product.³³

In services, call centres and IT back office activities have relatively low entry barriers even for low-income small countries. However, they require sufficiently educated workforces (Fernandez-Stark et al., 2011a). Integration may be especially beneficial for landlocked poor countries or island countries in which physical transport infrastructure is lacking or shipping costs remain high due to the small scale of activities. India has illustrated how this sector, concentrated in mainly two large cities in the country, may be a powerful engine for export growth. Based on these types of experiences, Gereffi et al. (2011) underline that small countries may be able to learn from GVC integration successes in large countries, as these are often regionally concentrated and could therefore possibly be replicated in smaller nations.

Most countries in Sub-Saharan Africa and some countries in Central Asia and Latin America are still struggling with this initial GVC integration. Greater difficulties for these

economies in integrating – particularly into manufacturing GVCs – may be due to their relatively large distances from any of the three factory regions in Europe, Asia and North America, described in Section C.1(a). Gibbon and Ponte (2005) point out that Africa has long been struggling because many of its firms lack the necessary competitive advantage and experience difficulty in meeting world market requirements. This is because they are too small and unspecialized, insufficiently vertically integrated or financially weak.³⁴ By some estimates, Kenya’s factory floor productivity is close to China’s but when other indirect costs are taken into account, Kenyan firms have a 40 per cent productivity gap relative to Chinese firms.

However, there are some African success stories in specific sectors and countries and their number is rising. Sutton (2012) highlights that some low-income countries in Africa, including Ethiopia, Kenya and Tanzania, have now improved their institutions and capabilities sufficiently to reach GVC integration in many areas. He points out that their performance over the next decade could be crucial in setting positive precedents and achieve geographical spillovers within Africa. This corresponds with an earlier study by Eifert et al. (2005), which points out that although indirect and business-environment-related losses depress the overall productivity of African firms, these costs vary considerably across countries, suggesting that the emergence of those nations with stronger business communities and better business climates could indeed be imminent.

(b) Distribution of gains within GVCs

A key issue for developing countries is that gains in GVCs are often distributed very unequally, particularly for the activities where integration first takes place. For instance, more than 95 per cent of personnel in the apparel value chain are employed in assembly line positions, mostly located in developing countries, yet they receive less than 10 per cent of the product’s value (International Labor Office (ILO), 2005; Nathan Associates Inc., 2006; Park et al., 2013).

Suppliers in developing countries produce directly or indirectly for the lead firm of the GVC. Firms in developing countries need access to these lead firms, which are generally headquartered in developed countries, to use their distribution channels in destination markets. What distinguishes lead firms is that they control access to major resources, such as product design, new technologies, brand names or consumer demand (Gereffi et al., 2005). These resources are acquired through an accumulation process, such as continuous advertising to establish brand recognition, and can therefore not be easily replicated (Teece, 1988).³⁵ Lead firms mostly concentrate on activities upstream or downstream from manufacturing, such as logistics, finance, design and marketing, which are more skill intensive (Fernandez-Stark et al., 2011b).³⁶ Based on the lead firm’s role, GVCs can be distinguished as buyer- or producer-led (see Box C.8).

Box C.8: Buyer- and producer-led supply chains

Depending on the nature of the lead firm, GVCs can be distinguished as producer- or buyer-driven supply chains (Gereffi, 1994).

In producer-driven GVCs, large, usually multinational, manufacturers play the central roles in coordinating production networks (including their backward and forward linkages) and are typically involved in the supply of critical components. This is common in capital- and technology-intensive industries, such as automobiles, aircraft, computers, semiconductors and heavy machinery. Profits in these chains are derived from scale, volume and technological advances.

In buyer-driven GVCs, lead firms are large retailers, marketers and branded manufacturers. Here, profits are created based on a combination of high-value research, design, sales, marketing and financial services. Lead firms in these GVCs are mostly not involved in the production process itself but only supply codified specifications to developing country contractors that carry out production. Tiered networks are the norm, in which large first-tier suppliers sub-contract certain tasks to smaller second-tier suppliers, and so forth. Buyer-led GVCs are common in consumer-goods industries, such as garments, footwear, toys, handicrafts and consumer electronics, where they have displaced traditional manufacturers as the leaders given their information advantage. The retailers in these GVCs use sophisticated technology, including bar coding and point-of-sale scanning, to provide immediate and accurate information on product sales. Capturing trends in demand allows them to quickly react to changes, thereby increasing revenues and lowering risks by getting suppliers to manage inventories.

Table C.5: Key determinants of gains distribution in GVCs

Type of GVC structure	Complexity of transactions	Ability to codify transactions	Capabilities in the supply base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	Low  High
Modular	High	High	High	
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	High	Low	

Source: Gereffi et al. (2005).

Gereffi et al. (2005) point out that how gains are distributed between partners in a GVC-based business relationship depends on their relative bargaining power. The relative bargaining power in turn depends on three factors: (i) how rare and coveted the capabilities of the supplier are and whether the transaction can easily be shifted to a different supplier, which in turn is the case if (ii) it can be codified and (iii) it is not very complex. Often lead firms possess rare capabilities while suppliers further down the chain stand in increasingly fierce competition with each other – leading to large gain capture of developed country lead firms vis-à-vis developing country suppliers.

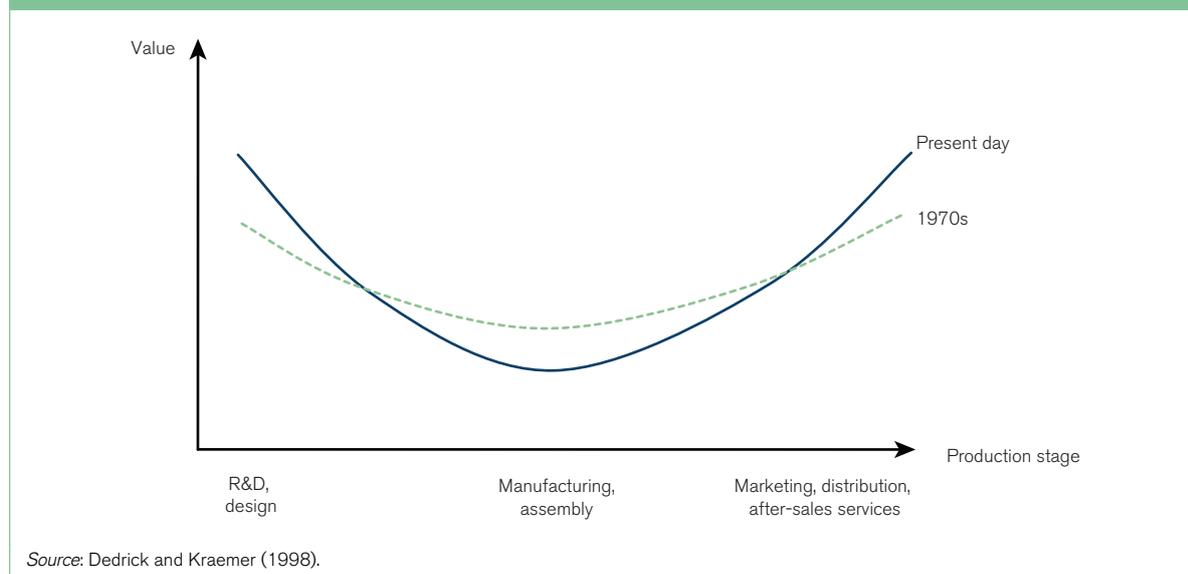
The authors identify five types of GVC structures based on the three factors above (see Table C.5). The first factor is the supplier's capability. If it is low, he will provide a task that can be easily performed by competitors and bargaining power will be heavily skewed in favour of the lead firm. This results in a captive GVC structure, in which developing country firms often find themselves in initial stages of integration. Developing country suppliers could get particularly squeezed if they face high costs of switching to another buyer, so they are effectively locked into dealing with one lead firm in the short run. However, as yet there is little empirical evidence regarding the scale of switching costs and the extent to which they may inhibit suppliers from switching from one buyer to another.

The second fundamental determinant for the remuneration for a task in a GVC is whether the knowledge and specifications needed to undertake the task, even though they may be complex, can be codified and readily transmitted. If this is the case, the remuneration for these activities will generally be low. This is typical in many standard manufacturing and assembly activities, including apparel manufacturing, as described above.³⁷ The ability to codify makes it easier for purchasers to switch between suppliers, thus heightening competition among suppliers and driving down their prices.

On the other hand, if transactions are complex and not easily codified, switching costs are high. Linkages in these chains are therefore tight, and often involve a high proportion of face-to-face interaction and mutual learning, which constitute sunk costs, including for lead firms. Mutual dependence is regulated through reputation and long-term commitments and distribution of gains will be more favourable for the suppliers. To participate in such a "relational" GVC structure, developing country suppliers must possess strong production and communication capabilities, which are typically not present at early stages of GVC integration.

Finally, lead firms' bargaining power is larger if they have few competitors to which suppliers could switch their products. Lee and Gereffi (2013) illustrate this point using the mobile phone global value chain. In recent years, the

Figure C.17: The smile curve



number of lead firms in the sector has shrunk considerably, with Apple and Samsung largely dominating global markets. The authors provide evidence that this consolidation has resulted in increased bargaining power and profits for lead firms, while manufacturing host countries have observed limited wage increases and have become more dependent on the demand from a single lead firm.

The "smile curve" in Figure C.17 describes a general empirical regularity suggesting that upstream activities (R&D, design) and downstream activities (marketing, distribution) are characterized by higher value-added capture.³⁸ In the initial stages of development, countries mostly enter at the low value-added manufacturing and assembly stages, in which knowledge is often easily codifiable and the capabilities required are low. On the other hand, knowledge in other activities, such as design, marketing and retail is not easily codifiable, and brand value and recognition play a large role. These activities are often undertaken directly by the lead firms. As they are hard to replicate, this knowledge and these intangible assets often become the source of a durably strong market position (Palpacuer, 2000; Teece et al., 1997).

While significant welfare gains may be realized because of productivity increases in response to the shift of labour from agriculture to manufacturing and services, as previously described, these gains may not be as large as in the past because the smile curve has "deepened" since the 1970s, meaning lower levels of value added in the middle stages of the value chain. This is due to three reasons (Baldwin, 2012).

The first reason is that tasks are offshored to developing countries precisely because production costs in these countries are low relative to coordination costs. This lowering of costs at that stage necessarily implies that the value added during that stage goes down. The lowering of costs in turn has mainly been driven by many developing countries acquiring during the past decades the capabilities to provide manufacturing and assembly services in many

industries. The second reason is relative market power. The tasks that are easy to offshore are often those that require low capabilities and can be done in various countries and, hence, have become subject to more intense competition as many developing countries have opened up their trade, keeping value added in those stages low. The third reason is internationally mobile technology. The transfer of advanced technology to the offshore locations is now more worthwhile than in the 1970s in light of lower coordination costs. Incorporation of more advanced production technology leads to cost savings and drives down further the value added of the offshored stages.

Existing empirical evidence seems to broadly confirm the distribution of gains in favour of lead firms in GVCs. This evidence generally corroborates that there is lower competition at the stages undertaken directly by global lead firms. For instance, the coffee GVC is important in many developing countries, including landlocked LDCs such as Burundi, Ethiopia, Rwanda and Uganda, accounting for a lion's share of their exports. However, 60 per cent of value added is captured inside the developed country consuming the coffee and accrues to lead firms in roasting and retailing (Fitter and Kaplinsky, 2001).³⁹

Dolan and Humphrey (2010) report that in the UK-Africa horticulture chain particularly, small growers – although just as efficient as large producers – can be marginalized by lead firms' preference for big suppliers in their sourcing strategies. For the apparel GVC, Park et al. (2013) find that, often, less than 10 per cent of value added accrues to developing country manufacturing. Evidence from China's sporting goods sector suggests that lead firms keep their value added capture high by using their influence to control domestic firms' pattern of specialization and upgrading initiatives (Zhou et al., 2009).

In the electronics industry, value capture by lead firms is also relatively high (one-quarter to one-third of products' wholesale prices). In many cases, further significant shares also go to

core software and component suppliers, such as Microsoft and Intel, who own valuable standards, allowing them to charge a considerable price premium (Dedrick et al., 2008). The differences in power underlying this skewed distribution of gains may be aggravated by the lack of appropriate anti-trust regulatory frameworks within many developing countries (Baldwin, 2012; OECD et al., 2013).

(c) Upgrading in GVCs

Uneven distribution of gains in favour of lead firms can to some extent be addressed through efforts by developing countries to “upgrade” or “deepen” their integration in GVCs, although the trade literature does not yet deliver strong conclusions as to whether firm level distributions of gains also apply to the country level. Both upgrading and deepening integration can also often underpin development, but countries that have accomplished both at the same time seem to have fared best in terms of economic growth (see Table C.6).

Upgrading refers to broadening value added performed in a GVC in which integration has already been achieved. It implies climbing up the value ladder (or “smile curve”), moving away from low-skill activities characterized by low entry barriers and high competition. Authors have argued that upgrading within GVCs has been a key factor behind the rapid development of East Asian countries (e.g. Lall, 2001). Deepening integration is often also called intersectoral upgrading. It refers to achieving integration into GVCs in other activities either by establishing backward linkages to other domestic activities or by transferring capabilities to undertake new activities.

Different types of upgrading can be distinguished (Humphrey and Schmitz, 2000). The first is “process upgrading”, referring to improvements in the production process that result in a more efficient transformation of inputs into outputs. It may involve acquiring new machinery, implementing a quality control programme, shortening delivery times or reducing waste. The second is “product upgrading”, consisting of introducing new products, changing designs, improving quality, and producing a more sophisticated final output. The third is “functional upgrading”, involving moving into different

Table C.6: Median GDP per capita growth rate by change in GVC participation and domestic value added provided, 1990–2010

GVC participation growth rate	High	2.2%	3.4%
	Low	0.7%	1.2%
		Low	High
		Growth of the domestic value added share of exports	

Source: UNCTAD (2013a).

stages of production or functions beyond production within a given GVC. Most commonly this implies moving into new activities in a value chain with higher margin and difficult-to-replicate tasks, such as managing complex webs of inputs and outputs, original design, branding and marketing. Intersectoral spillovers across sectors, or deepening of GVC integration, can be distinguished as a fourth type of upgrading. This intersectoral upgrading refers to applying the competences acquired in a particular type of task as a means of integrating into a new sector.

(i) Process and product upgrading

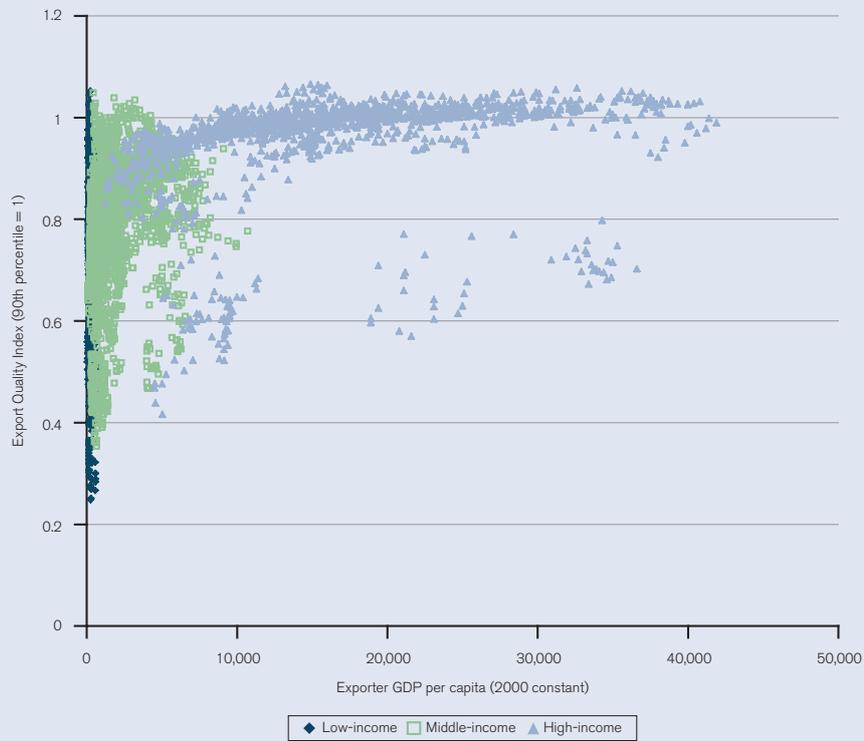
The economic literature suggests that process and product upgrading can lead to considerable productivity gains. Suppliers in GVCs distinguish themselves from other domestic firms partly through this upgrading process. Javorcik and Spatareanu (2009) find that suppliers in GVCs in the Czech Republic are larger, have a higher capital-labour ratio, pay higher wages and exhibit higher productivity. In addition, the literature on export quality suggests that product upgrading is associated with development, particularly in the early stages of development (see Box C.9).

However, gains from process and product upgrading often do not accrue entirely to developing country suppliers or workers. At least some of the gains of such upgrading generally accrue to lead firms because they typically still command large bargaining power at these initial stages of upgrading. Thus, they can squeeze the supplier's higher profit margin, resulting from the upgrading process, and thereby make the manufacturing stage cheaper. In this case,

Box C.9: GVC participation and upgrading export quality

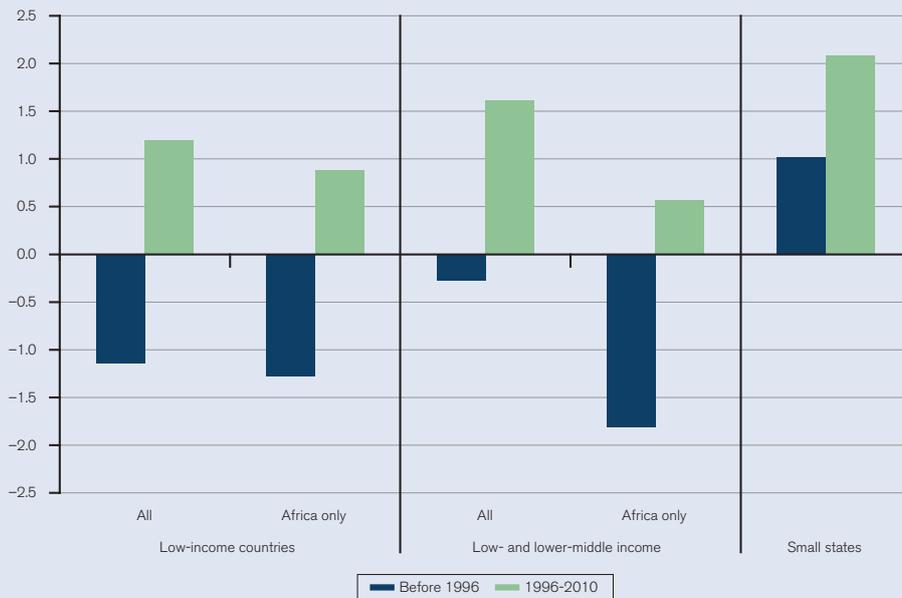
Harding and Javorcik (2012) demonstrate for a large sample of countries that prices of exports (a proxy for export quality) have increased especially strongly in sectors receiving FDI (a proxy for GVC participation). Henn et al. (2013) have devised a database on export quality with comprehensive coverage of developing and low-income countries back to 1962. They report that poor countries may gain considerably from quality upgrading. This form of upgrading in existing export products is strongly associated with development, particularly in the early stages of development (see Figure C.18). Countries complete convergence in export quality to world frontier levels largely by the time they reach upper middle-income status. Quality upgrading opportunities exist in the manufacturing and agricultural sectors although some highly concentrated low-income countries may profit from diversification into new export sectors. Countries with fast export quality convergence over the last two decades have also reaped large growth benefits, registering about 1 percentage point of additional annual growth in GDP per capita (see Figure C.19).

Figure C.18: Export quality and GDP per capita
(Index: 90th percentile = 1)



Source: Adapted from Henn et al. (2013).

Figure C.19: Additional GDP per capita growth in countries with fast quality convergence relative to those with slow convergence during 1996–2010
(percentage points)



Source: Adapted from Henn et al. (2013).

Notes: Additional annual per capita growth in fast quality convergers during 1995–2010 relative to slow convergers (percentage points). Fast quality convergers are those with export quality higher by 0.05 or more during 2008–2010 compared with 1994–1996. Other threshold values for the fast converger cut-off give similar results. Quality values are normalized to 1 at their 90th percentile and then typically range from 0.5 to 1.1.

the developing country supplier may not capture more value added, although it may still keep part of the benefits of the productivity increase. Benefits to the developing country can be larger than those to the supplier if the supplier also serves other parts of the domestic economy, which then benefit from an improved product and/or more competitive pricing.

Process and product upgrading opportunities are intimately linked with the GVC structure. Insertion in a captive GVC has been found to offer particularly favourable conditions for rapid process and product upgrading but often hinders functional upgrading (Humphrey and Schmitz, 2000; Schmitz and Knorringer, 2000). Relational GVCs, in which much interaction is required with purchasers, given that transactions cannot be codified, offer ideal product and process upgrading conditions. However, they are the least likely to occur for developing country producers, partly because in many of the industries that are easy to enter, the knowledge can be codified.

Process and product upgrading conditions also vary by sector. In Latin America, traditional manufacturing and natural resource-based clusters were found to have profited most from this type of upgrading, possibly through higher involvement in collective institutions aimed at raising productivity, such as business associations. However, the impact of upgrading was only moderate in high-cost, engineering-intensive products, such as automobiles and their components, and consumer electronics and collective institutions only played an important role in isolated cases (Giuliani et al., 2005). The authors highlight the key role played by lead firms in most developing countries and sectors in facilitating technology transfer enabling such upgrading.

In some cases, process and product upgrading are achieved with the help of lead firms while in others suppliers themselves are expected to drive these initiatives. Developing country producers can typically learn much from lead firms about how to improve their production processes, attain consistency and high quality, and increase their speed of response to customer orders. This is particularly the case if technology is not locally produced and the quality of products depends on the specialized skills of developed country producers (Giuliani et al., 2005).⁴⁰ In buyer-led chains, the lead firm has an additional important role in transferring information, especially on trends in demand in international markets, along the value chain and in signalling the need and the modes for the necessary upgrading. In certain sectors, such as automobile components and consumer electronics, however, lead firms often do not play a large role themselves in facilitating upgrading (Giuliani et al., 2005) as requirements are often codified by standards. Here, in order to retain the lead firms as buyers, suppliers undertake the upgrading themselves by contracting consultants or turning to other sources of knowledge available in the market.⁴¹

Standards are often used as instruments for achieving process and product upgrading. Often required by lead firms, they can lead to substantial skill development, and

economic and social upgrading by giving access to higher value export markets (Pietrobelli and Rabellotti, 2011). They can, however, represent trade barriers particularly for smaller firms. While compliance costs are typically relatively low (Maskus et al., 2000; 2005), they often tend to eliminate small firms from export markets as the fixed costs of implementing standards can be high relative to their size.⁴² Standards may also serve as catalysts for trade because they can reduce differences in access to information, which may be particularly significant between developed and developing countries. In addition, standards can reduce transaction costs and promote consumer confidence (Maertens and Swinnen, 2014).

Standards set by private firms are often harder to meet than public-sector standards. Both the importance and number of standards that firms need to respect to participate in global trade have also been increasing over time (Fulponi, 2006; Section D). However, a positive point for developing country producers is the trend towards harmonization of standards within sectors, giving producers greater opportunities to supply more than one lead firm. The regions that have integrated most into GVCs over the past 15 years – East Asia and Central and Eastern Europe – have experienced the largest increases in International Organization for Standardization (ISO) certifications, a series of standards aimed at achieving quality assurance for manufacturing and service industries (see Figure C.20).⁴³

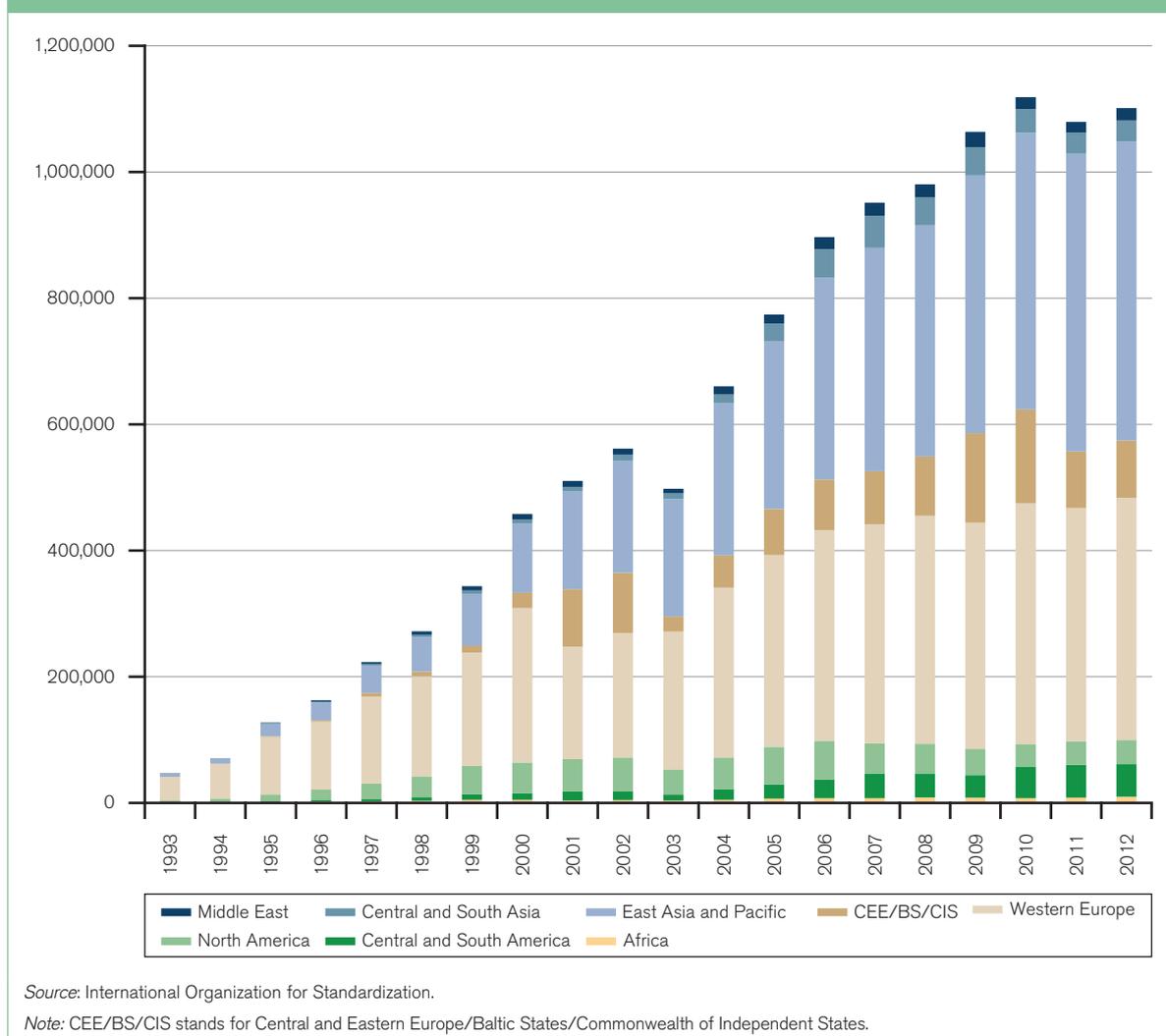
(ii) *Functional upgrading*

Competition from new entrants, particularly firms from other developing countries with lower production costs, is stronger in the manufacturing phases of GVCs than in other more knowledge and organization-intensive activities, such as providing a more complete product, managing part of the value chain, designing products or organizing distribution. Therefore, achieving functional upgrading will normally reduce the amount of competition a firm faces, increase its pricing and market power, and underpin more enduring competitive advantage than process upgrading.

By acquiring new capabilities, the supplier can often shift the structure of the GVC in its favour, e.g. from a captive to a modular relationship, in which the supplier produces a more complete product and manages some backward linkages in the chain (Humphrey and Schmitz, 2002). While functional upgrading has not been shown yet to cause growth, there seems to be an association. The IMF (2013b) finds that exporting more value added, a proxy for functional upgrading, has been associated with higher growth.

Entering GVCs where the developing country supplier is in a particularly weak bargaining position vis-à-vis the lead firm can hinder functional upgrading (Schmitz and Knorringer, 2000; Bair and Gereffi, 2001). To the extent that developing country suppliers initially integrate into these captive relationships, they are dependent on a small

Figure C.20: Stock of ISO 9001 certifications by region, 1993–2012
(number of certifications)



number of powerful customers. Lead firms often impose limitations on suppliers' functional upgrading efforts because they want them to focus their energy on providing the best product and not on other activities. Moreover, high financial risks for suppliers can be associated with functional upgrading ventures, which imply high sunk costs and are not guaranteed to succeed (Navas-Aléman, 2011).⁴⁴ Pressures by lead firms to discourage functional upgrading exist in many sectors but they may be lower in some, such as the software sector (Giuliani et al., 2005).⁴⁵ These pressures are particularly strong when upgrading efforts may threaten the competitive position of the lead firm in its core activities, such as design, marketing and sales (Bazan and Navas-Alemán, 2004).

If functional upgrading does not directly impinge on lead firms' core competences, it can often be achieved, however. Various studies for the garment sector, for instance, suggest that local producers in developing countries will not face too many obstacles when moving from assembly of imported inputs to increased local sourcing and production (Humphrey and Schmitz, 2002).

Apparel manufacturers have achieved upgrading from low value added export-oriented assembly products to export of the ready-to-sell product in various countries, including Mexico and the Asian Tiger economies (see Box C.10).⁴⁶ This type of functional upgrading through vertical linkages is relatively easy in some buyer-led supply chains, in which the lead firms completely focus on design and distribution in their home market and have never been involved in manufacturing. Functional upgrading by suppliers may even be in the interest of these lead firms because they often want to focus more closely on their core competences in design and marketing (Gereffi and Memedovic, 2003).

Further functional upgrading into original brand name manufacturing is typically harder to achieve. This is because through such upgrading, former suppliers often become direct competitors to lead firms, at least in some markets. The economies of clustering help such upgrading: as a country becomes involved in an increasing number of GVCs, the better its support service and infrastructure network become (Wood, 2001). This enables such advanced functional upgrading, which

Box C.10: Functional upgrading in apparel GVCs in East Asia

East Asian newly industrialized economies (NIEs) constitute a prominent example of industrial upgrading in developing countries. They entered apparel value chains in the 1950s, providing purely assembly services in captive relationships. Since then, they have undertaken considerable functional upgrading in three major steps. First, they moved into production of the full product by acquiring capabilities to interpret designs, produce samples, monitor product quality, and meet lead firms' price and time conditions, thereby generating considerable backward linkages in the domestic economy (Gereffi, 1999; Gereffi et al., 2005). This led to development of innovative entrepreneurial capability comprising the coordination of complex production, trade and financial networks. As domestic wages rose with development, these countries in the second major step of functional upgrading became middlemen in GVCs by outsourcing the low value-added manufacturing activity to lower-wage countries in Asia. Firms in the NIEs now moved to focusing on value chain management and coordinating shipments from the low-wage countries directly to destination markets. In adopting this role, the reputation established with buyers through countless successful business transactions during previous years was crucial. In a third step of functional upgrading, East Asian NIEs have also taken up higher-value upstream products (such as exports of textiles and fibres), moved downstream to marketing products under their own brands, and integrated into other GVCs where the success in the apparel sector can be replicated.

tends to take place at later stages of development. For instance, some firms in the East Asian NIEs – after having first become competent manufacturing bases for developed country leaders – have pressed ahead to integrate their manufacturing expertise with the design and sale of their own branded goods. The Republic of Korea is one of the most advanced, with its many widely recognized brands, including automobiles (Hyundai) and electronic products and appliances (Samsung), sold in many developed economy markets. Firms based in Chinese Taipei have pursued original brand name manufacturing in computers, bicycles, sporting equipment and shoes (Gereffi, 2001).

Functional upgrading into activities that are core competences of lead firms, such as design or branding, can be facilitated in three ways. First, serving smaller domestic customers in addition to multinational lead firms typically leads to suppliers attaining functional upgrading (Navas-Aléman, 2011). In Brazil, retailers purchase ready-designed shoes to sell them in the domestic market either under their own labels or under the supplier's own brand (Schmitz, 2004). Similarly, knitwear firms in India sell to small foreign traders and also develop their own products (Tewari, 1999).

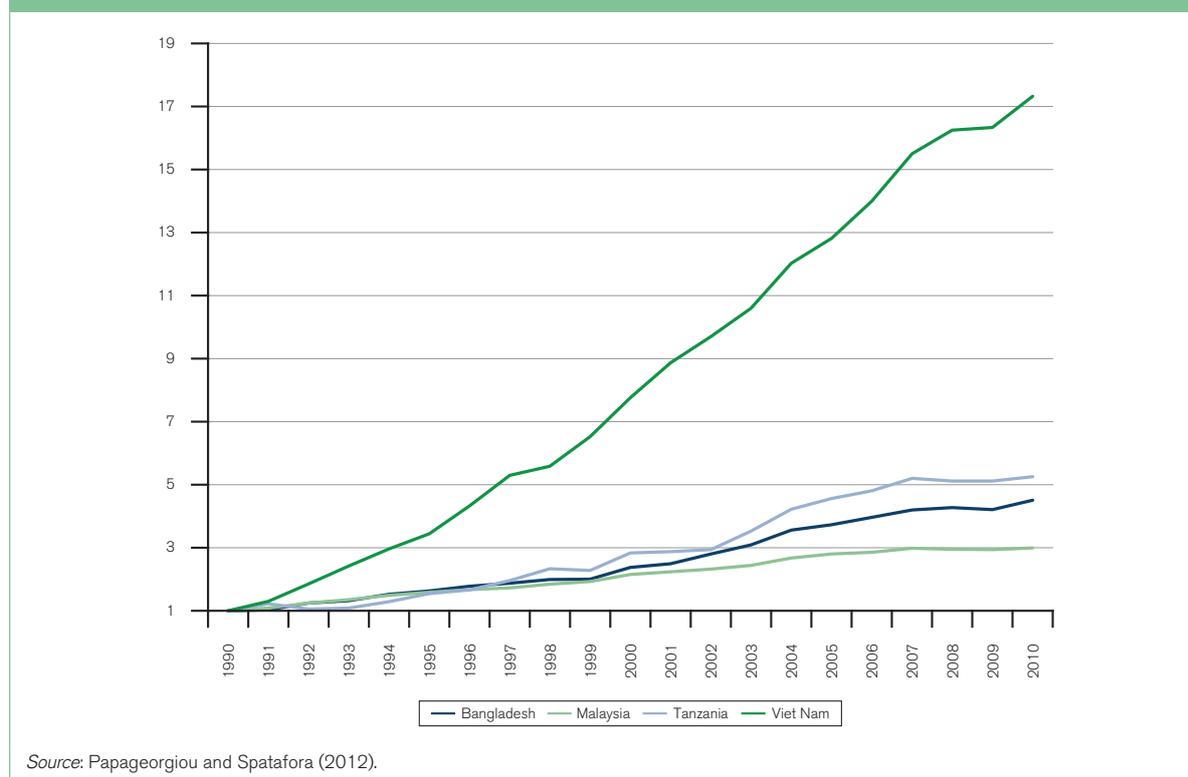
Secondly, being active simultaneously in various chains can foster functional upgrading. This exposes firms to different value chain structures that stimulate different types of upgrading. It can have a significant impact when there is a deliberate intent to apply newly acquired capabilities from more captive chains to more flexible ones, such as market-based relationships. Navas-Aleman (2011) have found that multi-chain producers show the best levels of attainment in all three types of upgrading: product, process and functional upgrading. Giuliani et al. (2005) find many instances of multi-chain clusters in their large study of 40 Latin American industry clusters.

Thirdly, being active in chains at the domestic, regional and global levels is favourable for functional upgrading. Such diversified activity has been observed for firms in various industries.⁴⁷ In particular, functional upgrading into design and marketing may be more easily attainable initially in the local market. Even being based in a small country may not place unsurmountable obstacles if firms manage to take advantage of internal and neighbouring markets, as highlighted by Reardon and Berdegúe (2002) for the Central American agro-industrial sector. For countries weakly integrated into world markets and characterized by many small-scale producers, regional integration may be an intermediate step in attaining internationally acceptable productivity and quality levels (Draper et al., 2013).

Collective institutions and joint actions among firms in clusters are important for fostering functional upgrading. Clusters can help firms, particularly smaller ones, overcome major constraints and encourage division and specialization of labour by providing a wide network of suppliers, agents who sell to distant markets, specialized producer services, and a pool of specialized and skilled workers (Giuliani et al., 2005). Collective institutions are important for supporting the development of clusters. These institutions include business associations, joint marketing, trade fair participation, integration of research and technology diffusion centres, and collaboration with universities.⁴⁸ Importantly for developing countries at initial stages of development, collective action can also be successful among small firms and in the agricultural sector.⁴⁹

Raising education levels is likely to be important in unlocking upgrading potential, as pointed out by Draper et al. (2013), who advocate such horizontal policies rather than a focus on specific activities. They emphasize that education constitutes a crucial determinant of the position into which a country can insert itself in a value

Figure C.21: Growth in varieties of products exported in 1990–2010
(index 1990=1)



chain, and is increasingly valued by investors vis-à-vis low labour costs.

(iii) Intersectoral upgrading

Intersectoral upgrading, or deepening of integration across sectors, refers to the ability to establish vertical backward linkages or transfer capabilities to new products and activities.

Backward linkages

Vertical backward linkages refer to the integration of local suppliers into production processes of domestic GVC firms. Successful establishment of vertical linkages can then also help these suppliers benefit from knowledge and technology spillovers. Javorcik and Spatareanu (2008) find that FDI affiliates with joint domestic and foreign ownership face lower costs in identifying local suppliers. This highlights that the process of identifying suppliers involves specific local knowledge that may not be easily available to wholly foreign-owned firms. The results suggest that, to the extent that such information is made available, e.g. through business associations or specific government agencies, it could facilitate local firms' integration into supply chains.⁵⁰

New products and activities

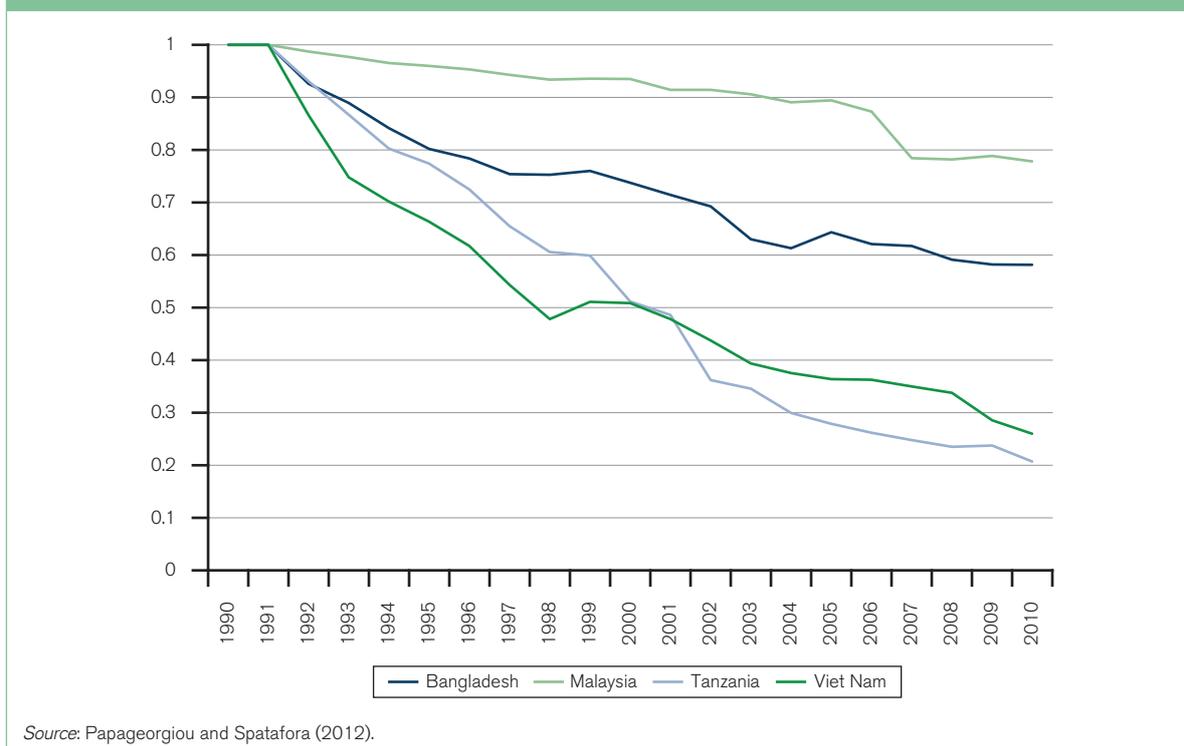
An example for successful intersectoral upgrading into new products and activities is manufacturers in Chinese Taipei, who built on their skills in producing TVs by first

making monitors, and then moving into the computer sector (Guerrieri and Pietrobelli, 2004; Humphrey and Schmitz, 2002). Costa Rica's diversification from medical devices into computer chips (see Box C.6) can also be seen as a case of intersectoral upgrading.

It is, however, not straightforward to identify those products and activities that will be competitive. Finding them is largely a trial-and-error process and requires experimentation, but can lead to durable competitive advantage.⁵¹ Papageorgiou and Spatafora (2012) illustrate that some fast-growing low-income countries, such as Viet Nam, feature high experimentation. For instance, Viet Nam nowadays exports 18 times as many different products as it did in 1990 (see Figure C.21). Experimentation is an important way for a country to discover those products that can be particularly successful exports, which Easterly et al. (2009) call "big hits". The authors find that many countries' export baskets become dominated by just a few "big hits". To cultivate a "big hit", it is also important that export growth can be sustained after the discovery phase; the data show that Tanzania has been particularly successful in this respect (see Figure C.22).

Sutton and Kellow's (2010) results suggest that those persons and organizations most successful in discovering export opportunities are aware of both international demand and local capabilities. The authors find that many large enterprises in African countries are owned either by foreign companies or locals previously involved in the import-export

Figure C.22: Export value of 1990 incumbent varieties of products, 1990–2010
(index 1990=1)



business. Papageorgiou and Spatafora (2012) suggest that experimentation and subsequent export growth may be encouraged by low set-up costs for firms, strong linkages between industry and universities, and low barriers for entry into new markets and for exporting.

3. Risks related to GVC participation

There are various risks relating to GVC participation. While spillover benefits through integration and upgrading in GVCs can be important, these risks also need to be appropriately taken into account. This section highlights six types of such risks. GVC participation can heighten vulnerabilities to demand fluctuations resulting from global business cycles and to supply fluctuations caused by disruptions in supply, and by relocation and investment risks. Further risks relate to labour and the environment, adverse effects on income inequality inside countries, and narrow learning.

(a) Increased vulnerability to global business cycles

Participation in GVCs can increase vulnerability to global business cycles. Altomonte et al. (2012) show that during the great trade collapse of late 2008, GVC trade fell faster and further – but also recovered faster – than non-GVC trade in detailed data on French trading firms, for which these two types of flows can be distinguished (see Figure C.23). The authors attribute this to more synchronized

information sharing within GVCs, which allows more immediate stock adjustments in response to shocks and causes impacts to be rapidly transmitted upstream through GVCs.⁵² Yet, the study also shows that supplier relationships are generally long lasting in GVCs and were not destroyed by the economic crisis.

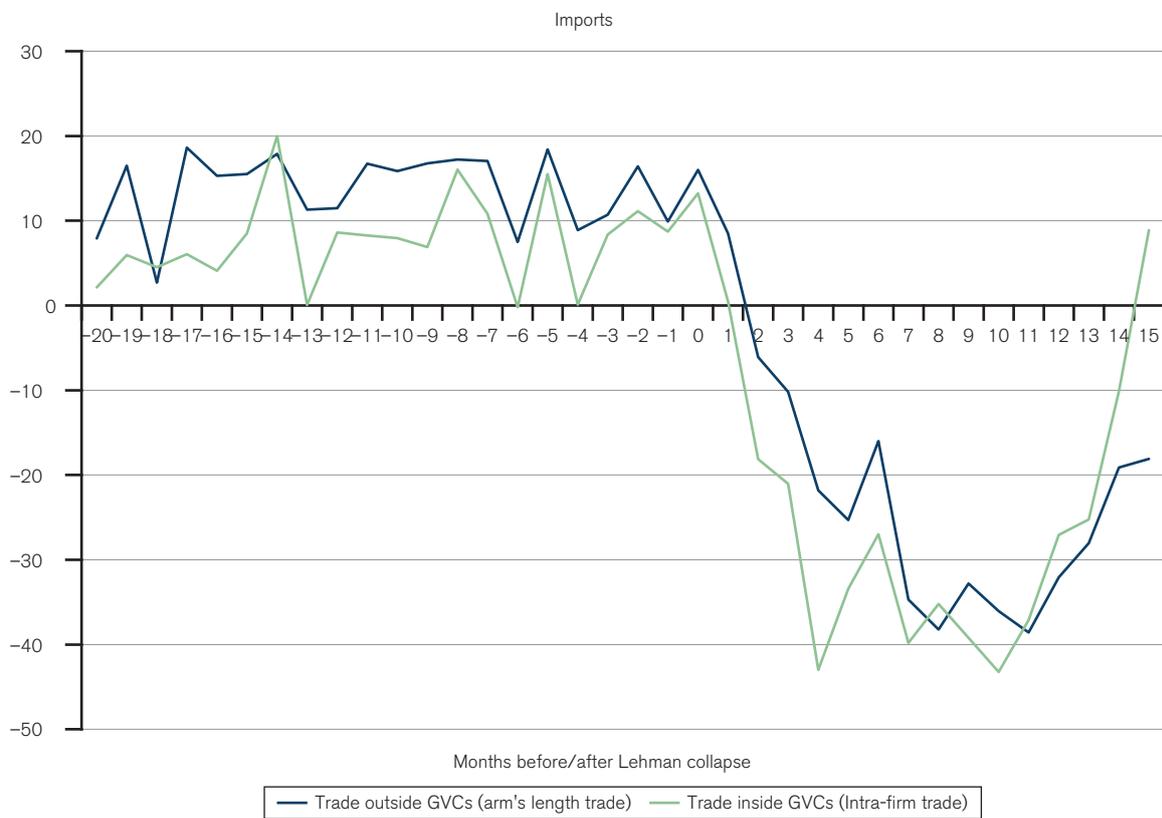
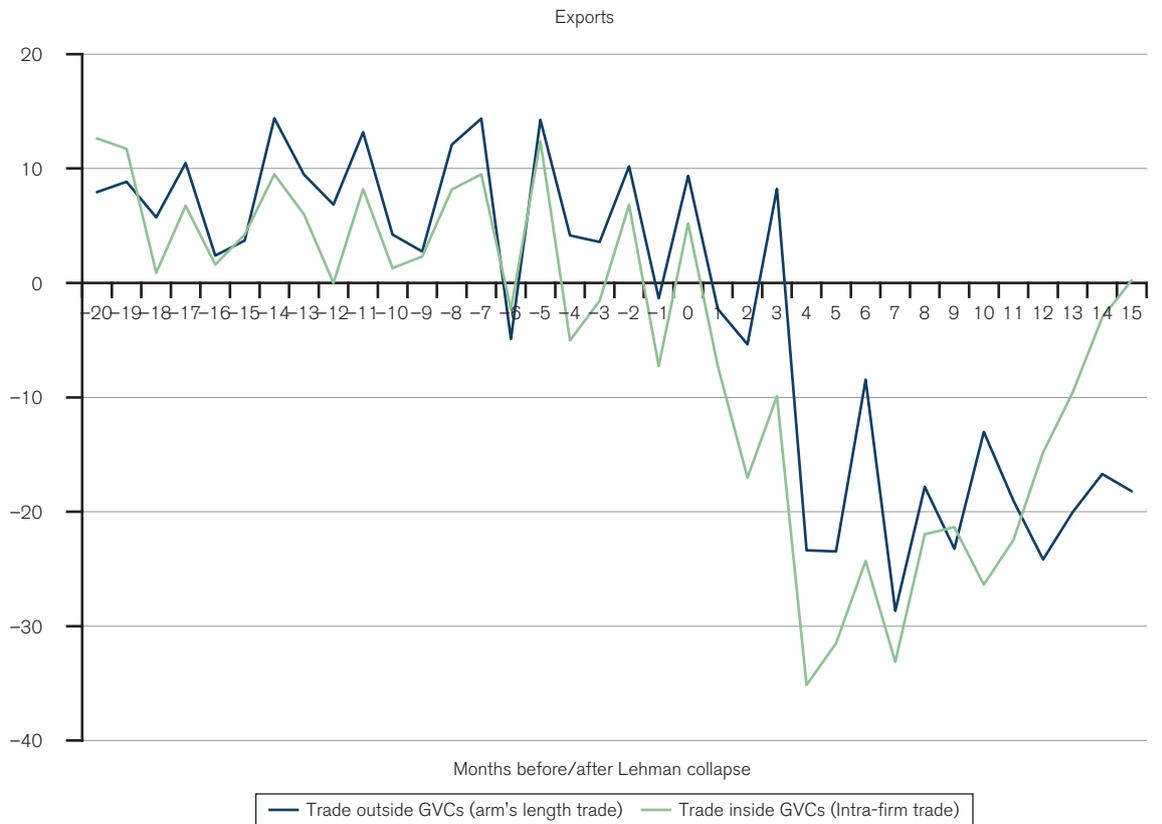
Nonetheless, adjustments to persistently lower demand can be painful for developing countries. For instance, the clothing industry slashed over 11 million jobs in the year and a half following the global crisis, with China, India and Pakistan most affected (Staritz, 2011).⁵³ In addition, developing countries may be more exposed to idiosyncratic shocks at the level of individual lead firms because these often pass on uncertainty to smaller sub-contractors and their workforces (Arnold and Shih, 2010).

Ivarsson and Alvstam (2010) suggest that participation in multiple types of supply chains can be helpful in mitigating exposure to global business cycles. By having their own brand, marketing strategy and design, multi-chain firms can more easily switch between domestic and regional markets for the sale of products.

(b) Increased vulnerability to supply disruptions

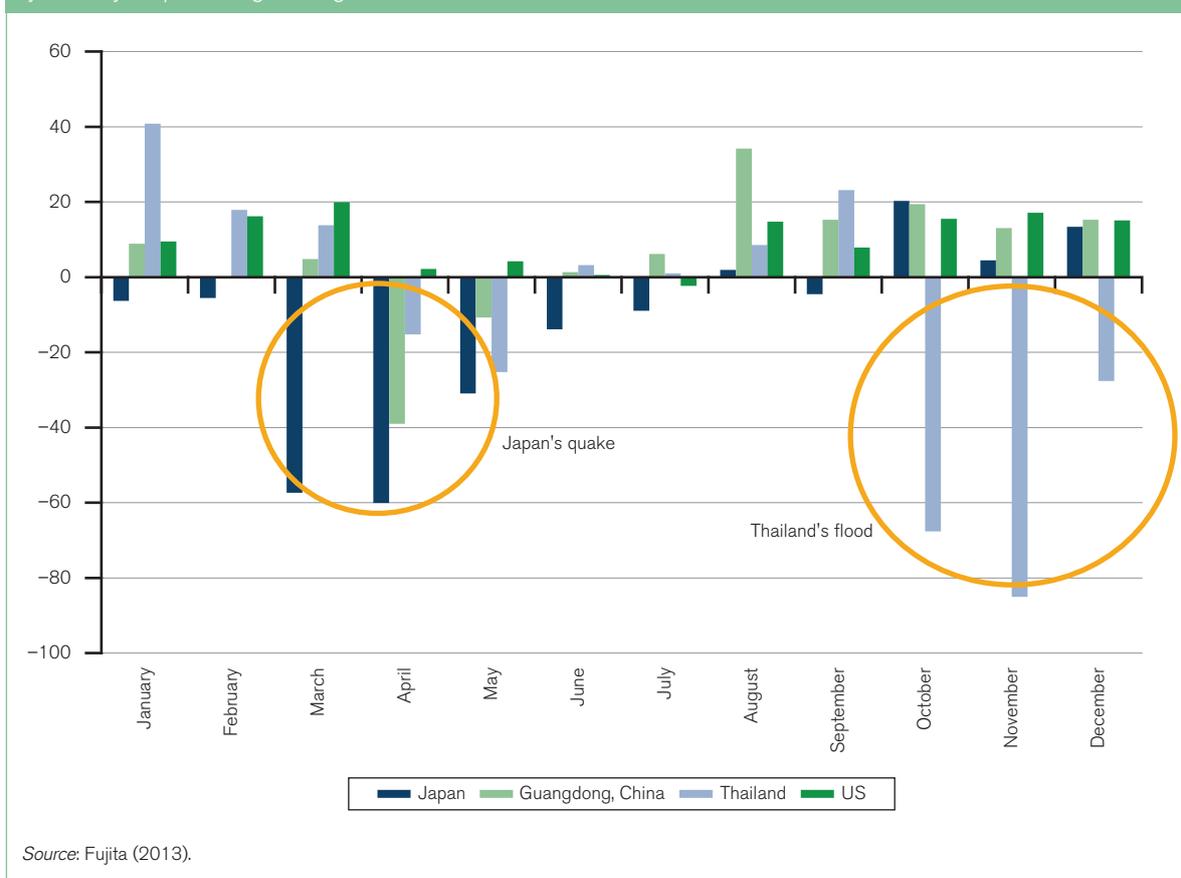
Isolated events, such as natural disasters, can create large disruptions in GVCs. The disruptions can be particularly large if: (i) production is very concentrated geographically,

Figure C.23: Trade of French firms within and outside GVCs during the Great Trade Collapse of late 2008 (year-on-year percentage changes; Month 0 = September 2008)



Source: Altomonte et al. (2012).

Figure C.24: Automobile production in selected regions, 2011
(year-on-year percentage changes)



with a certain component produced only in one or a few places worldwide; (ii) if the final product consists of many components; and (iii) if a supply shock arises upstream rather than downstream.⁵⁴ The devastating 2011 Tohoku earthquake in Japan illustrated this, as production of a key car component was concentrated in the region most affected by the disaster. Although Japanese overall trade was not hugely affected (Escalaith et al., 2011), Japanese auto production fell by as much as the decline in parts production in the disaster area, given its reliance on the component. Furthermore, there were international ripple effects in other automobile manufacturing areas, including in China, Thailand and Japan (see Figure C.24). However, the impact of floods in Thailand later the same year was more contained, affecting mainly domestic production with less knock-on effects to other economies, arguably because Thai car manufacturing is more downstream (Fujita, 2013).

(c) Relocation and investment risks

In GVCs, specialization of suppliers is intensified, competitive advantage becomes more dynamic and knowledge has to be acquired continuously for suppliers to safeguard competitive positions (Cattaneo et al., 2013). Location decisions in GVCs are characterized by

a trade-off between production costs and the transaction costs of unbundling. Indeed, certain components may be produced in a country with a production cost disadvantage to save on unbundling costs (Baldwin and Venables, 2013).

Even small changes in production or unbundling costs may be sufficient, therefore, to affect the location decision of firms. If transaction costs increase or production costs in developing countries rise relative to those in advanced countries, firms might decide to bring back part of the production that has been previously offshored. Likewise, if relative production costs change between different developing countries, production may relocate between them. It is therefore not surprising that vertical FDI, which is particularly important in GVCs, has been found to be more mobile than horizontal FDI (Olney, 2013). Adverse impacts may also materialize even if firms do not completely pull out of the domestic economy but only shift orders to different production plants or suppliers in other countries (Plank and Staritz, 2013).

This high mobility of GVCs results in relocation and investment risks for those countries that have achieved integration, particularly if their capabilities are relatively ubiquitous (Draper et al., 2013). These risks can materialize in manifold ways. Policy makers may be unaware of when

thresholds for relocation are reached and may be surprised by sudden shifts in production, leaving the country unprepared in the face of significant structural adjustment needs and social dislocation.⁵⁵ Public investments in infrastructure, education and other resources have often been made (or are being undertaken) based on the country's economic structure, if not specifically to attract lead firms and foster integration into GVCs. These public investments can then quickly become badly spent resources. Private investments may also be at risk. Local suppliers can face strong decreases in downstream demand if key partners relocate to a distant destination. To the extent that the domestic banking system has extended significant credit to such suppliers, these exposures may be in jeopardy and can deteriorate banks' solvency, curtailing their ability to fund other investments in the economy.

Governments incur fiscal and relocation risks as they take decisions on which types of FDI to attract. In seeking to attract FDI, often considerable resources are committed through various instruments – explicitly as investment subsidies or tax breaks or implicitly as commitments for infrastructure development, regulatory reform, labour market liberalization or port authority changes (Blanchard, 2014). The likelihood of relocation for different types of investment therefore constitutes an important part of cost-benefit analyses undertaken by governments in attracting investments.⁵⁶ There is also a risk that governments could be drawn into a “race to the bottom” against their peers in offering concessions which could unduly constrain future policy making through grandfathering rules or compensation clauses for foreign investors (Hoekman and Newfarmer, 2005).

(d) Risks relating to labour and the environment

Developed country lead firms often require adherence to social, labour and environmental aspects of process standards, such as ISO certification, from their developing country suppliers. While these standards generally represent improvements over national norms, these improvements have reportedly been uneven across GVCs with regards to working conditions and labour rights (Locke et al., 2009). The collapse of the Rana Plaza garment factory in Bangladesh, from which a series of lead firms procured products, has increased public interest in the issue of worker safety, and raises concerns that there may indeed be a risk of a “race to the bottom” among developing countries to secure foreign contracts and investment.

Differing responses among lead firms seem to confirm that the extent of public scrutiny in their home markets is an important driver in directing corporations' resources towards labour issues. However, even if resources are deployed, lead firms face various challenges in improving labour standards in their developing country suppliers.

First, they may not have perfect control over suppliers. At present, requirements are often neither contractual nor subject to verification (Jorgensen and Knudsen, 2006). When verification occurs, lead firms' monitoring mechanisms are often based on inspections, where a mentoring approach to help local suppliers adopt standards might be more successful (Locke et al., 2009). Finally, sustainability standards could be evaded by suppliers by outsourcing tasks further down the chain to second- and third-tier suppliers (Jorgensen and Knudsen, 2006).

Nonetheless, government and non-governmental agencies concerned with raising labour and environmental standards have recognized that lead firms can provide a leverage point for their aims. However, a key blockage remains, in that standards are not equivalent across lead firms or sectors. For example, no common approach for factory inspections has yet emerged among global buyers in the wake of the Rana Plaza tragedy. Thus, convergence in standards involves multi-stakeholder initiatives consisting of diverse public and private, local and global agents. Even when such multi-stakeholder initiatives come to fruition, effective monitoring can be difficult and standards remain at risk of being undermined by stray cases of non-compliance.

Environmental outcomes have been relatively positive when narrowly comparing GVC integration with more traditional types of industrialization.⁵⁷ Available evidence focuses on the impact of FDI – a reasonable proxy for GVC presence – on environmental variables. Tambunlertchai et al. (2013) find for Thailand that FDI, particularly when originating from OECD countries, typically plays a positive role in the adoption of environmental standards. The authors also show that emission reductions are concentrated in those firms that face low implementation costs, have more understanding of procedures to meet standards and greater access to necessary technology. Case evidence from China pinpoints that emissions by firms financed by foreign capital are lower than those by domestically financed firms, at least for some types of pollution (Yang et al., 2013).

(e) Risks relating to income inequality within countries

Across countries, global integration during the last two decades has had a positive impact on reducing global income equality (Section B). However, power asymmetries inside GVCs can lead to unequal distribution of gains across firms and potentially also countries.

Within countries, GVCs are often associated with differing impacts on employment and inequality. Trends toward higher within-country inequality materialized in both developed and developing countries around the same time as the rise of GVCs, although it remains unclear whether it was globalization that drove this widening in income distribution within countries.⁵⁸ For developed countries,

offshoring can be associated with large transfers of some types of jobs to developing countries (Feenstra, 1998), thus affecting employment and income distribution in developed countries (OECD, 2011).

For developing countries, rapid growth through GVC participation causes them to face simultaneously the problems of the developed and developing world in a wide range of social and economic issues, including rapid industrialization and de-industrialization in different sectors, and simultaneous incidences of malnutrition and obesity, as well as simultaneous requirements for basic literacy and world-class tertiary education (Sturgeon and Memedovic, 2010). These impacts operate mainly through two channels: by affecting relative wages and by increasing profit shares.

Feenstra and Hanson (1996) develop a theoretical argument of this link between offshoring and inequality through wage differences between high- and low-skill workers.⁵⁹ Developed countries are assumed to be abundant in high-skill workers and scarce in low-skill workers while the reverse is assumed for developing countries. Producers in developed countries will offshore the low-skill tasks when the wage differential becomes large enough to compensate for increased coordination costs (Baldwin and Venables, 2013). If that happens, the developed country experiences an increase in the complexity of the tasks performed and, hence, the demand for high-skill workers goes up, resulting in a wage gap increase between the high- and low-skill workers. Assuming the offshored tasks are considered high-skill in the developing country (given lower overall levels of human capital), a similar effect will be observed there. Thus, in both countries the wage gap increases between high- and low-skill workers.

Whether the absolute wages of the low-skill workers increase or fall depends on the terms-of-trade change in the model outlined above, and can go either way. Low-skill workers' wages would increase as a result of gains in productivity through outsourcing tasks, but only if there is perfect competition among firms, as Grossman and Rossi-Hansberg's (2008) alternative model suggests. However, offshoring firms are often large firms operating in imperfect competition, as this section has highlighted, so a positive impact on low-skill wages cannot be assured.

The impact of international offshoring on rising wage gaps is confirmed by empirical studies. Feenstra and Hanson (1996; 1997) present evidence both for developed and developing countries. The authors show that higher offshoring in US industries from 1979 to 1992 was associated with a rising share of wages of high-skill workers. At the same time, a similar pattern was observed in Mexico: the wages of non-production workers increased relative to production workers. Analysis of Mexican plants owned by US firms close to the border suggests that this increase was indeed driven by offshoring as the sharpest

increases in wage inequality were observed in the states that hosted many such plants.

Results from Swedish and Japanese multinationals indicate that the impact of offshoring on the domestic skill intensity depends negatively on the income level of the host country. Therefore, vertical FDI, particularly in low-income countries, appears to lead to skill upgrading at home – and higher wages (Head and Ries, 2002). This increase in wage differentials between skilled and unskilled workers could be offset if, simultaneously, the supply of skilled workers expanded sufficiently; however, this does not seem to be the case in practice.⁶⁰

Profits and consolidation of firms constitute the second channel through which income inequality within countries tends to increase. International competition leads to increasing consolidation and firm sizes by creating higher returns to scale. Iacovone et al. (2013) find that Chinese competition in the US market especially drove small Mexican firms out of the market. However, large Mexican firms were unaffected. As large firms are typically more productive, this may have positive welfare effects overall but to the extent that small firms are owned by poorer individuals, there are adverse income distribution effects. Moreover, the share of profits in total income has risen in most countries during the last two decades, while the share of wages has declined. Given that profits increasingly accrue to large firms, which are mostly owned by relatively wealthy individuals, income inequality has increased further (Rodriguez and Jayadev, 2010).

Finally, there is inconclusive empirical evidence on whether FDI may be a factor in increasing the profit and wage gaps. Jaumotte et al. (2013) find evidence of inequality being driven by technological progress and, to a lesser extent, financial openness, the latter mainly felt through FDI.⁶¹ Both of these appear to increase the premium on higher skills and possibly higher returns to capital. Meanwhile, trade openness is not found to have a negative impact on income inequality.⁶² Some earlier studies generally corroborate this result (Tsai, 1995; Alderson and Nielsen, 1999; Choi, 2006). Other research expresses concerns that FDI inflows into developing countries might have a negative impact on the development of local firms, and gains in labour demand may be limited because FDI often uses labour-saving technologies (Park et al., 2013). In contrast, other studies cannot find any impact by FDI on income distribution (Milanovic, 2002; Sylwester, 2005; Adams, 2008). Adams (2008) finds instead that other globalization proxies (trade openness and intellectual property rights) may be associated with higher income inequality, but they also can only explain 15 per cent of inequality patterns.⁶³

The literature suggests that adverse developments in income and wealth distribution could be mitigated through various channels. Redistribution within countries and internationally is one of these channels. Ostry et al. (2014) analyse historical data on redistributive policies

and show that resulting higher equality also boosted growth subsequently. Fitter and Kaplinsky (2001) point out that, until the late 1990s in Europe, the distribution of consumption standards had not become markedly more unequal, despite a worsening pattern in income distribution. However, in retrospect this may also have led to macroeconomic imbalances partly underlying the 2008 crisis, highlighting that such redistribution must be carefully designed, including to avoid persistent balance of payments imbalances (see Section E).

Once initial GVC integration has been achieved, international aid initiatives and transfers may be focused more strongly towards building skills and empowering local workers and producers which may enhance their bargaining power vis-à-vis lead firms (Mayer and Milberg, 2013). Bernhardt and Milberg (2012) show that when social upgrading in GVCs (proxied by increasing employment and real wages) occurs, it is generally underpinned by economic upgrading (proxied by rising export market shares and export prices). However, economic upgrading does not guarantee social upgrading.

(f) Narrow learning

Some types of participation in global value chains may lead to a narrow type of learning. This can occur when the skills involved in the activities performed in GVCs can neither be usefully transferred to other activities nor used to upgrade within the same value chain (Kawakami and Sturgeon, 2011; OECD et al., 2013). Davis (2010) argues that narrow learning can make the economy dependent with regard to a few tasks, which may not lead to the creation of sufficiently large economies of scale. Although many firms manage to upgrade in GVCs, much product and process upgrading takes place in the lower remunerated sphere of manufacturing, and survey evidence pinpoints that some firms do not achieve substantial upgrading. Thus, joining a GVC does not constitute a guarantee for future upgrading (Navas-Aléman, 2011).⁶⁴

A related issue arises if new knowledge is not widely dispersed throughout the economy. This may happen, for instance, when lead firms are not interested in integrating new local suppliers, which has been reported in some cases. Hungary's government programmes to integrate small and medium-sized enterprises (SMEs) into the country's electronics GVCs were not very successful, reportedly, despite the active participation of SMEs in the programmes and the parallel improvement of their capabilities (Plank and Staritz, 2011). The underlying reason may be that lead firms prefer to keep their supply base organizationally and geographically concentrated, with the result that room for potential local suppliers can be limited, regardless of their capabilities. Spillovers through human capital can be also limited when it is not attractive for local managers of lead firm affiliates to switch to domestically-owned firms (Plank and Staritz, 2013).

4. Policies affecting GVCs

Country-specific determinants, such as those related to the domestic business environment, are important in reducing trade costs, especially in the context of GVCs (see Section C.4.a). Moreover, keeping tariff barriers and other traditional trade barriers low is very important in a world in which inputs cross borders several times (see Section C.4.b). Finally, the patterns of GVCs have been accompanied by a deeper integration through trade agreements that go beyond these traditional instruments (see Section C.4.c).

(a) Setting the right framework for GVC participation

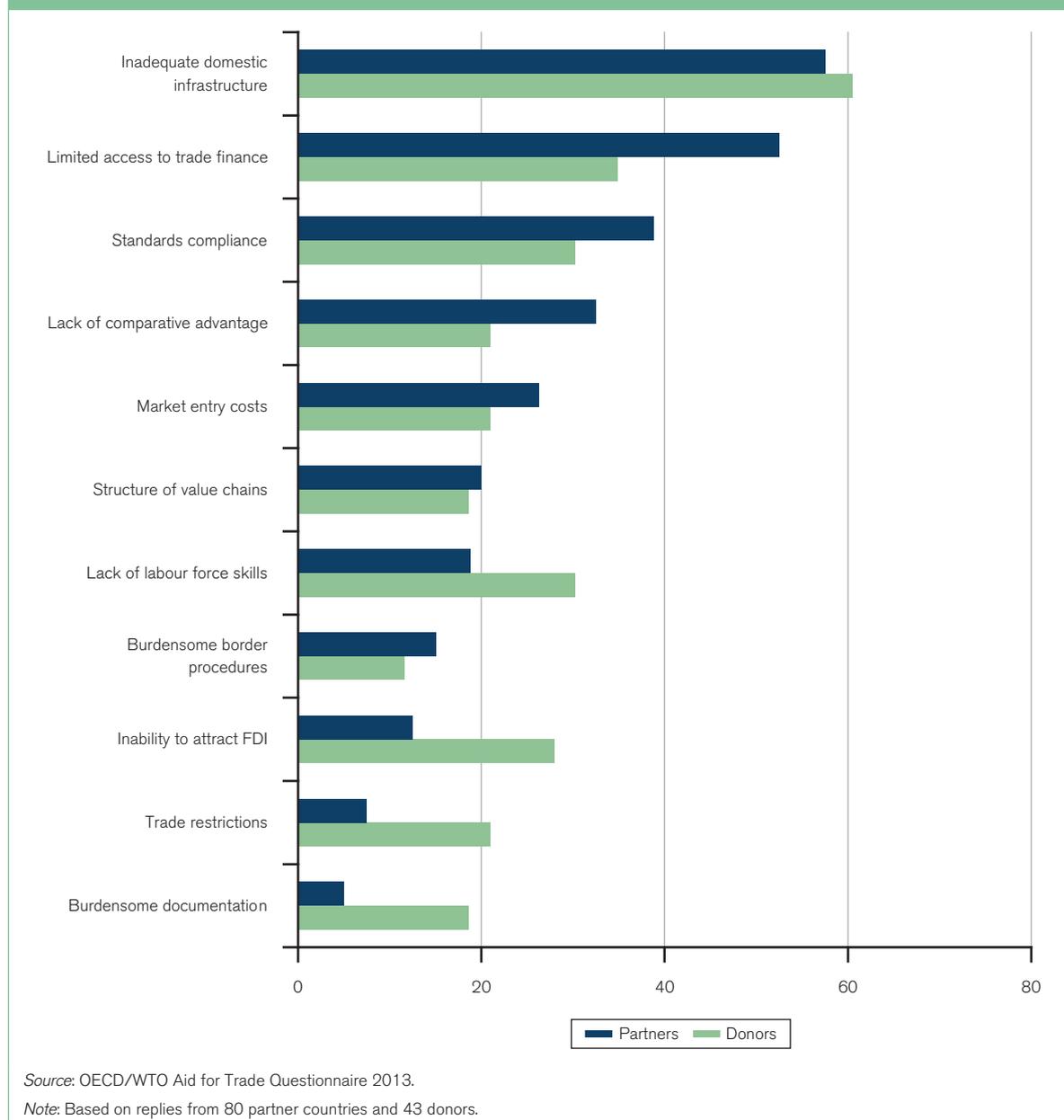
As part of the Fourth Global Review of Aid for Trade in July 2013, the WTO and the OECD conducted a joint monitoring exercise to identify the main barriers that developing country firms face in seeking to participate in value chains and how the Aid for Trade initiative can help firms overcome these barriers. Surveys were filled in by both the public and private sectors. From the public sector, 52 donors and 80 partner countries, including 36 LDCs, participated. From the private sector, 697 firms, including 524 developing country suppliers and 173 lead firms, responded. These firms are engaged in five value chains: agrifood, information and communications technology (ICT), textiles and apparel, tourism, and transport and logistics.

Partner countries and providers of trade-related assistance highlight three main barriers for developing country firms seeking to participate in value chains (see Figure C.25): inadequate infrastructure, limited access to trade finance, and standards compliance. Besides transport and ICT infrastructure, unreliable supplies of electricity still constitute a major constraint for firms in developing countries, and in LDCs in particular. Access to trade finance is a particular problem for small exporters.⁶⁵

Finally, firms have to demonstrate compliance, often through certification, with a range of standards, including technical, health and safety requirements, in order to be able to access mature markets and participate in value chains. WTO (2013a) presents a dedicated analysis of the effects of non-tariff measures on the exports of small economies. It shows that small, vulnerable economies (SVEs) are particularly affected by such non-tariff measures, as they specialize in products such as vegetables and food products that are significantly exposed to sanitary and phytosanitary (SPS) measures, and often lack the facilities to conduct testing and certification procedures that are required to meet standards and technical regulations in export markets.

Based on the replies of developing country suppliers and lead firms, Table C.7 shows the main barriers that

Figure C.25: Partner and donor country views on main barriers to firms entering value chains, 2013
(per cent)



developing country firms perceive as hindering their participation in value chains. Both suppliers and lead firms regard transportation costs and delays as well as customs procedures as major trade-related difficulties. These two issues seem to be of higher relevance than import duties and licensing requirements, which remain significant barriers nevertheless.

Suppliers and lead firms highlight the same four supply-side constraints: the regulatory environment, the business environment, transport infrastructure and labour skills. Furthermore, in line with the views of the public sector, developing country suppliers and lead firms regard access to finance, and in particular

trade finance, as well as an inadequate infrastructure for standards as significant supply-side constraints in developing countries.

The presence of these obstacles might matter more for supply chain participation than for final goods trade. When different components of a good are produced in different locations, uncertainty as to the arrival time or the quality level of a certain component might disrupt the overall supply chain.⁶⁶ Studies such as Nordås et al. (2006) and Hummels and Schaur (2013) suggest that costs associated with burdensome border procedures and a longer time to export are particularly relevant for time-sensitive sectors such as intermediate goods.

Table C.7: Main barriers hindering developing countries' participation in value chains, 2013 (per cent)

Developing country suppliers		Lead firms	
<i>Difficulties connecting developing country suppliers to value chains</i>		<i>Difficulties connecting developing country suppliers to value chains</i>	
Transportation costs and delays	42%	Customs procedures	52%
Access to trade finance	40%	Transportation costs and delays	38%
Customs procedures	36%	Licensing requirements (domestic or trade)	33%
Import duties	23%	Import duties	33%
Supply chain governance	23%	Meeting volume requirements	22%
<i>Supply side constraints</i>		<i>Obstacles to establish commercial presence</i>	
Access to finance	48%	Business environment	50%
Labour skills	39%	Regulatory transparency	48%
Business environment	38%	Inadequate standards infrastructure	38%
Regulatory transparency	30%	Transport infrastructure	33%
Transport infrastructure	29%	Labour skills	30%

Source: OECD/WTO Aid for Trade Questionnaire 2013.

Note: Shares are calculated based on the sectors for which the respective issue could be selected as an answer, e.g. import duties could not be selected by tourism and transport and logistics firms.

Table C.8 illustrates some of the supply chain determinants for countries with high and low levels of participation in GVCs.⁶⁷ The table suggests that GVC costs are negatively correlated with GVC participation. Specifically, the quality of transportation and communication infrastructure is lower in countries with low rates of GVC participation. On the other hand, the quality of the institutions, and in particular of the legal systems, is higher in countries with high levels of participation in GVCs. Also, procedures required to start up a business as well as waiting times at the border are longer in countries with low GVC participation rates.⁶⁸ Finally, countries with high levels of supply chain participation show slightly higher levels of IP protection compared with countries with low levels of GVC participation.

Policies targeting new sources of comparative advantage are fundamental to increasing the opportunities for developing countries to join GVCs, and can be achieved, for instance, through capital investments in infrastructure, such as transportation or telecommunications, or increased efficiency of institutions. The availability of a trained workforce often determines in which GVCs – and, in turn, in which tasks therein – developing countries are able to participate.⁶⁹

The WTO's Aid for Trade initiative (see Box C.11) can be used to address some of the obstacles to developing country firms' participation in value chains. It can be used to support transport infrastructure development, to fund trade facilitation, or to improve national or regional initiatives aimed at helping firms meet technical regulations and standards in export markets.

Trade facilitation helps reduce trading times and improve the predictability of trade, which have been found to

be significant determinants of trade in general, and of trade in time-sensitive goods and within value chains in particular (Djankov et al., 2010; Hummels and Schaur, 2013; Gamberoni et al., 2010). Moisés and Sorescu (2013) estimate that the trade cost reduction due to the implementation of trade facilitation can be as high as 15 per cent.⁷⁰

The new Trade Facilitation Agreement signed at the Ninth WTO Ministerial Conference will play an important role (see Box C.12). It should help reduce trading times, improve the predictability of trade and thereby boost trade, in particular within value chains. In the short run, the challenge will be to ensure a speedy and effective implementation of the Agreement. As the Agreement states that the extent and the timing of implementing the provisions will be related to the implementation capacities of developing and least-developed country members, this will involve securing enough assistance and support to help developing and least-developed country members implement the provisions of this agreement, in accordance with their nature and scope.

Moreover, in the context of the Aid for Trade initiative, Aid for Trade facilitation is an area of particular importance to supply chains as both developing country suppliers and lead firms perceive customs procedures as major obstacles to the participation of developing country firms in value chains.

Existing empirical studies point to a negative relationship between Aid for Trade facilitation and the cost of trading. Calí and te Velde (2011) find that Aid for Trade facilitation, in contrast to aid to transport infrastructures, significantly reduces the monetary cost to import or export a container and the number of days it takes to

Table C.8: Cross-country comparison of some determinants of GVC participation costs

	Parts and components		Trade in value added	
	Low participation	High participation	Low participation	High participation
Quality of transport infrastructures				
Quality of port infrastructure, index from 1 to 7 (2011)	4.1	4.6	4.6	5.1
Quality of communication infrastructures				
Mobile cellular subscriptions, per 100 people (2011)	89.5	112.5	113.1	131.9
Telephone lines, per 100 people (2011)	17.1	24.8	33.8	32.0
Internet users, per 100 people (2011)	34.0	49.0	57.3	68.1
Quality of institution for doing business				
Time to enforce a contract, days (2012)	621.5	561.0	577.3	465.9
Procedures to enforce a contract, number (2012)	37.8	35.9	36.0	31.4
Cost to enforce a contract, % of claims (2012)	35.5	29.3	31.6	20.8
Rule of law, index between -2.5 and 2.5 (2012)	-0.1	0.3	0.7	1.0
Time-related barriers				
Time to start a business, days (2012)	31.3	22.1	26.5	14.2
Documents to export, number (2011)	6.7	5.8	5.3	4.8
Documents to import, number (2011)	7.5	6.8	5.7	5.7
Time to export, days (2011)	22.1	17.8	12.9	11.8
Time to import, days (2011)	24.3	19.8	14.4	12.1
Quality of IP protection				
Index of patent rights, index from 0 to 5 (2005)	3.2	3.7	4.2	4.1
Trade facilitation				
Trade facilitation indicator, index from 0 to 2 (2009)	1.2	1.4	1.4	1.4

Source: Author's calculations based on World Bank Doing Business Database (2012), Worldwide Governance Indicators Database (2012), World Development Indicators (2011), Park (2008), OECD Trade Facilitation Indicators.

Note: In the first two columns, economies are split into high and low participation using the share of imports in parts and components on total manufacturing trade in 2011. Economies with a share higher (lower) than the sample median are classified as having high (low) participation. In the last two columns economies are split according to the participation index in 2008 based on TiVA dataset. Economies with a share higher (lower) than the sample median are classified as high (low) participation. The low-participation economies according to TiVA are: Argentina, Australia, Brazil, Brunei Darussalam, Cambodia, Canada, China, Denmark, France, Germany, Greece, India, Indonesia, Israel, Italy, Japan, Mexico, New Zealand, Poland, Romania, the Kingdom of Saudi Arabia, South Africa, Spain, Switzerland, Turkey, the United Kingdom, and the United States. The high-participation economies according to TiVA are: Austria, Belgium, Bulgaria, Chile, Czech Republic, Estonia, Finland, Hong Kong (China), Hungary, Ireland, Republic of Korea, Latvia, Lithuania, Luxembourg, Malaysia, the Netherlands, Norway, the Philippines, Portugal, the Russian Federation, Singapore, the Slovak Republic, Slovenia, Sweden, Chinese Taipei, Thailand and Viet Nam.

Box C.11: Aid for Trade initiative and Aid for Trade flows

The Aid for Trade initiative was launched at the WTO's Ministerial Conference in Hong Kong in 2005. It aims to increase the awareness of governments regarding the importance of trade for development and to mobilize resources to address the trade-related supply-side constraints of developing countries. Aid for Trade is a sub-set of Official Development Assistance (ODA), covering four broad support categories: trade policy and regulations; economic infrastructure, i.e. transport, energy and telecommunications; productive capacity-building, i.e. sectoral support; and trade-related adjustment.

Aid for Trade commitments amounted to US\$ 53.8 billion in 2012, accounting for almost 40 per cent of total ODA, and have increased by 109 per cent compared with the 2002-05 baseline average.⁷¹ SVEs and LDCs have received commitments of US\$ 2.5 billion and US\$ 13.1 billion in 2012, respectively. For LDCs, amongst other countries, Aid for Trade represents a significant source of development finance and an important complement to the US\$ 24 billion FDI inflows in 2012.

According to existing cross-country analyses, Aid for Trade is positively correlated with trade expansion and reductions in trade costs.⁷² In many instances, empirical studies find that the impact of Aid for Trade on trade costs or trade performance depends on the purpose of aid, i.e. aid targeted at infrastructure, trade policy or sectors, or on the geography and income level of the recipient country. Evidence regarding the effectiveness of Aid for Trade in stimulating value chains trade is limited. However, available research (OECD and WTO, 2013a) suggests that Aid for Trade is positively associated with increased developing country exports of parts and components.

Box C.12: Trade Facilitation Agreement

At the Bali Ministerial Conference in December 2013, after more than nine years of negotiations, WTO members reached consensus on a Trade Facilitation Agreement. Its objective is to “clarify and improve relevant aspects of Articles V, VIII and X of the GATT 1994 with a view to further expediting the movement, release and clearance of goods, including goods in transit”. Recognizing “the particular needs of developing and especially least-developed country Members” it also aims to enhance assistance and support for capacity building in this area.

The Agreement contains 13 articles and a special section dealing with special and differential treatment provisions. Among the issues addressed in the Agreement are:

- norms for the publication of laws, regulations and procedures, including Internet publication
- provision for advance rulings
- disciplines on fees and charges and on penalties
- pre-arrival processing of goods
- use of electronic payment
- guarantees to allow rapid release of goods
- use of “authorized operators” schemes
- procedures for expediting shipments
- faster release of perishable goods
- reduced documents and formalities with common customs standards
- promotion of the use of a single window⁷³
- uniformity in border procedures
- temporary admission of goods
- simplified transit procedures
- provisions for customs cooperation and coordination.

The Agreement also calls for the establishment of a Preparatory Committee on Trade Facilitation under the General Council, open to all WTO members, to perform such functions as may be necessary to ensure the expeditious entry into force of the Agreement and to prepare for the efficient operation of the Agreement upon its entry into force.

In particular, the Preparatory Committee will conduct the legal review of the Agreement, receive notifications of commitments from members, and draw up a Protocol of Amendment to insert the Agreement into Annex 1A of the WTO Agreement.

import a container. In particular, they find that an increase in Aid for Trade of US\$ 390,000 is associated with a decrease of US\$ 82 in the cost of importing a container. Considering the very high number of containers crossing the borders of developing countries, the return on increases in Aid for Trade facilitation is substantial. Similarly, Busse et al. (2012) find that the overall Aid for Trade policy, and in particular Aid for Trade facilitation, significantly reduce the cost of trading. Furthermore, Helble et al. (2012) find a positive relationship between Aid for Trade facilitation and the trade performance of countries.

Case studies provide another source of evidence regarding the effectiveness of Aid for Trade facilitation. The Third Global Review of Aid for Trade in 2011 gathered 269 case stories, 62 of which relate to trade facilitation (OECD and WTO, 2013b). While 14 case stories describe hard infrastructure investments, 48 address “soft” infrastructure issues, such as trade policy, customs regulations, border crossings and the

business environment. These case stories highlight several key factors for the success of a project, i.e. ownership and political commitment by the recipient country, strong involvement of local stakeholders, in particular the private sector, and efficient coordination among donors and recipients. Box C.13 describes one Aid for Trade facilitation case story in Central America.

(b) Tariffs in GVCs

In the presence of global supply chains, where intermediate inputs cross borders several times, the impact of trade barriers is magnified. The effect of a marginal increase in trade costs is much higher compared with its effect when there is a single international transaction (Blanchard, 2014).⁷⁴ As Baldwin (2012) suggests, this explains why many developing economies have unilaterally liberalized tariffs and embraced pro-business and pro-investor policies after the second unbundling.

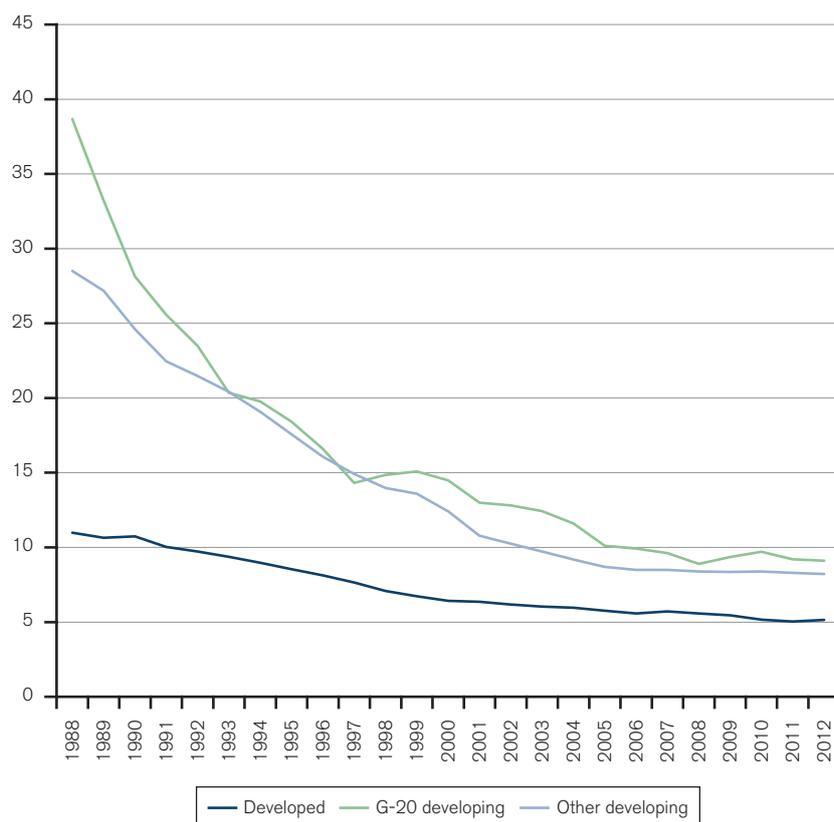
Box C.13: Case study – international transit of goods (TIM) in Central America

To reduce border crossing waiting times and the complexity of customs procedures, the Inter-American Development Bank (IDB) designed and implemented the US\$ 2 million International Transit of Goods project (or TIM, its Spanish acronym), an electronic system for managing the flow of goods in transit.⁷⁵ In 2008, TIM was implemented as a pilot project in El Amatillo, the border crossing between El Salvador and Honduras with the highest volume of trade-related transactions in Central America.

TIM has considerably improved the border clearance for these goods by harmonizing procedures and consolidating information and certification into a single electronic document. The border-crossing time for goods at El Amatillo was reduced from an average of 62 to eight minutes, and the volume of paperwork was decreased. Political support, consensus among stakeholders, close coordination on the ground and technical expertise were the main factors for success and helped overcome resistance regarding organizational and infrastructural change.

Given the success of the project, the second phase has seen the extension of TIM to seven countries (Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama) along the Pacific Corridor. While TIM has been implemented at some borders, others are still in a process of putting it into action. The next step consists of extending TIM to all borders (land and maritime) and airports in the region.

Figure C.26: Most-favoured nation (MFN) tariffs on parts and components by country group (per cent)



Note: Underlying data are simple averages of ad valorem rates.

Source: Calculations based on the TRAINS (Trade Analysis and Information System) database, WITS (World Integrated Trade Solution).

(i) Tariff opening

Figure C.26 shows that average tariffs applied on intermediate goods have been decreasing over time, reaching an average value of around 5 per

cent and 8 per cent, respectively, in developed and developing countries in 2012. Developing countries have significantly decreased their tariffs on parts and components over time. This pattern confirms the fact that better access to international markets is as

important as access to their own markets for developing countries aiming to participate in GVCs.

The pattern of reducing tariffs on parts and components in G-20 developing economies such as China, which is highly involved in GVCs, is particularly interesting. In the mid-1990s, China was already participating in supply chain activities but had high tariffs for parts and components (about 25 per cent on average). Before its accession to the WTO in 2001, China had gradually reduced tariffs to about 18 per cent on average by 2000 and continued to reduce them to 11 per cent by 2003. A similar pattern of gradual trade opening in intermediate goods is observed for India, which decreased its tariffs from more than 30 per cent in 2000 to around 9 per cent in 2009. The Republic of Korea started its trade opening much earlier and already by the mid-1990s had reduced its tariffs to around 9 per cent.

(ii) *Tariff escalation and GVCs*

Tariff escalation is a form of protectionism whereby tariffs tend to rise as the stage of processing advances. In other words, tariffs on primary resources and intermediate goods are lower than tariffs applied to final products.⁷⁶ Tariff escalation is often used by resource-poor countries in order to have better access to natural

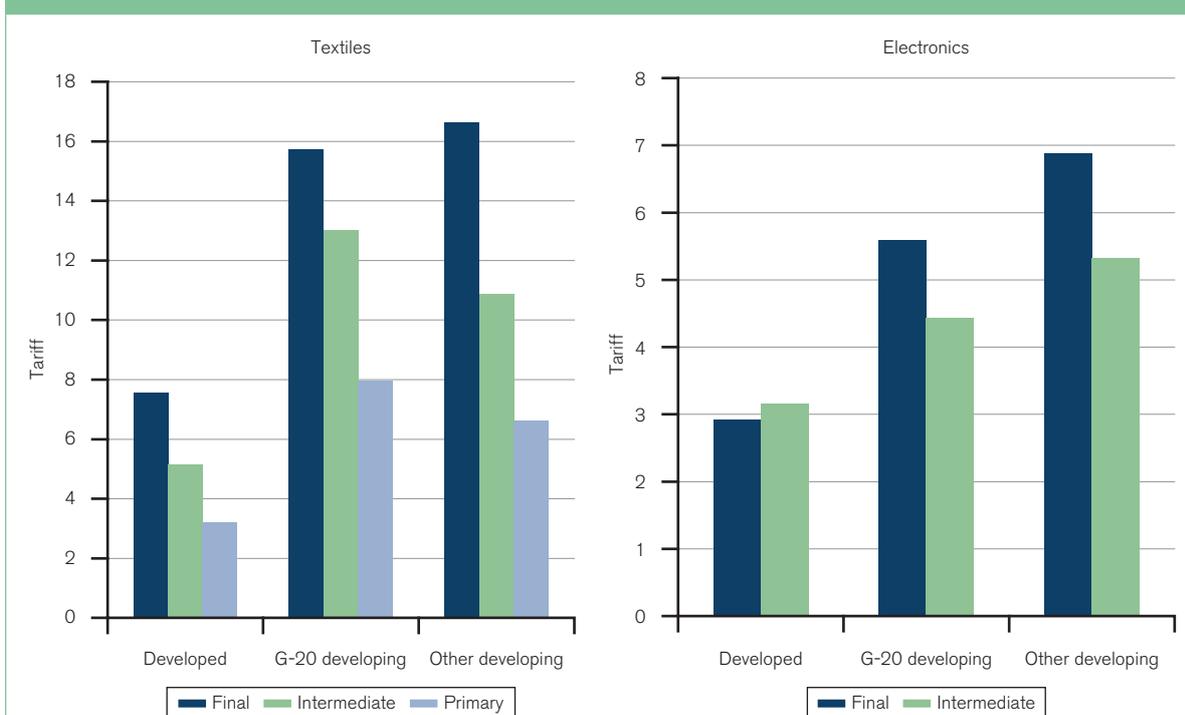
and primary resources and to provide an advantage to domestic firms engaged in higher value-added stages of production rather than in the provision of low value-added intermediate products.⁷⁷

Tariff escalation can lead to a form of competition between countries that might hinder the potential of upgrading along the supply chain. The protection guaranteed by high tariffs on a final good in a large market affects the relative prices of intermediate and final goods. The comparative advantage structure is thus distorted and GVC upgrading becomes more difficult for countries specialized in low value-added stages.

Although tariff escalation is usually considered a phenomenon typical of the agriculture and natural resources sectors (see Section D.3), it is also present in manufacturing value chains. Figure C.27 illustrates the existence of tariff escalation in two sectors in which GVCs are particularly prevalent, electronics and textiles.⁷⁸ This shows that, in general, the levels of tariffs applied to primary inputs or intermediate products are lower compared with tariffs applied to the final product.

Figure C.27 also illustrates that tariff escalation is not only undertaken by developed economies but is also present in G-20 developing countries and other developing

Figure C.27: Simple average tariff on primary, intermediate and final electronic and textile products by country group, 2011 (per cent)



Source: Calculations based on TRAINS dataset.

Note: In order to reduce the number of missing values in the dataset, missing data have been interpolated.

economies. In 2011, for example, the average tariff on imports of final electronic goods was almost 26 per cent higher than the tariff imposed on intermediates by G-20 developing countries.

(c) Deep integration and GVCs

The changing nature of trade, from trade in final goods to trade in intermediate goods, is related to the growing demand for deeper agreements that can address new cross-border effects.⁷⁹ The increase in trade flows, involving the exchange of customized inputs across multiple locations, incomplete contracts and costs associated with the search for suitable foreign input suppliers, creates new forms of cross-border policy effects, and therefore highlights the importance of services measures together with other non-tariff measures having an impact on different nodes and dimensions of a GVC.

The proliferation of preferential trade arrangements (PTAs) captures, to some extent, this increasing demand for

deeper integration (Baldwin, 2011a; WTO, 2011). Trade agreements no longer simply involve tariff reduction, but increasingly cover disciplines related to behind-the-border measures. In particular, provisions related to competition policy, investment, standards and intellectual property rights are present in more than 40 per cent of agreements⁸⁰ active in 2012 (see Table C.9).

Orefice and Rocha (2013) formally investigate the two-way relationship between deep integration and GVCs. The authors find that the greater the depth of an agreement, the bigger the increase in trade in intermediate goods among member countries. On the other hand, higher levels of trade in production networks increase the likelihood of signing deeper agreements containing provisions of regulatory nature such as intellectual property rights and movement of capital.

Provisions such as investment and IPRs in PTAs encourage more FDI flows and production sharing by protecting firm-specific assets such as human capital (management or technical experts) and intellectual property (patents or blueprints).⁸¹ In addition, the vertical

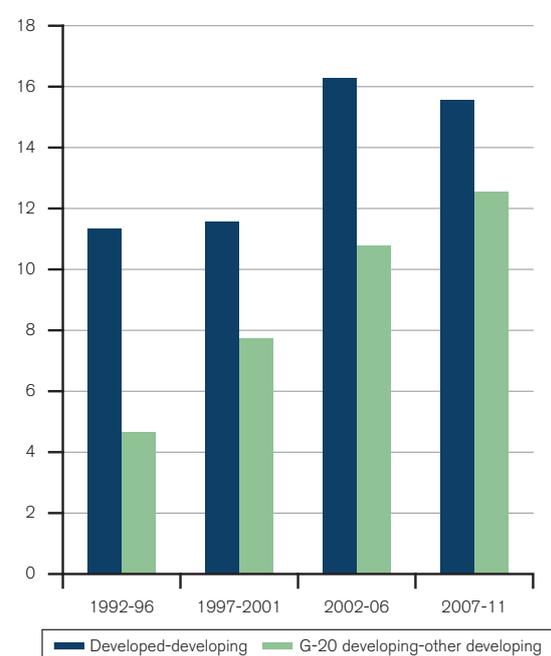
Table C.9: Share of agreements covering non-tariff disciplines in 2012 (per cent)

Provision	Share of agreements	Provision	Share of agreements
Customs	88	Financial assistance	7
Export taxes	64	Consumer protection	6
Movement of capital	57	Data protection	5
General Agreement on Trade in Services (GATS)	54	Education and training	5
State aid	52	Illegal immigration	4
State trading enterprises	47	Industrial cooperation	4
Intellectual property rights	46	Information society	4
Investment	42	Small and medium-sized enterprises	4
Technical barriers to trade	41	Regional cooperation	3
Competition policy	40	Statistics	3
Public procurement	37	Cultural cooperation	2
Sanitary and phytosanitary measures	30	Economic policy dialogue	2
Visas and asylum	18	Taxation	2
Labour market regulation	17	Audiovisual	1
Environmental laws	16	Civil protection	1
Social matters	12	Innovation policies	1
Energy	8	Health	1
Research and technology	8	Mining	1
Anti-corruption	7	Public administration	1
Agriculture	7	Terrorism	1
Approximation of legislation	7		

Source: Authors' calculations on WTO PTA content dataset.

Note: The shares are calculated over 100 agreements, which is the total number of agreements mapped in the PTA content dataset.

Figure C.28: Average number of provisions by country group and period, 1992–2011 (number of PTAs)



Source: WTO Secretariat.

Note: Developed-developing includes 42 agreements between developed countries and all developing countries excluding LDCs. G-20 developing countries-other developing includes 25 agreements between G-20 developing economies and other developing countries excluding LDCs. Each bar represents the average number of provisions included in the agreements signed in each time period.

integration of production through FDIs may be enhanced by the presence of provisions such as SPS measures, technical barriers to trade (TBTs), and customs.⁸² Such provisions, in fact, foster the reduction of contractual uncertainty, either through a harmonization of differences in contractual institutions, or by providing an enforcement mechanism and a commitment device to countries with weaker institutions.⁸³

The increased servicification of GVCs⁸⁴ highlights the strategic role that the opening of trade in services can play in determining the extent to which a country might participate in global value chains. Data show that WTO members that are more involved in GVCs have higher levels of GATS commitments and services offers in the Doha Development Agenda.⁸⁵

The increasing role of South-South supply chains presented in Section C.1(a) poses the question of whether and how agreements between developing countries participating in GVCs have evolved over time. A clear upward trend in the average depth of agreements signed between G-20 developing economies and other developing economies, compared with “old” developed-developing agreements, is highlighted in Figure C.28.

Figure C.29 shows the evolution of agreements between G-20 developing countries and other developing countries for a selected number of provisions. An increase in harmonization of policies between G-20 developing countries and other developing countries is evident. In particular, a high share of PTAs now includes SPS measures and TBTs. Similarly, disciplines on services, investment, competition policy and IPRs have been adopted by an increasing share of agreements over time.

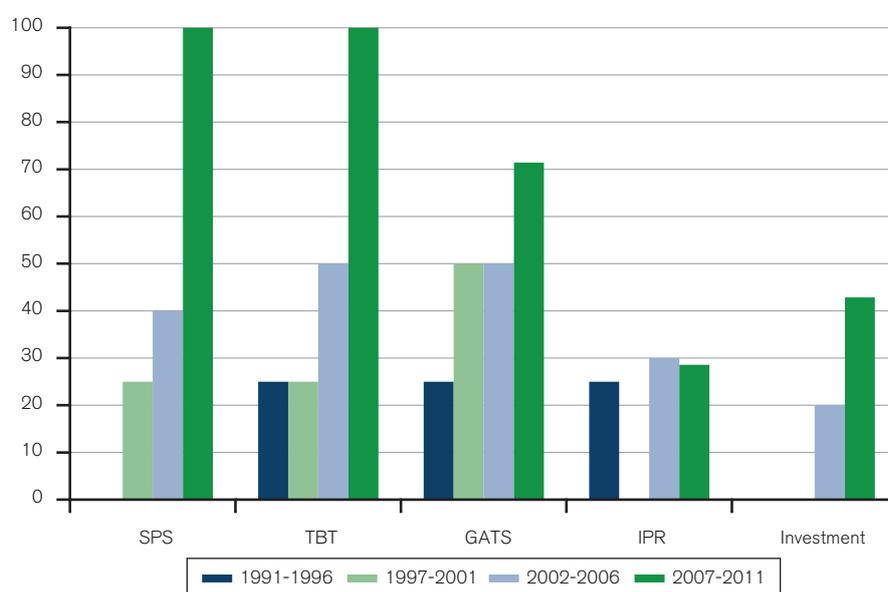
5. Conclusions

Global value chains and the international outsourcing of tasks are not a completely new phenomenon, but have shifted into high gear with the trade opening of G-20 developing countries. What is new is their increasing scale and scope, involving a complex organization of inputs, in terms of both goods and services, from many countries. Developing countries are playing a more important role in value chains, in terms of their participation as well as in the nature of activities performed within these chains. In 2008, the highest levels of supply chain participation were held by developing countries. Developing economies are also, increasingly, recipients and sources of FDI – a fundamental channel for building global supply chains and integrating into them. Also, South-South activity in GVCs has significantly increased: the share of trade in parts and components between developing countries has risen from around 6 per cent in 1988 to almost 25 per cent in 2013. Finally, more than 30 per cent of developing countries’ exports consist of services value added, with services having become an important input into manufactured goods. This underlines the important role of services for GVC efficiency and development.

There is some evidence that successful integration and upgrading in GVCs can underpin development success, with data showing that countries that participate more in GVCs are richer, and that those that integrate more rapidly grow faster. However, gains are not automatic, and economic upgrading may not translate into social upgrading. In addition, more research is needed on the strength of links between GVC participation and development. To judge the impact of GVCs on many developing economies, including LDCs and SVEs, value-added trade statistics will need to be devised to cover these countries. The GVC literature is evolving and still suffers from some shortcomings – for instance, it is not clear whether documented firm level impacts also apply to the country level.

Inward FDI and other GVC-based interactions with foreign firms can be important to help countries achieve spillovers of new technology and knowledge, and building local capabilities to operationalize them is crucial. Initial integration into GVCs can lead to substantial growth benefits in poor countries as labour

Figure C.29: Share of G-20 developing countries-other developing countries agreements including selected provisions, 1991–2011 (per cent)



Source: WTO Secretariat.

Note: The numbers represent the shares of agreements signed in a particular time-period between G-20 developing countries and other developing countries that include a particular provision. There are 25 agreements involving both G-20 developing countries and other developing countries.

is moved from low-productivity subsistence agriculture to higher-productivity manufacturing or services. However, integration is normally achieved at the low skill stages of GVCs – e.g. in assembly. Competition among developing countries is often fierce in these activities, and therefore these countries' capture of value added is initially low. While upgrading to more sophisticated activities in GVCs may be a way to underpin growth at middle-income status and beyond, it can be harder to achieve, partly because lead firms may resist such upgrading on behalf of suppliers, especially if it impinges on their core competences.

GVC participation also holds risks. It exposes countries more strongly to global business cycles and to supply disruptions in far-away locations if these produce crucial inputs into production. The fact that it is possible to integrate into a GVC with a relatively narrow set of skills implies that competitive advantage becomes more fleeting and that the risks of industries relocating are higher. Competition to attract new investments exposes countries to a potential race-to-the bottom on domestic regulation. Finally, GVCs may increase income inequality as high-skill individuals' relative remuneration tends to rise and the share of profit in output increases relative to that of labour.

Countries that have a more favourable domestic business environment have been found to be more

integrated into global value chains. Trade policy also plays a role in facilitating supply chain participation. Obstacles to GVC integration include infrastructure and customs barriers. Trade facilitation addresses these obstacles and helps to reduce trading times and improve the predictability of trade, which have been found to be significant determinants of trade in general and within value chains in particular. When production is fragmented, the impact of trade costs is magnified. On average, countries have significantly decreased their tariffs on intermediate goods over time, but variation among countries is high.

The proliferation of PTAs captures, to some extent, the increasing demand for deeper integration that can address new cross-border effects due to the changing nature of trade. In fact, these preferential trade agreements increasingly cover disciplines related to behind-the-border measures. In particular, provisions related to competition policy, investment, standards and intellectual property rights are present in more than 40 per cent of agreements in force in 2012. Countries with higher GVC participation have also made deeper commitments under the WTO's General Agreement on Trade in Services (GATS). However, to the extent that the issues that PTAs attempt to address are global in nature, they will eventually emerge as issues at the multilateral level. The challenge for governments will be to ensure complementarity between regional and multilateral disciplines.

Endnotes

- 1 In the trade literature, this phenomenon is referred to as "global supply chains", "global value chains", "international production networks", "vertical specialization", "offshore outsourcing" and "production fragmentation".
- 2 Similarly, a country that exports a lot of intermediate goods that are not exported to a third country after further processing would register a low participation in GVCs.
- 3 The economies covered by the dataset are limited to Argentina, Australia, Brazil, Brunei Darussalam, Cambodia, Canada, Chile, China, Hong Kong (China), India, Indonesia, Israel, Japan, Republic of Korea, Malaysia, Mexico, New Zealand, Norway, the Philippines, the Russian Federation, the Kingdom of Saudi Arabia, Singapore, South Africa, Switzerland, Chinese Taipei, Thailand, Turkey, the United Kingdom, the United States, Viet Nam and all EU countries except Croatia and Cyprus.
- 4 More recently, Daudin et al. (2006; 2009), Escaith (2008), and Koopman et al. (2010) are among the first papers to refer explicitly to a measurement of the value added of trade, with some empirical measurement requiring an international input-output framework. Johnson and Noguera (2012) define value-added exports as the value added produced by the home country and absorbed by its trade partners. They propose the ratio of value added to gross exports (or VAX ratio) as a measure of the intensity of cross-country production sharing. Los et al. (2012) and Stehrer (2012), who are involved in the World Input-Output Database (WIOD) project, carried out research work relating value-added flows with the notions of final demand and production factors.
- 5 The participation index is formally calculated as

$$\text{GVC Participation} = \text{IVA} / \text{EXP} + \text{FVA} / \text{EXP}$$
- 6 This index has been used also in De Backer and Miroudot (2013), OECD (2013a), and UNCTAD (2013a).
- 7 Data are reported on 2008 in order to avoid confounding effects due to the crisis. However, the picture is similar for 2009.
- 8 Comparing graphs between 1995 and 2012 captures change in the role of countries as importers rather than exporters. Because trade flows are normalized as a percentage from the exporter's perspective, the distribution and size of arrows will not change even when the global weight of the country increases, unless its geographical distribution of trade changes dramatically. For example, the number of arcs initiating from China did not change (three and four for final and intermediate goods, respectively).
- 9 See also Johnson (2012).
- 10 The dataset used builds on the OECD-WTO TiVA database, a series of structural economic indicators (World Bank's WDI) and trade policy variables derived from Diakantoni and Escaith (2014).
- 11 Koopman et al. (2010) define an index for the position in a GVC as the log ratio of a country's supply of intermediates used in other countries' exports to the use of imported intermediate goods in its own production:

$$\text{GVC Position} = \log(1 + \text{IVA} / \text{EXP}) + \log(1 + \text{FVA} / \text{EXP})$$
- 12 Using a different methodology, Fally (2012) shows that GVCs have become more downstream in time.
- 13 It should be noted that the role of services in GVCs may be underestimated in the TiVA database. Service activities that are conducted by manufacturing firms in-house – and where, consequently, no arm's length transaction exists – are likely to be allocated to goods value added and trade (Low, 2013).
 The extent of this underestimation depends on the economies' possibility of analysing enterprises or establishments.
- 14 The participation indices shown in Figures C.9 and C.10 differ slightly as they are based on different versions of the OECD-WTO TiVA Database. Utilities are included with agriculture and mining in the primary sector.
- 15 The increased use of services as input into manufacturing means that statisticians are planning to include (intermediate) services in the revision of the Broad Economic Categories classification, which is currently used to define intermediate goods. This inclusion would help define intermediate inputs in a broader context.
- 16 The UNCTAD-EORA dataset is the only one that reports value-added trade for LDCs, but its substantial drawback in doing so is that of estimating input-output relationships for these countries based on other data in the model.
- 17 Indirect service exports refer to domestically-produced service outputs that are recorded in the domestic product. These service enterprises include national as well as foreign-owned enterprises.
- 18 Source: WTO Trade in Services Database and WTO Merchandise Trade Database.
- 19 Box C.4 is based on the results of the note by the WTO Secretariat: WT/COMTD/LDC/W/58.
- 20 The RI indicator is calculated as the share of intra-regional exports in industry k divided by the share of intra-regional exports in overall trade:

$$RI_{jk} = \frac{x_{ij,k} / x_{i,k}}{x_{ij} / x_i}$$
 where x indicates exports and subscripts i, j, k denote exporting region, importing region and industry, respectively. A RI larger (smaller) than one indicates that industry k is traded relatively more (less) intra-regionally than overall trade.
- 21 Taking a different perspective, the *World Trade Report 2013* showed that intra-regional trade in goods has been increasing for most regions since 1990 and, for example, accounted respectively for 52 and 12 per cent of merchandise exports from Asia and Africa in 2011.
- 22 Since data on trade in intermediate services are not available in the TiVA database, no distinction could be made between intermediate and final services trade. RI indicators for the mining and quarrying industries, as well as for electricity, gas and water supply, are not shown.
- 23 Baldwin (2011b), for instance, includes illustrative case studies of the Malaysian and Thai automobile sectors. The Malaysian government continued to push a domestically based industrialization strategy even after 1990 while Thailand was quick to embrace the new trend and make use of spillovers, including by courting Japanese manufacturers. As a result, Thailand's auto industry has experienced strong rises in production and exports, while Malaysia's has stagnated.
- 24 Shifts of employment towards manufacturing and services may even happen if integration is mainly achieved in agricultural GVCs because higher productivity through technology transfer in the agricultural sector would still be likely to set free labour for other uses.

- 25 The *World Trade Report 2013* shows that assumptions on technological progress play by far the largest role in simulation scenarios for future trade growth.
- 26 WTO (2008) highlights three further channels through which trade may impact growth. First, higher trade will enhance competition in the domestic market, generally leading to more innovation (Blundell et al., 1999; Aghion et al., 2005). Secondly, as GVC integration is often associated with trade reform, it may improve a country's institutional framework (Rodrik et al., 2004), for instance by adopting certain international norms favourable to growth. Tang and Wei (2009) find that WTO/GATT accession has favourable effects on growth by committing countries to policy reform. Thirdly, increased trade gives firms access to larger markets for sourcing inputs, thereby giving implicit access to foreign production technology embodied in these goods and ultimately increasing productivity.
- 27 The authors study the Mexican retail sector and find that following the entry of Wal-mex (the Mexican affiliate of Walmart), local retailers started to adopt advanced technologies, such as cold chain (a temperature-controlled supply chain).
- 28 Most innovation in developing economies is based on capability building (Bell, 2007). Innovation through R&D, meanwhile, generally only becomes important at later stages of development. For instance, newly industrialized economies such as the Republic of Korea, Hong Kong (China), Chinese Taipei and Singapore developed into high-income economies through their own capacity to innovate. However, they first had to become efficient production platforms for developed economies (Mahmood and Singh, 2003).
- 29 Also export subsidies of 10 per cent of the value of exports were used for some time to help domestic companies reorient their strategies from local and regional towards global markets. These were phased out by 2003 based on the Uruguay Round decisions (Rodríguez-Clare, 2001).
- 30 To be exact, τ , T , and χ represent unity plus the tariff, transport, and coordination cost markup, respectively.
- 31 Although the agricultural sector sheds labour, it does not imply that the sector's output has to shrink. The IMF (2014) finds that quality upgrading opportunities are also abundant in agriculture but such upgrading typically leads to the shedding of labour in the sector in low-income countries, as farms grow more efficient.
- 32 The labour-intensive apparel global value chain employs 25 million people, with 96-97 per cent employed in assembly line positions (International Labor Office (ILO), 2005; Nathan Associates Inc., 2006). Thus, integration can have a large impact on employment.
- 33 Park et al. (2013 p. 129) illustrate that, for a suit made in China and sold in the United States, only 4 per cent of its value goes towards manufacturing labour.
- 34 Gibbon and Ponte (2005) also point out that demise of national export monopolies in many countries – although they operated inefficiently and often corruptly – constitutes an issue because they allowed coordination of many small firms to facilitate integration into world markets.
- 35 Lead firms typically conduct business in many countries and are involved in about 80 per cent of trade flows (UNCTAD, 2013b).
- 36 Another argument that has been made to explain the position of developing countries in GVCs is based on relative skills. Costinot et al. (2013) present an economic model in which a good is manufactured in different stages. At each production stage, there is a chance that a mistake may occur, resulting in the loss of all inputs embodied in the product up to that stage. Consequently, developing countries, which are assumed to have a higher propensity for making mistakes due to lower human capital, are only involved at the initial low-value added stages of the chain.
- 37 In specialized manufacturing sub-sectors, capabilities can be a crucial proprietary resource if they are distinctive and hard to copy. Many German medium-sized exporting firms have excelled at this type of manufacturing and have discovered small niches in world markets in which many of them are leaders (Venohr and Meyer, 2007; Langenscheidt and Venohr, 2010).
- 38 Case studies document the existence of the smile curves for various sectors. Although the initial "smile curve" was developed for Stan Shih Acer products, it was shown that the same pattern is observed for Nokia (Ali-Yrkkö et al., 2011) and Apple (OECD, 2011) products and the apparel industry (Park et al., 2013).
- 39 Furthermore, power concentration is increasing in consuming countries but decreasing in coffee-producing countries as lead firms are expanding into differentiated products. These can include gourmet coffee and coffee houses, providing high-quality ambiance. For instance, the coffee value-added content of the cost of cappuccino in a coffee house is typically less than 4 per cent (Fitter and Kaplinsky, 2001).
- 40 Giuliani et al. (2005) further argue that lead firms' role is most important in traditional manufacturing clusters in Latin America where relevant technology is not produced locally. The lead firms here replace the virtuous and close relationship between technology producers and technology users that has been important in other cases, such as Italian industrial districts.
- 41 Quadros (2004) illustrates for the case of GM and Volkswagen in Brazil that GVC local suppliers improved their production quality and achieved ISO 9000 certification, largely without the help of lead firms. Instead, technical support came mostly from consultancies and accredited certification institutions. Similar evidence was found for the automotive sectors in Argentina (Albornoz et al., 2002) and Mexico (Dutrenit et al., 2002).
- 42 Furthermore, Section D discusses the role of standards in the agricultural sector. Aloui and Kenny (2005) and (Otsuki et al., 2001) provide case study evidence of the cost of meeting importers' food safety standards.
- 43 These country groupings in Figure C.20 are based on ISO definitions.
- 44 Lack of functional upgrading may also be due to suppliers in captive relationships showing little interest themselves in activities by business chambers aimed at fostering domestic inter-firm networks and functional upgrading (Leite, 2002).
- 45 Artola and Parrilli (2000) find similar results for the milk industry in Nicaragua, in which involvement by multinational lead firms has also fostered upgrading of products and processes but hindered functional upgrading.
- 46 In the Mexican case, regional integration due to NAFTA played an important role in the upgrading of the country's garment industry from simple tasks to more complex ones (Bair and Gereffi, 2001).
- 47 These include, for instance, apparel in Turkey, Morocco and Eastern Europe (Pickles et al., 2006; Tewari, 1999; 2006; Tokatli, 2007; Tokatli and Kizilgun, 2004; 2010) and furniture in South Africa (Kaplinsky et al., 2002), in addition to the examples already mentioned above.
- 48 Two examples for clusters are illustrative. The Delphi automotive cluster in Juárez, Mexico, experienced functional upgrading due to the development of the design and engineering centre of Delphi (Carrillo and Lara, 2004). Meanwhile collective action

- was virtually absent in the Torrejón blue jeans cluster and the institutional environment not favourable to cluster growth (Bair and Gereffi, 2001).
- 49 For instance, through public-private initiatives in the local agricultural development agency, research and technology extension services were made available in the mango and grape cluster of Petrolina Juazeiro in Brazil and promoted a sequence of crops that facilitated the learning process of small growers (Giuliani et al., 2005). Another example is salmon farming in Southern Chile, initially set up by a public actor to prove its profitability. Joint action led by the private sector firms that had joined and supported by public policies (such as a trade market, joint promotion abroad) then underpinned the cluster's development (Pietrobelli, 1998).
- 50 Information gathering about the local economic structure at a micro level may thus have to be an initial step. Enterprise maps of the local economy, which have been devised for a series of African countries by Sutton and co-authors (e.g. Sutton and Kellow, 2010), have reportedly been very helpful for the corresponding governments and have encouraged an optimistic outlook.
- 51 German mid-sized manufacturing exporters are a good example – many of them are global market leaders in their niches (Venohr and Meyer, 2007; Langenscheidt and Venohr, 2010).
- 52 See also Section E with regard to the synchronized nature of trade declines during the Great Trade Collapse of late 2008. Other reasons for the Great Trade Collapse that have been highlighted in the economic literature include amplified demand shocks in goods that are traded heavily, such as capital goods and consumer durables (Bems et al., 2010) and a drying-up of trade finance (Ahn et al., 2011).
- 53 In contrast, the apparel industry in the region was almost unscathed by the Asian financial crisis of 1997–98. Relying heavily on labour-intensive technologies, it neither had high levels of external debt nor the need to source costly foreign inputs.
- 54 Gassebner et al. (2010) study data on disasters in 170 countries between 1962 and 2004. They find that trade impacts were typically contained in this period, which was less shaped by GVCs, but highlight that trade impacts were much larger for disasters in small countries.
- 55 One example is the clothing and textile sector which entered into rapid decline after 2000 (Joomun, 2006).
- 56 Significant investment in production facilities can provide assurance that the supplier will remain in the country. For instance, partly to mitigate relocation risks, Brazil aimed at attracting a large first-tier supplier, Foxconn, rather than a lead firm like Apple, in its attempt to integrate into the consumer electronics GVC (Gereffi and Sturgeon, 2013). Foxconn works with multiple customers and has made commitments to enlarge the production scope in Brazil and increase the domestically created value by sourcing or producing more components in Brazil.
- 57 Of course, GVC integration constitutes a vehicle for many large emerging countries to industrialize, leading to much higher emission levels worldwide and heightened sustainability concerns. The narrow point made here is that industrialization through GVC integration is not likely to be “dirtier” than industrialization under autarky.
- 58 For instance, Milanovic and Squire (2007) and Barro (2000) find that globalization, proxied by tariff liberalization and trade openness, respectively, causes higher within-country inequality in developing countries, while Ravallion (2001) and Dollar and Kraay (2002) cannot confirm such effects.
- 59 See also Wood (2002) and Anderson et al. (2006).
- 60 Goldin and Katz (1998) present evidence for the United States. They suggest that increases in inequality in the United States are partly a result of a slowing rate of accumulation of human capital, which has not kept pace with technological change that, among other things, makes offshoring possible (for instance, through better communications technology). Acemoglu and Autor (2012) highlight that increasing the supply of human capital in developed economies will tend to increase the relative output of these skill-intensive activities, and hence reduce income inequality by decreasing the skill premium that educated workers can command.
- 61 Their sample covers the period 1981–2003, and thus includes the initial rise of GVCs.
- 62 Reuveny and Li (2003) even find that increased trade is related to decreases in income inequality.
- 63 These studies, unlike Jaumotte et al. (2013), do not separately account for the impact of technological progress, which may lead by itself to increased premiums for high-skill workers, even in the absence of FDI.
- 64 Moreover, gains from learning by exporting may not be as large as believed, with some studies pointing out that improvements in exporting firms' product and process performance may instead be the results of investments pre-dating their export activity – not of learning by exporting (Greenaway and Kneller, 2007a).
- 65 The economic literature suggests that country-specific determinants of GVC participation include the quality of communications infrastructure for the transmission of information, the quality of the institutional framework in enforcing contracts, the level of IP protection and any other factors that reduce the cost of offshoring and foreign investment. See, for example, Baldwin and Lopez-Gonzalez (2013), Kimura (2009), Hew et al. (2009), Grossman and Helpman (2005), Nunn (2007), Levchenko (2007), WTO (2013c), and Draper et al. (2013).
- 66 See Harrigan and Venables (2006) and Gamberoni et al. (2010).
- 67 The table shows results using both the share of imports of parts and components and the participation index based on TiVA dataset. The sample of countries varies widely in the two cases, thus affecting the magnitudes of the averages in the table.
- 68 Djankov et al. (2010), Freund and Rocha (2010), Zaki (2010), Hummels and Schaur (2013), and Carballo et al. (2013) analyse the adverse impact of time to trade on trade with different approaches and using datasets.
- 69 Mayer (2001) shows that it is the combination of know-how of the workforce and the importing of machinery which has a positive effect on economic growth. Moreover, technological spillovers increase with the ease of doing business in a country and the quality of its tertiary education system (Coe et al., 2009).
- 70 Also Hoekman and Nicita (2011) and Hufbauer and Schott (2013) provide evidence of the boosting effects of trade facilitation on imports and exports of developing countries.
- 71 Figures obtained from the OECD-DAC Creditor Reporting System (CRS).
- 72 OECD/WTO (2013a) and ODI (2012) provide literature reviews.
- 73 The United Nations Economic Commission for Europe (UNECE) Trade Facilitation Implementation Guide, Recommendation No. 33, describes the “single window” as “a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export and transit-related regulatory requirements” (<http://tfig.unece.org/contents/single-window-for-trade.htm>).

- 74 Blanchard (2014) further points out that this may recast the role of existing GATT/WTO rules as well as create rationales for new multilateral disciplines. For an example on the cumulation of trade costs in a global supply chain, see the *World Trade Report 2012* (WTO, 2012b), Box D.2.
- 75 See IDB (2011; 2013).
- 76 This issue has been examined in previous WTO reports in terms of its application to manufactured goods (WTO, 2001), to non-oil commodities (WTO, 2003), and to natural resources (WTO, 2010).
- 77 Latina et al. (2011) show that tariff escalation can be a “beggar-thy-neighbour” policy because governments may be tempted to use it to alter the relative price of exports to their advantage (terms-of-trade effect) or to expand the domestic processing industry at the expense of foreign production (production relocation effect).
- 78 In order to classify goods into primary, intermediate and final, we follow Sturgeon and Memedovic (2010).
- 79 See Lawrence (1996) and Antras and Staiger (2012) on the systemic implications of global production and deep integration.
- 80 Shares are calculated over a total of 100 mapped agreements.
- 81 The trade and investment literature suggests that what gives the multinational enterprise its competitive edge in international markets is human capital and intellectual property, such as patents or blueprints – see, for example, Helpman (1984); Markusen (1984); Brainard (1993); Brainard (1997) and Markusen (1998).
- 82 Alfaro and Charlton (2009) show that vertical FDI is a far more important phenomenon than was previously thought: in contrast to the existing FDI literature, vertical FDI is more important and represents more than 50 per cent of international transactions across firms compared with horizontal FDI.
- 83 See Osnago et al. (2014) for an analysis of the topic.
- 84 See Section C.1 for a further discussion of servicification of manufacturing activities in GVCs.
- 85 The data (available at: http://www.wto.org/english/tratop_e/serv_e/dataset_e/dataset_e.htm) build on the work in Marchetti and Roy (2009), who construct an index on the following basis for each sub-sector and for both modes 1 and 3: values of 1 for full commitments (without market access or national treatment limitations), 0.5 for partial commitments (with some market access and/or national treatment limitations), 0 for no commitments. Similarly, WTO members that are more involved in GVCs have undertaken commitments across a greater number of service sub-sectors under the GATS.

Appendix Table C.1: Differences in sources of value added in gross exports by exporter and source economy, 1995–2008

EXPORTER	Differences in sources of value added in gross exports by exporter and source economy, 1995–2008 (per cent)																							
	G-20 developing										Other developing													
	Developed	Argentina	Brazil	China	Indonesia	India	Republic of Korea	Mexico	Russian Federation	Saudi Arabia	Turkey	South Africa	Brunei Darussalam	Chile	Hong Kong, China	Israel	Malaysia	Philippines	Singapore	Thailand	Chinese Taipei	Viet Nam	Cambodia	Rest of the World
Developed	-5.06%	0.03%	0.14%	0.87%	0.05%	0.22%	0.16%	0.15%	1.09%	0.32%	0.09%	-0.08%	0.01%	0.06%	0.03%	0.02%	0.07%	0.00%	0.07%	0.04%	0.04%	0.04%	0.00%	1.63%
Argentina	0.34%	-4.76%	1.35%	0.84%	0.04%	0.16%	0.13%	0.15%	0.52%	0.11%	0.02%	0.03%	0.00%	0.01%	0.07%	0.00%	0.02%	0.01%	0.05%	0.06%	0.02%	0.01%	0.00%	0.83%
Brazil	-0.45%	-0.28%	-1.79%	0.50%	0.08%	0.19%	0.06%	0.03%	0.38%	-0.07%	0.01%	-0.09%	0.00%	0.06%	-0.01%	0.04%	0.06%	0.01%	0.01%	0.09%	0.01%	0.01%	0.00%	1.13%
China	8.80%	0.22%	0.74%	-2.140%	0.24%	0.63%	1.74%	0.10%	0.58%	1.29%	0.05%	0.14%	0.02%	0.34%	0.11%	0.07%	0.84%	0.40%	0.41%	0.45%	1.08%	0.09%	0.00%	3.06%
Indonesia	-2.06%	0.00%	0.11%	0.92%	-2.71%	0.28%	-0.65%	0.01%	0.14%	1.00%	0.22%	-0.08%	0.00%	-0.01%	0.04%	0.01%	0.68%	0.02%	0.62%	0.27%	-0.33%	0.07%	0.00%	0.90%
India	4.99%	0.05%	0.15%	1.50%	0.28%	-1.408%	0.33%	0.18%	0.16%	1.32%	0.11%	0.11%	0.00%	0.12%	0.20%	0.12%	0.23%	0.04%	0.26%	0.22%	0.12%	0.04%	0.00%	3.52%
Republic of Korea	1.31%	0.10%	0.28%	4.23%	0.47%	0.51%	-19.72%	0.03%	0.99%	3.16%	0.04%	-0.14%	0.00%	0.25%	0.17%	0.09%	0.69%	0.19%	0.52%	0.19%	0.52%	0.12%	0.00%	5.90%
Mexico	-2.62%	0.02%	0.12%	2.30%	0.07%	0.13%	1.08%	-4.10%	0.31%	0.31%	0.03%	-0.02%	0.00%	0.17%	0.03%	0.04%	0.33%	0.14%	0.10%	0.16%	0.36%	0.03%	0.00%	1.00%
Russian Federation	-2.24%	0.00%	0.00%	0.27%	-0.01%	-0.05%	0.17%	-0.06%	3.26%	0.02%	0.10%	-0.04%	0.00%	0.00%	-0.06%	-0.03%	0.01%	-0.03%	-0.10%	0.00%	0.01%	0.00%	0.00%	-1.22%
Kingdom of Saudi Arabia	0.38%	0.01%	0.04%	0.12%	0.02%	0.10%	0.02%	0.00%	0.05%	-0.89%	0.03%	0.01%	0.00%	0.01%	-0.01%	0.01%	0.01%	0.00%	-0.01%	0.00%	0.03%	0.00%	0.00%	0.08%
Turkey	5.87%	-0.02%	0.13%	1.02%	0.08%	0.18%	0.27%	0.00%	4.11%	0.22%	-15.07%	0.02%	0.00%	0.08%	0.01%	0.05%	0.05%	0.02%	0.09%	0.09%	0.05%	0.03%	0.00%	2.71%
South Africa	1.65%	0.11%	0.10%	0.85%	0.11%	0.27%	0.17%	0.08%	0.44%	2.25%	0.05%	-9.35%	0.00%	0.03%	0.03%	-0.03%	0.08%	0.02%	0.14%	0.09%	-0.08%	0.02%	0.00%	2.96%
Brunei Darussalam	-5.89%	-0.01%	0.01%	0.13%	0.01%	0.06%	0.15%	-0.01%	-0.21%	0.05%	-0.05%	-0.02%	8.31%	-0.01%	-0.07%	0.00%	-0.29%	-0.01%	-2.02%	-0.14%	-0.12%	0.01%	0.00%	0.14%
Chile	-0.41%	-0.10%	0.54%	1.05%	0.09%	0.09%	0.58%	-0.05%	0.27%	0.24%	0.41%	-0.09%	0.01%	-5.61%	0.61%	-0.01%	0.04%	0.02%	0.09%	0.03%	-0.03%	0.01%	0.00%	2.21%
Hong Kong, China	-9.01%	0.02%	0.03%	-0.55%	-0.31%	0.49%	-1.00%	-0.08%	-0.04%	0.31%	-0.13%	-0.32%	0.01%	0.04%	11.53%	-0.08%	-0.05%	-0.13%	-0.04%	-0.12%	-1.81%	0.02%	0.00%	1.23%
Israel	-0.73%	0.01%	0.11%	1.65%	0.21%	0.74%	0.11%	0.11%	1.03%	0.30%	0.63%	-0.10%	0.00%	0.02%	0.16%	-6.31%	0.04%	0.03%	0.28%	0.05%	0.09%	0.05%	0.00%	1.50%
Malaysia	-8.37%	0.00%	0.10%	2.44%	0.29%	0.75%	0.06%	-0.03%	0.14%	0.81%	-0.08%	-0.06%	0.03%	-0.03%	-0.10%	0.07%	2.20%	0.07%	-0.37%	0.37%	-0.20%	0.27%	0.00%	1.67%
Philippines	-0.52%	0.06%	-0.03%	3.55%	-0.11%	0.25%	0.96%	-0.05%	-0.48%	1.56%	-0.03%	-0.06%	0.02%	0.00%	-0.42%	-0.02%	1.55%	-10.81%	2.01%	0.56%	1.10%	0.46%	0.00%	0.43%
Singapore	-2.49%	0.19%	0.19%	1.66%	0.01%	1.50%	-0.08%	0.01%	0.81%	1.72%	0.14%	-0.11%	-0.02%	0.08%	-0.22%	0.18%	-0.28%	-0.07%	-6.40%	-0.77%	0.18%	0.11%	0.00%	3.63%
Thailand	-3.56%	0.06%	0.29%	2.90%	0.43%	0.28%	0.49%	0.04%	0.28%	1.66%	0.02%	-0.05%	-0.07%	-0.01%	-0.01%	0.02%	0.84%	0.05%	0.00%	-7.92%	0.45%	0.27%	-0.10%	3.64%
Chinese Taipei	-5.71%	-0.02%	0.32%	4.41%	0.83%	0.47%	1.32%	0.05%	0.04%	3.62%	0.03%	-0.29%	0.02%	0.02%	-0.03%	0.11%	0.62%	0.17%	0.16%	0.12%	-11.91%	0.10%	0.00%	5.56%
Viet Nam	1.20%	0.17%	0.40%	5.17%	0.27%	0.82%	-0.13%	0.05%	0.82%	1.36%	0.06%	-0.02%	0.02%	0.07%	-0.37%	0.04%	0.63%	-0.01%	0.90%	0.91%	0.17%	-15.40%	0.04%	2.84%
Cambodia	-2.43%	0.02%	0.10%	5.57%	-0.25%	0.47%	0.53%	0.02%	0.67%	0.50%	0.03%	0.00%	-0.01%	0.03%	1.61%	0.01%	-0.24%	0.02%	-0.59%	0.49%	1.4%	1.33%	-10.10%	1.09%

□ indicate domestic value added

Source: Calculation on TIVA.

Note: The elements on the diagonal of the table represent the change in domestic value added in gross exports; the off-diagonal numbers indicate the change in the share of value added from a country in the columns embedded in the exports of a country in the rows.