The term “global value chains” (GVCs) has been used to describe the sequence of all functional activities required in the process of value creation involving more than one country (UNCTAD, 2013). According to UNCTAD (2013), “about 60 per cent of global trade, which today amounts to more than $20 trillion, consists of trade in intermediate goods and services that are incorporated at various stages in the production process of goods and services for final consumption.”

Global Value Chains will become increasingly influential in determining future trade and FDI patterns as well as growth opportunities. Experience from the Asia-Pacific region shows that the benefits from participation in GVCs are multilayered, ranging from the company level where GVCs can bolster productivity of participating enterprises and provide opportunities for creation of high(er)-skilled and better paid jobs, to the macro level with enhanced economic growth and higher per capita income. An effective development strategy will now require policy approaches to effectively facilitate dynamic insertion of local companies into GVCs.

Informed policies require good data and analysis. It is therefore essential to understand how GVCs work in Asia and the Pacific, and especially how policies can help countries strengthen their GVC participation. Drawing on alternative indicators of GVC involvement, the objective of this chapter is to improve understanding of current and emerging issues related to GVC development in Asia and the Pacific. It sets out the main evidence as well as the implications of trade and trade-related policies for strengthening GVC participation by Asia-Pacific economies. Systematic investigation shows how policies related to trade and trade facilitation could strengthen the role of Asia-Pacific exporters in GVC-trade networks. In addition, the different capacities of Asia-Pacific economies to engage in that process should not be taken for granted. Asia-Pacific economies at different development levels have different styles of engagement with these networks. At one extreme are low-income economies whose firms specialize in tasks that rely on low-wage/unskilled labour and may have limited opportunities to benefit from technology dissemination and skills upgrading. At the other extreme are the high-income economies that tend to control the knowledge-intensive tasks of the network. Finally, the chapter informs policymakers of the different policy needs for facilitating the adjustment process of GVC participation by economies of different development levels.
1. What are GVCs?

The concept of “value chain” implies a full range of functions (or activities) undertaken to collect various inputs and assemble them into final products (figure 7.1). At each individual function in this process, a certain value is added; these values are then accumulated in a final product.4

“A Global Value Chain is a sequence of all functional activities required in the process of value creation involving more than one country.”

A decline in trade costs due to trade liberalization and the technological advancement of communications, logistics, shipping and transport allows for most if not all individual functions in a value chain – which earlier had to be performed within a smaller geographical area (typically one country) – to be located where they could be produced most efficiently anywhere in the world (taking into consideration a combination of price, quality, timeliness and other factors). This separability of functions or tasks allowed for value chains to evolve in the international context where there is “trade in tasks” between countries participating in the same value chain.

Although the nature of GVCs may be sector-specific, they typically involve the movement of intermediate goods through successive countries within the global network system of multinational companies (MNCs). The global production strategies of MNCs result in shifting the focus of global trade from trade in final consumer items (goods and services) to trade in intermediate inputs.

Figure 7.1. A simplified value chain

Source: ESCAP.

The development of GVCs has taken place in various sectors, such as apparel and footwear, automobiles, electronics and the agro-food industry.5 Although GVCs have sector-specific characteristics, they typically involve the movement of intermediate goods through a series of countries where, in each one, a new value is designed, coordinated and implemented through the global network system. This has enabled some local enterprises in developing countries to also participate as providers of inputs (goods and services) based on their expertise.

While the term GVCs is widely used, in general, researchers have not differentiated between GVCs and “global production networks”. There are also other terms related to the GVC phenomenon that are used interchangeably in the economics literature, such as “disintegration of process”, “international production sharing” and “international unbundling of production”.6 The term “international product fragmentation” is also often used in the economics literature when describing the split of the production process in the GVC phenomenon across countries.
The unbundling of the production process in the GVC phenomenon can be both geographical (across countries) and organizational (across firms). According to Cattaneo and others (2013), when the fragmented process of production takes place within a firm but at its foreign locations, it is called “offshoring” or “offshore production”. The offshoring activities are conducted via vertical foreign direct investment (FDI), and trade within a respective GVC is considered to be an intra-firm trade. In contrast, if the activities are subcontracted to independent contractors and suppliers, the term “outsourcing” is often used to highlight the fact that trade within a respective GVC is at an arm’s length in nature. In this context, Antrás and Helpman (2004) simplify the possible organizational and geographical structure of GVCs into a matrix of four sourcing strategies (figure 7.2). Operations can take place inside the lead firm and in its home country, which is referred to as domestic in-house production (the upper left quadrant of the matrix). Second, production stages can take place inside the firm but with some operated in a foreign country through offshore production via vertical FDI (the lower left quadrant of the matrix). Alternatively, firms can outsource activities to independent suppliers. This is called “arm’s length relationship”. If the arm’s length suppliers are based in the same country as the lead firm, the strategy is called domestic outsourcing (the upper right quadrant of the matrix). An alternative strategy is to offshore outsourcing, which implies that the arm’s length suppliers operate in a foreign location. It is important to note that the possible sourcing strategies described and defined above can apply to any stage of the production and business process, from the design stage to the final assembly stage.

These global sourcing strategies result in greater FDI, especially of the vertical type, and increased intra-firm trade as well as vertical arm’s length trade between a lead firm and its suppliers. According to UNCTAD (2013), the ratio between global FDI stock and trade has almost doubled from around 50% in the mid-1990s to more than 100% in 2010. UNCTAD estimates that around 80% of global trade (in terms of gross exports) is linked to the international production networks of MNCs (either as intra-firm trade, contract manufacturing, licensing or franchising), or through arm’s length transactions involving at least one MNC. In general, the rise of GVCs is linked in particular to greater efficiency-seeking FDI, through which MNCs seek to locate discrete parts of their production process in low-cost locations (box 7.1). Efficiency-seeking FDI increases the amount of trade taking place within the international production networks of MNCs.

Figure 7.2. Simplified illustration of sourcing strategies in GVCs

Source: ESCAP (adapted from Antrás and Helpman, 2004).
Integration into international production networks or GVCs is viewed as a key to developing the manufacturing sector in India, which generates about 20% of GDP. However, India’s level of participation in GVCs has remained lower than that of the other developing economies in Asia (Athukorala, 2011). As India is slowly starting to integrate into GVCs, it is important to examine the factors that may promote or create a hindrance to this process. A brief examination is made here of the impact of India’s manufacturing outward FDI, on the one hand, and bilateral trade costs on the other hand, on production-network related exports from India to the FDI host countries.

The production network-related (or GVC) exports refer to exports of parts and components by manufacturing industries. Production network-related trade is dominant in certain manufacturing industries (e.g. machinery and electronics). However, there is no single measure of production network-related trade as it varies depending on the use of trade classification, coverage of industries and countries, level of disaggregation used, nature and intensity of such trade etc. (see, for example, Ando and Kimura, 2005; Athukorala, 2010; and Amighini, 2012). Nevertheless, in this note, the classification developed by Athukorala (2010) is used as it can capture production network-related trade in a wide range of manufacturing industries and is thus not limited to machinery parts and components only.

India’s exports of parts and components have been growing at a slower pace than the country’s overall manufacturing exports. As a result, the share of parts and components in total manufacturing exports has remained low (figure A). Similarly, manufacturing outward FDI has been growing slower than total outward FDI. Nevertheless, manufacturing outward FDI constitutes a significant fraction of total outward FDI (figure B), although its level does not change much.

The findings of the empirical analysis (see annex 7A) suggest that manufacturing outward FDI has a significant positive impact on exports of parts and components to the FDI host countries, even when inward FDI to India from the partner country does not change. On the other hand, bilateral trade costs have a significant negative impact on production network-related exports.

The results have a pertinent implication for policy. In particular, encouraging outward FDI in the manufacturing sector could significantly improve India’s participation in international production networks. On the other hand, in line with existing wisdom, trade costs reduce exports of parts and components to the FDI host countries of India.

Figure A. India’s exports of parts and components

Source: Author’s compilation from United Nations Comtrade (using SITC Rev. 3 data)
2. What are the main drivers of GVCs?

The current GVC phenomenon has some distinctive features that have attracted research attention worldwide. One is the pace and scale of GVC expansion, which is now faster and wider than ever before. In addition, international sharing of production is no longer restricted to developed countries, but increasingly involves developing countries, including emerging ones. Factors influencing the decision by firms to internationally fragment their production are discussed by a large body of literature. Based on that literature, figure 7.3 identifies three groups of factors that are linked to: (a) cost efficiency; (b) market access; and (c) low international trade costs. The main categories or examples of each of these are also listed in figure 7.3.

“For GVCs to emerge, trade costs must be low enough to enable firms utilizing country-specific advantages related to cost efficiency and/or market access.”

Figure 7.3 Main factors behind GVCs

- **Cost efficiency**
  - Costs of inputs
  - Economies-of-scale
  - Institutional costs and benefits
  - Infrastructure accessibility and costs

- **Market access**
  - Access to intermediate-import markets (backward linkages)
  - Access to intermediate-export markets (forward linkages)
  - Proximity to final demand
  - Conditions related to social-, environmental-, factors, and trade agreements

- **Low international trade costs**
  - Technological advances in communications, transports, and logistics
  - Trade and investment liberalization and regulatory reforms

Source: ESCAP.
International production sharing in GVCs takes place on different geographic scales (regional and global). As described by Jones and Kierzkowski (2001), the level of fragmentation depends on a trade-off between lower production costs and higher trade costs. By locating stages of production in economies where production costs are lower, firms can decrease the marginal cost of production; however, they may then incur higher fixed and variable costs that correspond to all the services links needed to maintain production in several locations.

The pace and scale of GVC expansion in the past two decades are associated with a significant reduction of trade costs (OECD, 2013b). A precondition for the international unbundling of the production process is that trade costs must be low enough to enable firms to utilize location advantages of countries arising from factor-price differences and economies-of-scale (Anukoonwattaka, 2011).10

Trade costs include the whole range of costs incurred by a firm when bringing goods or services from the place of production to where users or consumers are located.11 GVC operations require intermediate inputs to be manufactured in one or more countries and then shipped to another destination for final assembly, and a portion of trade costs are incurred each time a good-in-process crosses a border. An important cost element related to GVCs is coordination costs, as geographically dispersed activities have to be managed in a consistent way. Even a minor reduction in one or more trade cost elements can result in the cost of a vertically-integrated good being reduced considerably due to a cumulative effect of a change in tariffs.

Other factors can also result in a reduction of trade costs. During past decades, transport and communication costs have decreased first and foremost due to technological advances such as in container shipment or Internet-based communication. Progress has been made all along the logistics chain, ensuring the smooth flow of goods and services in a coordinated and inexpensive way. Lower trade costs are not limited to technological change. The improvements in trade cost-related infrastructure and services such as logistics, transportation, and information and communications technology (ICT), streamlined customs clearance, and more efficient financial and insurance services have helped reduce trade costs. Duval and Utoktham (2010) suggested that tariff trade costs in Asia and the Pacific generally account up to 10% of bilateral comprehensive trade costs, while other policy-related trade costs (i.e. of a non-tariff nature) account for 60% to 90% of bilateral trade costs (figure 7.4).

A trade cost reduction may make it profitable for firms, which had previously kept all of their production stages in one country, to move some stages of the production process to locations overseas. Firms that have already internationally fragmented their production are also likely to increase their flows of the component trade when trade costs decline.

![Figure 7.4. Contribution of various policy-related factors to changes in trade costs](image-url)

**Figure 7.4. Contribution of various policy-related factors to changes in trade costs**

- **Tariff trade costs**
  - 0-10%*
  - 1%
  - 6-7%
  - Direct behind- and at-the border trade costs
  - Availability/use of ICT services
  - Business (regulatory) environment
  - Maritime connectivity/services
  - Other trade costs
    - Indirect cost of trade procedure
    - Currency fluctuation
    - Other non-tariff barriers

- **Policy-related non-tariff trade costs**
  - 60-90%*
  - 16-18%

- **Natural trade costs (geographical and cultural factors)**
  - 10-30%*

* Illustrative figure, based on casual observation of the data only. Natural trade costs for landlocked countries may be outside the range shown for natural trade costs.

Source: Duval and Uthoktham (2010).
Another motivation for firms to internationally fragment their production is the opportunity to increase efficiency, as growing competition in domestic and international markets forces firms to become more efficient and focused on lowering costs. Spreading production stages over different countries may allow an MNC to achieve necessary production cost savings because some required inputs such as labour, natural resources, and intermediate goods and services, may be available in some countries at cheaper rates than in the home country of the MNC.

However, resource endowment is not the only source of location advantages. For certain tasks of the value chains that involve high fixed costs, the potential for achieving scale economies becomes a dominant factor explaining why a country has been able to participate in some parts of GVCs. Institutional and infrastructure factors also have impacts on cost competitiveness. In addition, the availability of infrastructure and related costs, tax incentives, preferential trade arrangements and existing regulatory frameworks are among the factors that determine the participation by a country in GVCs (Bhattacharya and Moazzem, 2013).

Another important form of motivation is entry into new markets and access to strategic inputs. In a GVC context, backward linkages mean that a country imports intermediate goods to be used in its exports, while forward linkages exist when a country exports inputs to be used in exports by other countries. The efficiency of backward linkages requires that GVC-participating firms are able to access the most efficient inputs either from domestic markets or imports. At the same time, the efficiency of forward linkages requires access to downstream producers who will further process the exports (if those exports are intermediate goods) or consumers (if those exports are final products). It is important to note that the spread of fragmented production is not necessarily across countries; instead, it may be concentrated in a certain region.

The issue is emphasized in the literature on “New Economic Geography”, which shows there are “agglomeration effects” that draw firms to cluster in a certain area in order to benefit from positive externality in the form of knowledge spillovers and backward- and forward-linkages. Conditions for certain locations to provide benefits from the agglomeration effects are related to social, environmental, geographical and trade agreements. This report gives particular attention to exploring how trade agreements and regional integration have an impact on the location of GVCs.

### 3. How are regional integration and GVCs related?

The expansion of GVCs has opened opportunities for firms to strengthen their regional components in order to support deeper integration within Asia and the Pacific by allowing economies to pursue the division of labour and specialization in tasks as opposed to product-based comparative advantages. For example, technology-intensive parts and components of electronics products are produced in relatively advanced industrial countries of the region, such as Japan, and the Republic of Korea, while the assembling of different intermediates into finished products is taking place elsewhere in the region, i.e. in emerging economies such as China and Viet Nam. The regional nature of GVCs has been confirmed by empirical literature using inter-country input-output tables. For example, Baldwin (2013) pointed out that much of the value-added distribution in GVCs tends to be within regional blocs that are broadly defined as “Factory Europe”, “Factory North America” and “Factory Asia”. Backer and Yamano (2012) indicated that around three-quarters of the intermediates embodied in exports from the European Union are sourced within Europe. Similarly, Canada and Mexico are heavily oriented towards the other North-American Free Trade Agreement (NAFTA) members; more than 50% of the imported intermediates embodied in their exports originate somewhere in the NAFTA zone.

The regional nature of GVCs may be related to the role played by trade costs. Other things being equal, countries appear to source intermediates from nearby countries in order to minimize transportation costs that are an important part of trade costs. Regional integration agreements may partly reduce trade costs between countries within a respective region, especially if such agreements provide for deep integration beyond market access. In other words, integration agreements that include liberalization of services trade, investment provisions, intellectual property rights protection, and the harmonization of standards and regulations will make cross-border production more efficient.

The empirical literature is rich with evidence pointing to a positive association between the existence of regional trade agreements and existence of regional value chains (regional production fragmentation) (see, for example, Johnston and Noguera, 2012; Hayakawa and Yamashita 2011; Blyde, Graziano and Martinus, 2014; and Orefice and Rocha, 2014). It appears that these two phenomena are mutually supporting; the deeper and more comprehensive trade integration agreements will go hand-in-hand with more expansive production sharing across borders in the region.

However, there is also the possibility of reverse causality. Orefice and Rocha (2014) found that the higher levels of trade in GVCs raised the likelihood of signing deeper agreements, especially between countries of different development levels. In addition, they found that the...
evidence appeared to be relatively strong for Asian countries. For example, following the implementation of NAFTA and the signature of the Mexico-European Union Free Trade Agreement, Japanese automobile manufacturers found themselves in a disadvantaged position and pushed the Government to sign an FTA with Mexico. In addition, Japanese FTAs often include beyond-the-border issues that help to improve the efficiency of international production networks such as trade facilitation, investment protection and facilitation, technical cooperation and international financial policy cooperation (Jerzewska, 2011).

4. How do GVCs contribute to development?

The ultimate development objectives of a country are socio-economic upgrading with more and better-remunerated jobs, a more sustainable use of resources, and better governance and political stability at large. Socio-economic upgrading often occurs as a process of “industrial upgrading”, which now often occurs through the process of industrial transformation and trade within GVCs (WTO, 2014). Prior to the mid-1980s, achieving industrialization was largely synonymous with building the whole supply chain within one economy. This was done successfully through decade-long learning-by-doing by early entrants such as Japan, the Republic of Korea and Taiwan Province of China. Nowadays, a greater division of labour and segmentation of production on a global scale in GVCs allows more economies to benefit from trade. It is not necessary to develop vertically integrated industries in order to participate in global trade; it is enough to develop capacities in specific segments (stages of production, tasks or business functions) of the value chain. The learning process involved is then less complex and, as a result, industrialization is easier to achieve (Baldwin, 2011). In other words, even small developing economies with limited capacities to develop a whole value chain now have a chance to operate tasks previously executed in developed economies, creating local jobs and value-added etc.

“In terms of productivity and competitiveness upgrading, the GVC phenomenon offers an alternative outward-looking development model driven by trade and competitiveness. Firms participating in GVCs are pressured to become more competitive and engaged in innovative activities. The pressure arises from engaging in exporting, by operating in a market exposed to imports or by being exposed to foreign affiliates of MNCs. Also, the outsourcing and offshoring of less efficient activities to more efficient producers can increase the productivity of firms. Interactions between foreign affiliates and domestic firms in host countries increase the potential of knowledge and technological spillovers. Direct investment by MNCs may also positively affect productivity in host countries to the extent that they are more likely to offer training and on-the-job learning.”

Evidence clearly shows that GVC-driven trade has brought investments in new productive capacity and infrastructure improvements in developing economies (OECD, 2013a). Key producing countries such as China, have developed enormous factory complexes whose output is sent to world markets through vast new port facilities (Stone and Shepherd, 2013). Participation in GVC activities has boosted employment, enabled increased specialisation and larger scale production, driven more efficient geographical allocation of industrial activities, and increased the availability of a variety of intermediate goods in the developing world (Gereffi, 2006).

5. Why are GVCs particularly important for small emerging economies?

GVC participation enhances the possibilities for access to new types of production and to upgrade towards higher value-added activities. If and when they are able to participate in the international production networks of MNCs, the benefit for developing economies will be critical as it will unlock their development disadvantages arising from being a small domestic market as well as from insufficient capital and the lack the experience to meet international standards. In fact, the competitiveness improvements can be felt beyond the GVC-participating firms and export sectors. Local firms, in general, can achieve greater success in their own markets by combining domestic and imported intermediate inputs.

With regard to long-term development, preserving participation in GVCs requires greater attention to “upgrading” the segment in which firms and economies are involved. Business strategies in GVCs are dynamic. Participating firms have to be able to adjust quickly to changes in demand factors such as consumers’ tastes and purchasing power, and supply factors affecting competition between producers at each stage of production. For emerging economies that, in general, started their participation in GVCs in the low-skilled, labour-intensive segments, economic growth and expansion of relatively labour-intensive segments will be followed by increasing real wages. Preserving a country’s participation in GVCs for long-term development then requires upgrading, or moving up the value chain, which is also desirable from the perspective of higher benefits that will be received by an economy when
As described by Humphrey and Schmitz (2002), there are four types of upgrading for enterprises within a value chain:

(a) Process upgrading – transforming inputs into outputs more efficiently by recognising the production system or introducing superior technology;

(b) Product upgrading – moving into more sophisticated product lines in terms of increased unit values;

(c) Functional upgrading – acquiring new, superior functions in the chain, such as design or marketing; and

(d) Intersectoral upgrading – applying the competences acquired in a particular function to move into a new sector.

Economies with limited capacity to upgrade into at least one of these four dimensions will eventually no longer be able to preserve their participation in GVCs.

GVCs AND ASIA-PACIFIC COUNTRIES: STYLIZED FACTS

The use of descriptive statistics allows for the identification of several stylized facts and trends as detailed below. 16

1. Participation of Asia-Pacific economies in GVCs

“The region is a major exporter of GVC final products, but not yet a major source of final demand.”

While it is clear that Asia-Pacific economies have been an important exporter of GVC products, final demand still comes mainly from developed economies outside the region. In 2013, about 45% of global GVC-related exports of final products came from the Asia-Pacific region, with exports by China representing half of the region’s final exports (figure 7.5). In contrast, the region’s imports of GVC final products accounted for just 26% of global imports. Imports of GVC final products are dominated by the United States and countries in the European Union.


Note: See online appendix A for product list.
2. In which countries are GVC trade opportunities mainly concentrated?

“GVC participation of Asia and the Pacific appears to be largely concentrated in just 10 countries”

While China dominates final products exports, other countries in the region have captured a significant share in the global trade of GVC-intermediate products. In 2013, 43% of global GVC-intermediate exports came from the Asia-Pacific region. At the same time, 38% of global GVC-intermediate imports went to the region. However, 90% of these trade flows are concentrated in just 10 countries, i.e. Australia, China, Japan, India, Indonesia, Malaysia, the Republic of Korea, Singapore, Thailand and Turkey (figure 7.6).

Figure 7.6. Major exporters and importers of GVC-intermediate products, 2013

(Percentage share of total exports and imports)

Note: See online appendix A for product list.

3. Does national income level matter for participation in GVCs?

“The low-income economies are largely bypassed by GVCs.”

Although GVCs in principle should promote economies of different development levels to jointly take part in a production process, it appears that participants in GVCs are mostly in the high- and middle-income categories while low-income economies are being left out. In general, GVC exports by Asia and the Pacific are dominated by electronics from the upper-middle income economies (figure 7.7). The region is also prevalent in the exports of other product groups, except for automotive products, of which the high income countries are the major exporters. There is no evidence from the GVC-related trade data to the fear that everything will be produced in China; countries specialize in different product groups. For example, China is specialized in the exports of electronics. Turkey and Thailand have significant export shares, especially in the final exports of automotive and agriculture products. Malaysia is the largest exporter of processed agriculture intermediates while also accounting for a considerable share in exports of intermediate electronics. The low-income economies still represent a negligible share in most cases except for the final export of apparel and footwear, mainly from Bangladesh and Cambodia.-
4. How did the recent global economic crisis affect GVCs?

“Core of demand for final goods has started to shift towards Asia and the Pacific.”

The 2008/2009 economic crisis in developed countries has accelerated global demand shift from the United States and the European Union towards developing economies. The Asia-Pacific region has significantly increased its stake in final imports by 7 percentage points, from 19% in 2007 to 26% in 2013 (figure 7.8). Exporters in developed countries are also aware of the drop in demand at home and are shifting their focus to emerging markets. An example is the case of Spanish group Inditex (Zara), which has opened retail outlets in China, India, Kazakhstan, the Republic of Korea and the Russian Federation with the hope of improving its financial performance after the crisis.

Figure 7.8. Shares of Asia and the Pacific in global trade of GVC final products, before and after the 2008-2009 global economic crisis

The shifts in global demand appear to be triggering a restructuring of GVC intermediate trade. For example, there has been a significant drop in demand for final and intermediate electronics products since the start of the economic crisis in the United States and European countries. In contrast, automotive intermediates have been less affected than electronics because there is still a relatively robust automotive demand from fast-growing developing economies. As a result, the share of electronics in the global trade of intermediate goods dropped significantly from 53% in 2006 to 25.5% in 2013 while the share of the automotive sector increased from 29.5% to 42% during those same years.

These global shifts have been reflected in the export structures of Asia and the Pacific. The share of intermediate electronics in the region’s total intermediate exports dropped from 73% in 2006 to 43% in 2013 (figure 7.9). The import share decreased even more, from 74% to 38%, in the same period. The stronger reduction of the import share compared with the export share may imply that assembling countries such as China have already diversified their production towards upstream activities and, hence, now rely less on imported parts and components. This has put pressure on other Asia-Pacific economies to upgrade and adjust their positions in accordance with shifting GVC dynamics.

5. How is intraregional trade affected by GVCs?

“Intraregional trade, especially South-South trade, playing an increasing role.”

The share of intraregional exports in total intermediate exports by Asia-Pacific countries grew from 52.6% in 1995 to 58% in 2013. GVC-related production in Asia and the Pacific relies heavily on intraregional intermediate imports. In 2013, more than 65% of the GVC intermediate imports of Asian and Pacific economies came from within the region. The regional import intensity was particularly high for apparel and footwear as well as electronics, with shares of intraregional intermediate imports as high as 91.5% and 82%, respectively (figure 7.10). The regional import intensity was moderate for automotive and processed agriculture, of which the regional intermediate imports were 60% and 55%, respectively, in 2013. In contrast, the regional intensity for primary-agriculture imports was relatively low at 22%.

For final products, the regional export intensity of GVC final exports from Asia and the Pacific increased rapidly from 30.7% in 2007 to 37% in 2013. The regional trade intensity is expected to continue to strengthen if the region reaffirms its role as a global growth pole. However, the opportunities for rising intraregional trade in final products will differ across sectors. The sectors that have a relatively high potential to benefit from the global demand shift towards Asia and the Pacific include the apparel/footwear and electronics sectors, which have a high share of intraregional import at 86.5% and 76.6% of total final imports, respectively. These shifts in global final demand towards large developing economies in the region also add to the importance of regional integration, especially for smaller developing economies in the region.
With the rising intraregional trade intensity of GVCs in Asia and the Pacific, there is also growing intraregional (South-South) trade among developing economies excluding those in the high-income category (hereafter referred to as “non-high income economies”). Trade statistics shows an increasing dependence of low-income economies’ exports on middle-income markets, especially the upper-middle income countries, between 1995 and 2013 (table 7.1). Exports from low-income countries to the upper-middle-income countries in the Asia-Pacific region accounted for more than 66% of their intraregional intermediate exports and 33% of their intraregional final exports in 2013, which is a significant increase by 58 and 23 percentage points, respectively, from the export shares in 1995. Similarly, upper-middle-income Asia-Pacific countries as a group have become a major destination for intraregional exports from other income groups with shares of about 40.6% to 53% of the high-income countries’ intraregional final and intermediate exports, 36.6% to 46% of those of the lower-middle income group, and 11.7% to 18.9% of the exports from the same group. In contrast, intraregional exports to the region’s high-income countries have grown at a much slower rate. As a result, although intraregional exports to high-income countries are still significant, their shares of total intraregional exports have dropped considerably. For instance, the final exports to high-income economies accounted as much as 43.7% of the final exports by lower-middle income countries in 2013. However, that is a decrease by 39.1 percentage points compared to their share in 1995.
6. What is the role of services in the development of GVCs in Asia and the Pacific?

“Services create a significant value in the process of manufacturing, distribution and marketing of goods in GVCs.”

The recognition of the value created, directly or indirectly, by services used in the process of manufacturing, distribution and marketing of goods has become known as “servicification” (ESCAP, 2013). GVCs rely intensively on services to link and coordinate the activities located in different countries (Gereffi and others, 2001). In addition, increasing liberalization of trade in services as well as the advancement of communications and transportation technologies have increased tradeability of services, and consequently generate a higher share of foreign services in industrial exports.

Using the data on trade in value-added from the OECD-WTO TiVA database, research by ESCAP has estimated that services accounted for 29.4% of the total value-added in industrial exports by Asia and the Pacific in 2009 (Anukoonwattaka and others, 2015). The share of services is predominant in high-technology sectors, i.e. electrical and optical equipment (32.5%), machinery (30.8%), transport equipment (30.6%), and chemicals and non-metallic mineral products (30%), while it lags behind in agriculture, hunting, forestry and fishing (18.5%), mining and quarrying (21.8%), and food products (25.2%). These results are in line with the global trend, where transport equipment and high-tech sectors are the most service-intensive industries (World Bank, 2013). Much of the intermediate services are imported, particularly business services that are an essential input to the export production of manufacturing goods, especially electrical, machinery, transport equipment and chemical products. The share of imported services in industrial exports increased from 7% in 1995 to 11% in 2009. The increase of services imports has been particularly rapid in the case of business services. Furthermore, the share of intraregional imports of services increased, especially in GVC-related industrial exports.

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<th>Table 7.1. Intraregional exports of GVC products, by income group, 2013 and changes from 1995 (Percentage share of intraregional exports)</th>
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<td><strong>Final goods</strong></td>
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</tbody>
</table>

GVCs have been an important feature of the trade, investment and production of Asia-Pacific countries. As mentioned above, the process of industrialization in many countries appears to accelerate after entering GVCs and expanding GVC-related exports (WTO, 2014; and Baldwin, 2011). However, the opportunities to engage in GVC-related activities have been opened only to a limited number of countries in the region. Therefore, a question for Asia-Pacific policymakers is how to create an enabling environment to enhance the opportunity to further integrate into GVCs in order to reap the long-term benefits from participation.

With a presumption that the combination of natural and policy-related factors determine a country’s participation in GVCs, this section explores which policy variables are the most relevant and it provides policy advice for improving the ability of developing Asia and the Pacific to integrate into GVCs. The analysis also draws on suggestive stylized evidence from the previous section which indicates that policy advice should take into account differences across development levels, sectors and stages of production. For example, a policy designed for a country exporting final goods might differ from that designed for a country exporting intermediate products; these may differ even further, depending on a country development level. It is also argued that, in a world with GVCs where exports include a significant amount of imported inputs, import barriers (at- and behind-the-border) imposed by an exporting country could be as harmful as trade barriers imposed in the export market.

To investigate these issues, an augmented gravity model of trade is estimated. The model is estimated to assess the impacts of changes in trade and trade-facilitation policies on exports of Asia-Pacific economies through GVCs after controlling for fixed effects of time, exporting and importing countries, and sectors (box 7.2). The empirical framework, based on Baldwin and Taglioni (2011), is suitable for capturing GVC-related trade where trade in intermediate goods is important. In order to control for differences in the patterns of trade in final and intermediate products, the gravity equations are estimated for final and intermediate exports separately. Furthermore, the models for intraregional exports of those products are also estimated to investigate if the patterns differ between trade in global and regional value chains.

In addition to the gravity model of the whole Asia-Pacific region, separated gravity models of exports by each income group are estimated in order to provide specific policy advice to countries with different development levels. This study includes all Asia-Pacific economies, both developed and developing. Country classification by income group is based on the World Bank’s income classification in 2014. Countries are categorized into four income groups: high upper-middle lower-middle and low-income economies. It should be noted that high-income countries include developed and some developing economies (see country lists in online appendix B).

**Box 7.2. Augmented gravity model of GVC-related exports by Asia-Pacific economies**

The augmented gravity model of bilateral exports is estimated to measure the effects of policy factors on GVC-related exports of final and intermediate goods by Asia-Pacific economies from 1995 to 2013. The focus is on trade-related policies that include trade-policy measures, trade facilitation and behind-the-border obstacles to trade and FDI. In order to avoid multi-collinearity between policy variables and fixed effects, the gravity model of GVC-related exports is divided into two parts: (A) a gravity model with only trade-policy variables; and (B) a gravity model with not only trade policy variables but also trade facilitation and behind-the-border factors. The baseline specifications are:

(A) Gravity model with only trade-policy variables:

\[ X_{ijkt} = \beta_0 + \beta_1 mass_{ijt} + \beta_2 T_{ijkt}^i + \beta_3 T_{jikt}^i + \beta_4 RTA_{ijt} + \beta_5 G_{ijt} + \delta_{it} + \delta_{jt} + \delta_{kt} + \varepsilon_{ijkt} \]

(B) Gravity model with trade facilitation and behind-the-border factors:

\[ X_{ijkt} = \beta_0 + \beta_1 mass_{ijt} + \beta_2 T_{ijkt}^i + \beta_3 T_{jikt}^i + \beta_4 RTA_{ijt} + \beta_5 G_{ijt} + \beta_6 F_{it} + \beta_7 F_{jt} + \delta_{it} + \delta_{jt} + \varepsilon_{ijkt} \]
\[ \delta_k + \epsilon_{ijkt}, \text{ where} \]

\( X_{ijkt} \) is the bilateral exports of product l in sector k from country i to country j in year t, and \( mass_{ijt} \) is the economic mass measured under the method suggested by Baldwin and Taglioni (2011).\(^{23}\)

The role of policies imposed by both the exporting country i and the import country j are investigated through the estimated coefficients of policy variables included in the model: \( T_{ijkt}, T_{ijkt}', RTAi_{jt}, F_{lt} \) and \( F_{jt}' \). \( T_{ijkt} \) is a vector of product-variant trade-policy variables imposed by country i faced by country j related to trade in product l of sector k at time t. The set of policy variables include applied MFN tariffs and non-tariff measures. Similarly, \( T_{ijkt}' \) is a vector of the same set of policies faced by country i when exporting product l to country j at period t. \( RTAi_{jt} \) is a dummy variable capturing the regional trade agreement (RTA) relationship between country i and country j at time t. \( F_{lt} \) and \( F_{jt}' \) are the vectors of behind-the-border indicators at time t of country i and country j, respectively. The vectors include indices measuring behind-the-border conditions of a country such as availability of ICT (proxied by Internet users per 100 people), port and logistics conditions (based on international supply chain connectivity or ISCC index) and behind-the-border conditions, which reflect business environment (Doing business – distance to frontier), are country-time specific variables. In addition, \( G_{ij} \) is a vector that includes time-invariant controlled variables as per standard gravity model, i.e., distance, contingency and common official language. \( \delta_i, \delta_j, \text{ and } \delta_k \) are included in the model to capture unobserved time-invariant fixed effects by country and sector levels. Adding t to the subscript, the variables become time-variant fixed effects.

The dataset covers all Asia-Pacific countries whose data were available during the study period. The dataset combines trade and policy data from several databases. Trade data are from United Nations Comtrade, downloaded from World Integrated Trade Solution (WITS). The geographical distances between most populated cities (in kilometres), contiguity and bilateral common language dummy variables were obtained from CEPII (www.cepii.fr). GDP, value-added data of the manufacturing sector in current US dollars, GDP deflator and income group data were obtained from World Bank’s World Development Indicators (WB-WDI). For policy variables, tariff data were from the UNCTAD TRAINS database, downloaded through WITS. Non-tariff measures were obtained from WTO’s Integrated Trade Intelligence Portal (WTO-ITIP). RTA data were from de Sousa (2012). Trade facilitation data, cross-border proxy, and ISCC index were obtained from the ESCAP database (http://artnet.unescap.org/databases.html#fourth). Since ISCC data include some components in trading across borders in the ease of doing business indicator, the study calculates modified ease of doing business index (distance to frontier), excluding the trading across border component. The data were downloaded from Doing Business (www.doingbusiness.org). Internet users per 100 people, which is the proxy of efficiency in paperless trade facilitation, were obtained from WB-WDI (see annex 7B).

The analysis covers GVC-related final and intermediate exports of five sectors: apparel and footwear; automobiles; electronics; agricultural primary; and processed agricultural products.\(^{24}\) The product lists proposed by Sturgeon and Memedovic (2010) were utilized to identify GVC final and intermediate products of the apparel and footwear, automobile and electronics sectors.\(^{25}\) In addition, the final and intermediate exports of primary and processed agricultural products are identified, based on the Broad Economic Categories (BEC) categorization of household consumption for final goods, and industrial uses for intermediate goods users (see online appendix A). Exports by a country are measured based on data reported by its trading partners (importers). Using mirrored export data helps to partially eliminate the missing data, especially in the case of countries with limited export statistics.

1. **General requirements for enhancing GVC participation**

(a) A comprehensive trade liberalization

Tariffs and the numbers of non-tariff measures (NTMs) are used as suggestive indicators of trade protection while an RTA dummy represents the existence of a formal trade agreement between two trading partners. As presented in figure 7.11 and table 1 of online appendix C, there is evidence that tariff liberalization is a critical step in competitively engaging in the value chains, both globally and regionally. The impacts of tariffs imposed and faced by Asia-Pacific exporting countries at the product level (HS-6 digits) are investigated through the gravity model with trade policy variables. The estimated tariff coefficients suggest that a tariff reduction could enhance GVC-related exports of final and intermediate products, both to global and to intraregional markets. For the tariff faced by an exporting country, a tariff
This means that policymakers might suffer from its own protection measures more than from the protection measures of its import partners. A possible explanation could be related to the back-and-forth trade barriers for the promotion of participation in GVCs. Export competitiveness in GVCs then requires efficiency in import procurement even at a highly disaggregated product level (HS 6-digits). Thus, the results suggest that an adverse impact of tariff protection could happen even at the disaggregated level of intra-industry trade.

The sizes of tariff coefficients indicate that a country’s exports might suffer from its own protection measures more than from the protection measures of its import partners. A possible explanation could be related to the back-and-forth intra-industry trade at different stages of production in GVCs. Export competitiveness in GVCs then requires efficiency in import procurement even at a highly disaggregated product level. This means that policymakers must give much more consideration to facilitate imports, as they traditionally focus on promoting exports, if they want to support exports through participation in GVCs.

The results imply that the way in which trade policy is conceived requires some reordering. Although, in general, tariffs have declined substantially during the past few decades as a result of trade liberalization, both by unilateral and multilateral actions, tariffs remain an important impediment to trade in GVCs (see chapter 5 in this report for the current review). One reason is that there is a great diversity in levels of applied (and bound) tariffs in developing countries. More importantly, the impact of existing tariffs – however low those tariffs may be – is magnified due to the fact that when intermediate goods are traded across borders several times, before being assembled into a final exportable product, the applied tariffs get added on top of each other. The GVC-participating firms are therefore affected by a tariff at both ends of the chain, both as additional costs of their intermediate goods and as a barrier (affecting their competitiveness) in the market for which the exportable final good is destined.

Therefore, protection against imported inputs will increase the costs of GVC exports and reduce producers’ ability, especially those in the small and medium-sized enterprise (SME) sector, to compete in export markets. In addition, accumulated tariffs could reach quite a high level by the time the finished good reaches customers, their effect on either reduction of profit margins or demand, if being shifted to the consumers, might dampen production and investment at all stages of the value chain. For example, the effective burden for China’s exports, when measured by tariffs on the domestic value-added, was higher than 37% for agricultural exports and 20% for manufacturing products in 2009. This is much higher than when measured by tariffs on gross exports, which show tariffs facing a Chinese exporter were 22% for agricultural exports and less than 5% for manufacturing exports (OECD, 2013b).

The estimated coefficient of NTMs confirms that removing trade barriers for the promotion of participation in GVCs should go beyond tariff elimination. The NTM coefficients are negative. It means that the more NTMs are imposed, or are faced by an exporting country, the lower will be their exports. However, as is frequently the case in the estimation of trade impacts, when quantifying the impact resulting from changing the number of imposed NTMs on the volume of exports, the result does not give large numbers. Based on the statistical evidence, an additional NTM imposed by an exporting country is associated with a reduction of that country’s own exports by 0.3% for final exports and 0.5% for intermediate exports. On the other hand, an additional NTM faced by an exporting country is associated with a reduction of that country’s exports by 1.7% of GVC-related exports (see table 1 of online appendix C for details).

The estimated NTM coefficients are quite small compared to tariff coefficients. However, it does not imply that NTMs should be interpreted as negligible impediments to exports in GVCs. It shows that without knowing the tariff-equivalence of NTMs it is impossible to properly quantify a change in trade barriers attributed by NTMs (Heal and Palmioli, 2015). Since such tariff equivalents are not available across countries studied here, the number of NTMs reported by WTO members is used as a proxy. This is far from a perfect proxy because of the likely discrepancy between reported NTMs (as used in the model) and implemented NTMs if countries did not notify or update their real NTM status to WTO. It is also not true that countries necessarily underreport, as there are also possible cases where some measures, such as technical regulations, have been withdrawn without proper notification to WTO. In addition, the availability of data becomes an issue when the estimates focus on intraregional trade.
Box 7.3. How to interpret figures 7.11 and 7.12

Figures 7.11 and 7.12 are constructed to help explain the results of the econometric analysis (the tables of complete regression outputs can be found in online appendix C). The econometric analysis assesses the impacts of policy variables on GVC-related exports by Asia-Pacific countries. Figure 7.11 highlights the roles of trade-policy variables, while figure 7.12 illustrates the impacts of trade facilitation and behind-the-border conditions on exports of final and intermediate goods of Asia-Pacific countries through the global and regional value chains. The gravity models are estimated separately for global and intraregional exports of final and intermediate goods as categorized in the four models in figures 7.11 and 7.12. The horizontal axis shows the dependent variables of each model. Estimated coefficients from each gravity model are presented by dots along a vertical line. Only the coefficients of focused variables with statistically significant relationships at the 1% to 5% level are presented in the figures. A dot above a horizontal axis is a coefficient with a positive value, while a dot below a horizontal axis is a negative coefficient. Interpreting the coefficients follows standard econometric practice, i.e., a positive coefficient indicates a positive association between an independent variable (dot label) and a dependent variable (a category on a horizontal axis). Along a vertical line, the distance of a dot from a horizontal axis indicates the size of a respective coefficient. It then implies the elasticity of exports to a change in the respective policy measures.

Figure 7.11. Impacts of trade policy factors on exports in GVCs (estimated coefficients)

<table>
<thead>
<tr>
<th>Model 1:</th>
<th>Model 2:</th>
<th>Model 3:</th>
<th>Model 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exports</td>
<td>Intregional exports (final)</td>
<td>Intermediate exports</td>
<td>Intraregional exports (intermediates)</td>
</tr>
</tbody>
</table>

Dependent variable in the model
- Bilateral tariffs (exporters)
- Bilateral tariffs (importers)
- Bilateral NTMs (exporters)
- Bilateral NTMs (importers)

Source: ESCAP estimates.
Note: Estimated coefficients that are statistically significant at the 1% to 5% level are illustrated in the figure. See table 1 of online appendix C for details of the regression output.

It is also important to note that the phenomenon of servicification, as already mentioned, indicates the need for comprehensive coverage of liberalization policy across economic sectors (see also chapter 8). Removing barriers to cross-border movements of goods will not suffice for strengthening the competitiveness of national producers from the perspective of participation in GVCs. Appropriate liberalization of services sector, including trade in services, and movements of capital and labour are also necessary for the development of GVCs.

Servicification is very important in GVCs of industrial goods. It requires a comprehensive approach when formulating policies to strengthen GVC participation. While liberalizing trade in goods is a starting point for opening new trade opportunities, the value chains in the production of industrial goods also requires efficient services. Improvements in the performance of the service sectors, including through liberalization of services trade, would thereby enhance the competitiveness of manufacturing firms and facilitate their participation in global production networks. In addition, trade in services under modes 3 and 4 also relate to the liberalization of investment and movement of professionals.

“Liberalization of trade in services and investment could help facilitate participation in GVCs.”
In addition, facilitating business in GVCs requires minimizing behind-the-border obstacles (see next section for more details). This relates to the quality of regulatory institutions, which includes a broader set of domestic policy reform, deregulation and improvement of the transparency and efficiency of law enforcement. For example, a strong legal system to protect intellectual property rights and contract enforcement is crucial for participating in GVC tasks related to R&D, design, innovation and branding. Countries that have political stability, open to foreign investment and adhere to international standards are likely to succeed in attracting foreign investment and becoming a part of GVCs.

(b) Improving behind-the-border and border trade facilitation

Fast and efficient procedures at the border are essential to the operation of GVCs because goods cross borders many times as both inputs and final products. The efficient customs and simplified administrative procedures at the border are thus a critical factor for participation in GVCs as they will have an impact on the overall trade costs.

In order for a firm to be able to better connect to GVCs, improvement of hard infrastructure, such as port connectivity, transport, logistics and the information communication network, is required. The accessibility and high quality of these physical infrastructure features are critical to helping firms minimize trade costs and thereby increase their opportunities for connecting with global production networks.

To investigate the roles of infrastructure and trade facilitation, the estimation takes into account these elements by three indices on the export and import sides. The International Supply Chain Connectivity (ISCC) index reflects the efficiency of moving goods from the factory to export markets. It takes into account the availability and quality of ports, shipping, inland transportation, customs and procedures at the border. Availability and ease of access to the Internet is used as a proxy for efficiency in information flows and communication technologies. Sub-indicators related to the behind-the-border business environment from World Bank’s Doing Business database are aggregated to quantify the relative position of countries in terms of regulations and institutions including contract enforcement, the legal system, credit accessibility, etc.

As presented in figure 7.11 and table 2 of online appendix C, the coefficients of internet users in exporting and importing countries are positive and statistically significant for GVC-related exports of final and intermediate products at the global level. This is consistent with the hypothesis that the efficiency of communication technologies is important for coordinating business activities along a GVC. The improvement of ICT, either in importing or exporting economies, could lead to increases in exports to the global market. However, the coefficients show that Internet connectivity does not significantly affect intraregional trade. This may be due to the fact that other factors help facilitate information flows between Asia-Pacific nations. For example, communication between business entities in the value chains may be easier when the countries are in close proximity, sharing similar cultures or having historical and social linkages.

“The ICT is important for expanding production and trade networks from the regional to the global level.”

The empirical results confirm the expectation that an improvement in logistics and custom clearance in exporting economies would help their export performance. The ISCC coefficients show that better logistics (measured as an improvement in the ISCC score) in an exporting economy helps exports of final products through GVCs after controlling for the logistics in an import destination. A 1% improvement in the ISCC score of an exporting economy is associated with an increase of its final exports between 0.9% to 1%. There is no evidence that better logistics plays a significant role in intermediate exports.

In contrast, better logistics and ICT connectivity of an import partner that reduce the cost of GVC-related trade transaction with distant destinations also may reduce export opportunities for the Asia-Pacific region. In the other words, better logistics in an importing economy may increase its imports from any exporter in the world at the expense of Asia-Pacific exporters that used to leverage their location advantages. The contrasting impacts of logistics and ICT connectivity in exporter and importer economies lead to the conclusion that Asia-Pacific exporters need to match their import partners in improving logistics to avoid losing their competitive position in GVCs.

“Asia-Pacific exporters may lose their competitive edge in the GVC-related exports if they start lagging in logistics and customs procedures.”

“Exports in GVCs are highly sensitive to rules and obstacles of doing business in importing countries.”
The estimated coefficients of the Doing Business indicator reflect a strong link between behind-the-border factors in importing economies and exports in GVCs. The indicator is used in the regression as a proxy of quality of regulatory institutions, including rules, regulations and the legal system. The positive coefficients indicate that GVC-related exports are directed more to destinations with relatively good regulatory conditions. Estimated coefficients on doing business for importing economies are positive and significant at 1% to 5%. The coefficient magnitude is particularly large for intraregional trade compared with the coefficient estimated from total trade.

Based on this dataset, the estimation is still not conclusive enough to confirm that local regulations and rules in exporting countries matter. However, it is important to keep in mind that in the Asia-Pacific region foreign investments and exports related to GVCs often take place in export processing zones, which are meant to shelter foreign investors and the exporters from the red tape and other regulatory burden generated by local rules.

These results appear to confirm that GVCs require the reassessment of trade facilitation measures. As countries become strongly connected through GVC participation, the need for international coordination on regulatory reform and harmonization are stronger than ever before. Regional coordination is particularly important in the context of Asia and the Pacific because economies in the region are strongly connected in the value chains.

(c) Supporting GVC development through regional integration frameworks

“RTAs appear to be helping expansion of exports related to GVCs.”

Casual observations suggest that regional integration could enhance GVC participation by economies in the Asia-Pacific region. The results based on systematic investigation confirm the positive impacts of regional integration on GVC-related exports of Asia-Pacific region economies. The estimated RTA coefficients, which are positive and statistically significant, suggest that having a formal trade agreement appears to enhance bilateral export through GVCs (table 7.2). Based on the coefficients of RTA-dummy variables, GVC-related exports by Asia-Pacific economies in general could be at least 58.6% higher with an RTA than without an RTA (see details of regression output in table 1 of online appendix C). There are two possible interpretations of the panel data analysis. On the one hand, it may reflect that GVC-related exports from Asia-Pacific economies to a particular import partner appear to increase after a formal trade agreement is signed. On the other hand, it could also mean that GVC-related exports by Asia-Pacific economies appear to be destined more to countries with which those economies have a trade agreement compared to other countries with which they do not have a trade agreement, given that they are similar in other characteristics.

However, RTAs alone will have limited benefits without the improvement of connectivity with global trade partners through unilateral or multilateral trade and investment.
liberalization and facilitation. The RTA coefficients appear to be somewhat higher for global exports than for intraregional exports when the same type of export is considered. Having an RTA may increase final global exports by 73.9% and intraregional exports by 58.6%. For intermediate exports, the coefficients show that the impacts are 78.9% for global exports and 73.1% for intraregional exports. This may imply that an RTA is particularly supportive of GVC-related exports to destinations outside the region. A possible explanation could be that a formal trade agreement may not be important at the intraregional level because Asia-Pacific countries are already connected in the regional production networks even without an RTA, due to geographical advantages, historical factors etc.

In addition, the effectiveness of RTAs in helping GVC-related export appears to depend on the development levels of exporters and importers. For example, while significantly helping low-income economies to export to high-income countries, having a formal trade agreement does not play a significant role in exports to non-high income economies. When looking at exports from high-income countries, the results show that RTAs do not help their exports to countries in the same peer group. In contrast, having an RTA plays a significant role in helping lower-middle income economies increase their exports to intraregional markets regardless of the level of income.

Although the results are quite mixed, the general conclusion is that having an RTA with high-income import partners may be a useful strategy for Asia-Pacific exporters, both in the low and the middle-income groups. Given the fact that high-income countries are likely be a large market for intermediate and final products in GVCs, this finding implies that an RTA strategy that may effectively help GVC-related exports by low- and middle-income Asia-Pacific economies would be market-driven RTAs.

Table 7.2. Estimated RTA coefficients from the gravity models, by group of exporters and importers

<table>
<thead>
<tr>
<th>Exports by type of products and income level at destinations</th>
<th>Final (intraregional)</th>
<th>Intermediate (intraregional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia-Pacific exporters</td>
<td>High</td>
<td>Non-high</td>
</tr>
<tr>
<td>Low-income*</td>
<td>1.732</td>
<td>1.531</td>
</tr>
<tr>
<td>Lower-middle income b</td>
<td>1.908</td>
<td>0.515</td>
</tr>
<tr>
<td>Upper-middle income c</td>
<td>0.735</td>
<td>0.386</td>
</tr>
<tr>
<td>High-income d</td>
<td>1.062</td>
<td>1.266</td>
</tr>
<tr>
<td>All Asia-Pacific*</td>
<td>0.739</td>
<td>0.789</td>
</tr>
</tbody>
</table>

Note: Each column of the table presents estimated RTA coefficients obtained from different gravity models of GVC-related exports. The models are controlled for conditions related to trade protections, trade facilitation, and fixed effects of countries and years. Only the RTA coefficients with statistical significance at the 1% to 5% level are presented in the table.

* Based on regression output shown in tables 3 and 4 of online appendix C.
* Based on regression output shown in tables 5 and 6 of online appendix C.
* Based on regression output shown in tables 7 and 8 of online appendix C.
* Based on regression output shown in tables 9 and 10 of online appendix C.
* Based on regression output shown in table 1 of online appendix C.
2. National priorities for different income groups

Asia-Pacific economies are significantly diverse, both in terms of development levels and patterns of their exports in GVCs. Policy formulation to enhance GVC participation by Asia-Pacific economies should highlight market-specific and country-specific factors. Therefore, regressions are estimated separately by income group of exporters and importers as well as by types of exports. The results are presented in tables 7.3 to 7.5. They indicate that in addition to general policy conditions, the focus and priority of policymaking could vary between income groups. This, in turn reflects specificities of how a development stage of an economy affects its participation in GVCs, and indicates custom-made policies to support its GVC participation.

“Infrastructure investment to improve connectivity is the key to entering GVCs.”

Table 7.3. Estimated coefficients of policy variables from the gravity models of GVC-related exports, by low-income Asia-Pacific exporter

<table>
<thead>
<tr>
<th>Policy variables</th>
<th>Exports by types of products and income level at destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Final</td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Tariffs (exporters)</td>
<td>x</td>
</tr>
<tr>
<td>Tariffs (importers)</td>
<td>-3.46</td>
</tr>
<tr>
<td>RTA</td>
<td>1.732</td>
</tr>
<tr>
<td>Internet users (exporters)</td>
<td>0.274</td>
</tr>
<tr>
<td>ISCC (exporters)</td>
<td>2.675</td>
</tr>
<tr>
<td>Doing business (exporters)</td>
<td>x</td>
</tr>
<tr>
<td>Internet (importers)</td>
<td></td>
</tr>
<tr>
<td>ISCC (importers)</td>
<td></td>
</tr>
<tr>
<td>Doing business (importers)</td>
<td></td>
</tr>
</tbody>
</table>

Note: The table presents the estimated coefficients shown in tables 3 and 4 of online appendix C. Only the policy coefficients that are statistically significant at the 1% to 5% level are presented in the table. The coefficients with unexpected results are denoted by “x”. The models are controlled for conditions at the border and behind-the-border that may affect GVC-related export capacity. Fixed effects are also controlled at the country, year and sector levels. The NTM coefficient cannot be estimated due to the fact that NTM data are missing for most of the low-income economies.
Reforms of trade and investment policies, especially trade facilitation, are the sine qua non for these countries to become a major player in GVCs.”

Lower-middle income economies in the Asia-Pacific region are already involved in GVCs to a significant level. A major policy question, then, is how to enhance their performance in GVCs in order to maximize benefits for their further development. The estimated coefficients of policy variables shown in table 7.4 suggest that exports by lower-middle income economies to non-high income economies appear to be particularly sensitive to tariff reductions by their import partners and RTA memberships. This may reflect the fact that there is a room for tariff reductions to increase the margin of preference in trade between them. The evidence for the negative impact of NTMs is statistically significant, although the coefficient magnitude is quite small. In addition, there are cases where evidence shows that improved logistics and simplification of rules and regulations in lower-middle income economies could increase their GVC export opportunities. Similar to the findings in the model of GVC-related exports by the Asia-Pacific region overall, there is a negative association between infrastructure improvement in an importing country and the export opportunity of an Asia-Pacific lower-middle income exporter. This finding appears to confirm the earlier statement that better connectivity of an import partner may reduce the advantage of Asia-Pacific exporters in regional value chains. The better connectivity reduces the cost incurred by distance when importing, especially from a distant exporting source. Therefore, Asia-Pacific countries that enjoy location advantages may lose their export competitiveness.

Table 7.4. Estimated coefficients of policy variables from the gravity models of GVC-related exports, by lower-middle income Asia-Pacific exporters

<table>
<thead>
<tr>
<th>Policy variables</th>
<th>Exports by types of products and income level at destinations</th>
<th>Final</th>
<th>Intermediate</th>
<th>Final (intraregional)</th>
<th>Intermediate (intraregional)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>Non-high</td>
<td>High</td>
<td>Non-high</td>
</tr>
<tr>
<td>Tariffs (exporters)</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tariffs (importers)</td>
<td>-1.413</td>
<td>-1.805</td>
<td>-3.357</td>
<td>-1.369</td>
<td>-3.658</td>
</tr>
<tr>
<td>RTA</td>
<td>1.908</td>
<td>0.515</td>
<td>1.482</td>
<td>0.79</td>
<td>1.798</td>
</tr>
<tr>
<td>NTMs (exporters)</td>
<td>-0.009</td>
<td>-0.016</td>
<td>-0.005</td>
<td>-0.009</td>
<td>-0.021</td>
</tr>
<tr>
<td>NTMs (importers)</td>
<td>-0.002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet users (exporters)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISCC (exporters)</td>
<td>1.171</td>
<td>1.224</td>
<td></td>
<td>1.616</td>
<td></td>
</tr>
<tr>
<td>Doing business (exporters)</td>
<td></td>
<td></td>
<td></td>
<td>-3.628</td>
<td></td>
</tr>
<tr>
<td>Internet (importers)</td>
<td>0.355</td>
<td></td>
<td></td>
<td>-0.37</td>
<td></td>
</tr>
<tr>
<td>ISCC (importers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing business (importers)</td>
<td>1.663</td>
<td>1.416</td>
<td></td>
<td>9.06</td>
<td></td>
</tr>
</tbody>
</table>

Note: The table presents the estimated coefficients shown in tables 5 and 6 of online appendix C. Only the policy coefficients that are statistically significant at the 1% to 5% level are presented in the table. The coefficients with unexpected results are denoted by “x”. The models are controlled for conditions at the border and behind-the-border that may affect GVC-related export capacity. Fixed effects are also controlled at the country, year and sector levels.
(c) Upper-middle income economies

“Investing in technologies and enhancing market integration to facilitate upgrading process within a value chain.”

Upper-middle income economies appear to be already well-connected in the GVC web. Their positions in GVCs appear to be in transition. A priority for them is how to diversify their GVC participation into the higher value-added activities. The high value-added manufacturing sectors, by nature, are technologically intensive. This implies that upgrading vertically along the value chains to higher value-addition segments may, in turn, have some adverse effects on employment. To mitigate issues with potential rise in unemployment, some initiatives could simultaneously be undertaken to expand and diversify production horizontally into new products.

The empirical finding appears to suggest that upper-middle income economies need a different set of policies to support their GVC participation. Policy actions that would apparently help the export capacity of low- and lower-middle income economies in fact turn out to have the opposite impact on the export capacity of upper-middle income economies (table 7.5). Supporting GVC participation by upper-middle income Asia-Pacific exporters may require a set of policies that has not been included in the model. For example, the policy priorities may need to focus on facilitating production transformation towards a higher stage of value addition in value chains. A priority might be policies related to skills upgrading, technology transfer and innovation (see chapter 9), and outward FDI to maintain or enhance their export capacity (box 7.1). However, the evidence remains strong for the importance of ICT connectivity. This may reflect the fact that once developing countries reach the upper-middle-income stage, their GVC participation also moves towards higher value-added activities. Their GVC participation becomes more communication-intensive in order to respond quickly to changes in demand (just-in-time delivery) or to the need to adapt quickly to new designs or new production technology. Moreover, an RTA coefficient suggests that having a formal trade agreement could increase their chance to export to high-income countries.

**Table 7.5. Estimated coefficients of policy variables from the gravity models of GVC-related exports, by upper-middle income Asia-Pacific exporter**

<table>
<thead>
<tr>
<th>Policy variables</th>
<th>Final (intraregional)</th>
<th>Intermediate (intraregional)</th>
<th>Final</th>
<th>Intermediate</th>
<th>Policy variables</th>
<th>Final (intraregional)</th>
<th>Intermediate (intraregional)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Non-high</td>
<td>High</td>
<td>Non-high</td>
<td>High</td>
<td>Non-high</td>
<td>High</td>
</tr>
<tr>
<td>Tariffs (exporters)</td>
<td></td>
<td></td>
<td>-1.358</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tariffs (importers)</td>
<td></td>
<td></td>
<td>-2.509</td>
<td>-3.913</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>RTA</td>
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<td></td>
<td>0.386</td>
<td></td>
<td>0.663</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NTMs (exporters)</td>
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<td>-0.005</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>NTMs (importers)</td>
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<td></td>
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<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
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<td>Doing business (exporters)</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Internet (importers)</td>
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<tr>
<td>Doing business (importers)</td>
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<td></td>
<td>5.217</td>
<td></td>
<td>x</td>
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<td></td>
</tr>
</tbody>
</table>

Note: The table presents the estimated coefficients shown in tables 7 and 8 of online appendix C. Only the policy coefficients that are statistically significant at the 1% to 5% level are presented in the table. The coefficients with unexpected results are denoted by “x”. The models are controlled for conditions at the border and behind-the-border that may affect GVC-related export capacity. Fixed effects are also controlled at country, year and sector levels.
The rapid expansion of GVCs has been driven by technological progress and trade policy reforms that allowed multinational corporations to geographically disperse their stages of production across national borders. This phenomenon has created a finer division of labour between countries – at the level of specialization in tasks, rather than in products – both within the same region and across regions.

The experience of many Asia-Pacific countries appears to show that the emergence of GVCs offers a richer menu of options for diversification, industrialization, growth and development. However, the development of GVCs in Asia and the Pacific is centred on countries in North-East Asia and South-East Asia. In addition, integration into GVCs could open the door to industrialization and economic development, but it does not ensure long-term and sustainable economic development. Although it appears that participation in GVCs tends to be relatively successful in industrialization and in achieving high economic growth, for an economy to reap the long-term benefits from GVC participation, it is important to move towards higher value-added production activities and sectors supported by an enabling policy environment.

Policy formulation in response to the dynamics of interconnections in the global economy requires a comprehensive framework and long-term vision. The dynamic nature of GVCs implies that the specialization and comparative strengths of economies will continue to evolve, which will require further adjustment at the regional and national levels. For example, in recent years, the increasing global shift in demand for final products to developing Asia and the Pacific may lead to the deeper integration of the region in GVCs. In addition, the possibility for economies in the region to benefit from technological spillovers from high-value-added activities may increase because it is possible that research and designs as well as management may move to the region that is the major driver of final demand.

More fundamentally, policymakers will continue to be challenged by the global nature and operation of value chains. Informed policies related to GVCs will require the availability of good data and analyses. This chapter looks into the determinants of GVC-related exports for economies at different levels of GVC development. It informs policymakers about what is required on the national and the regional policy front in order to improve participation by firms and countries in GVCs, including:

(a) Trade cost reduction, which is essential for more effective participation in GVCs and for overcoming geographical disadvantages. Given the same level of production cost, trade costs are the key determinant of an economy’s GVC performance. Trade cost reduction policies include liberalization of trade in goods, services and investment;

(b) Trade facilitation, the development of ICT infrastructure, improved logistics performance, regulatory transparency and other policies that reduce broader behind-the-border obstacles to trade;

(c) Regional economic integration agreements, which could be a catalyst for enhancing GVC participation by developing Asia-Pacific economies, provided the agreements are deep in commitments as well as broad in scope and coverage. However, bilateral and regional integration agreements will have little effect without the implementation of necessary domestic trade reforms and, in particular, trade facilitation;

(d) Enabling GVC development, which will increasingly require more international cooperation and coordination among Governments. The need to harmonize domestic rules and regulations with international standards is particularly strong in Asia and the Pacific, as burdens from domestic rules and regulations could be amplified and damage the region-wide competitiveness in GVCs;

(e) The need to increase the involvement of low-income economies in GVCs. The dynamic nature of GVCs may offer new opportunities for economies that have thus far not been integrated into GVCs. The key to unlocking the potential of low-income economies is infrastructure development, especially where related to trade facilitation;

(f) Attention by Governments to removing behind-the-border obstacles after countries have become significantly integrated into GVCs. Domestic policy and regulatory reforms to facilitate trade and business operation would attract FDI and enable those countries to remain competitive in the face of intense competition in GVCs; and

(g) Investment in technologies in order to improve productivity and migration to other GVC segments with higher value addition. Due to cost increases, economies that have gone through the industrialization process will be under pressure to upgrade GVC participation to higher-value-added activities. A smooth transition from labour-intensive to skills-intensive segments of GVCs needs an enabling policy to facilitate the adjustment process through a well-designed labour market and social policies as well as through investment in education and skills. In addition,
economic integration policies could also help to strengthen the flexibility of economies and the labour force in the changing environment.

ENDNOTES

1 Although the term GVC has been widely used since the 2000s, the concept is not actually new. The term “Commodity Chain” was used in a quite similar context since the late 1970s (OECD, 2012). For example, Gereffi (1994) used the term “Global Commodity Chain” to describe the apparel commodity chain starting from raw materials such as cotton, wool, and fibres to the final product which is garments. In the 2000s, there was a terminology shift from the global commodity chain to the global value chain. The latter term was influenced by Porter’s study (1985) on the governance of value-added chains. Recently, the term “network” is often used instead of “chain”. A reason is to highlight the complexity of the interactions among global producers which is more complicated than a simple circuit or a linear flow (Coe, Dicken and Hess, 2007).

2 A much broader concept of GVCs that focuses on the “governance” nature of the supplier-buyer nexus is also mentioned in UNCTAD (2013). The definition subsumes intra-firm trade and intermediate trade as well as final goods bought for eventual sale by large retail establishments. In this view, GVCs might cover 70%-80% of world trade.

3 There are costs, too. Integration into GVCs on its own does not ensure long-term and sustainable development. The high economic growth could come with increasing income inequality and environmental degradation unless governments, enterprises, and other stakeholders reconcile their short-term and long-term development strategies and remain mindful of their respective roles and responsibilities with respect to social justice and sustainable development.

4 Since the late 1970s, the circular economy has attracted attention as a vibrant economic model to replace traditional linear production systems, such as the “take, make and dispose model”. It emphasizes the efficient use of resources and energy, the recycling of used goods and materials or waste and the sustainability of integrated product value chains, even across borders. A circular economy can potentially cover a wide range of global value chains and integrate all of them into a non-linear, or circular, production system in order to optimize the efficiency of resources and production used in the system rather than seeking efficiency of individual components or functions separately within the value chain (Braungart and McDonough, 2002).

5 The level of product fragmentation differs between products. Services, for example, are less prone to vertical specialisation because frequently the face-to-face contact between the provider and the consumer is required.

6 The debate on which terms are most appropriate is beyond the scope of this study.

7 OECD (2013a, p. 9) stated that “most trade today takes place within a production network (trade in intermediate goods and services represents 75% of global trade) or intra-firm.”

8 It is necessary to explain that ESCAP classifies countries by their development as described in UN DESA classification, meaning that only three countries in Asia and the Pacific belong to developed economies (Australia, Japan and New Zealand).


10 In the case of goods, trade costs include land transport and port costs, freight and insurance costs, tariffs and duties, costs associated with non-tariff measures, and can be extended to also include mark-ups from importers, wholesalers and retailers (OECD, 2013a). In the case of services, transport costs are largely replaced with communication costs (although services can also be provided by natural persons that have to travel to the country where the consumer is located) and trade barriers are non-tariff measures.

11 One way of thinking about these factors is as the “friction” associated with trade, or the set of economic forces that tends to reduce trade. Trade costs are the price equivalent of the reduction of international trade compared with the potential implied by domestic production and consumption in the origin and destination markets (Arvis and others, 2013).

12 Comparative-advantage theory suggests that interactions between factor-intensity of fragmenting tasks and factor-price differences between potential trade-partner countries will determine the division of labour between the countries participating in GVCs. Empirically, Kimura (2006) reveals a fact about GVCs in East Asia that wage differential plays a crucial role for multinational firms when taking location decisions. Meanwhile, Athukorala (2008) indicates that significant differences in wages among the countries within the East and South-East Asian regions have provided the basis for rapid expansion of intraregional product-sharing systems, giving rise to increased cross-border trade in parts and components.

13 The emergence of international production networks of automotive sector in ASEAN countries after the consolidation of Japanese operations in the ASEAN automotive sector in the early 2000s was an illustrative example of the combination
between lowering trade costs arising from regional trade liberalization programmes and the MNCs’ attempts to seek for cost-efficiency through scale economies (Anukoonwattaka, 2007).

14 Based on experiences of ASEAN and China, Athukorala (2008) indicated that site selection decisions by MNCs operating in assembly activities were strongly influenced by the presence of other key market players in a given country or in neighbouring countries. Moreover, the industrial relocation does not empty out the first location/nation but rather slows the growth of new manufacturing activity. As the second location’s wages are driven up, a third location/nation emerges for offshoring. This is, in essence, the geographical dimension of the “flying geese” pattern whereby one East Asian nation after the other benefits from a cluster of industrial activity (Baldwin, 2013).

15 Baldwin (2011) 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, 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, Baldwin (2011) advised economies to learn from experiences of those that have industrialized through GVCs, such as Thailand from the late 1980s, rather than from the early model of industrialization that involve building whole supply chain within one economy.

16 This study combines the classification of Sturgeon and Memedovic (2010) and the Broad Economic Categories (BEC) Classification of the United Nations to examine GVC-related trade in final- and intermediate- products of the agro-food, apparel and footwear, automotive, and electronics sectors using trade data available in the United Nations Comtrade database. Sturgeon and Memedovic (2010) approach allows a distinction between GVC-related products and general products on the basis of product differentiation. They adopt a concept of product differentiation which does not only focus on the differentiation of final products but also include customized intermediate inputs which tend to be utilized in the production of differentiated final products.

17 The findings seem to be consistent with that of Milberg and Winkler (2010). They observe that the share of trade among developing countries jumped to 50% of world intermediate goods trade in 2009 compared to about 25% in 2000.

18 It is based on data from the May 2013 version of OECD-WTO TiVA database. It covers 18 industries classified under 1 digit-ISIC Rev.3, which comprises 11 industrial sectors (agriculture, mining, food products, textiles and apparel, wood and paper, chemicals and minerals, basic metals, machinery, electrical equipment, transport equipment, other manufactures and utilities) and 7 service sectors (construction, wholesale and retail, transport and telecoms, finance and insurance, business services and other services).

19 See Anukoonwattaka, Scagliusi and Mikic (2015).

20 Distribution, business-coordination, and logistics are among the most important service inputs for the production of Asia-Pacific industrial exports. These services account for 9% and 7.5%, respectively, of industrial exports by Asia-Pacific region in 2009 (Anukoonwattaka and others, 2015). It is found that the shares of business services are particularly high in the exports of electrical equipment, machinery, and transport equipment. These industries are mentioned as the sectors involve intensively with the global operation of MNCs.

21 An important feature of Baldwin and Taglioni (2011) framework is allowing trade flows to be driven not only by final demand but also intermediate demand. Following from this feature, the drivers of intermediate trade flows would be, in addition to factors affecting consumer income, factors affecting the production cost of the whole value chains.

22 The World Bank’s income groups are based on Gross National Income per capita which certainly has some limitations in representing the development level of a country. However, grouping countries by income levels provide better information about country’s development status compared to other types of country grouping.

23 Based on the framework of Baldwin and Taglioni (2011), the feature of GVC-related trade is controlled through the adjusted “mass” variable in the gravity model. This adjusted “mass” variable is defined as:

\[
\text{mass}_{ij} = \epsilon_{it} E_{jt} / \omega_{it} P_{jt}
\]

where

\[
\epsilon_{it} = VA_{it}^{mfg} + \sum_{j \neq o} m_{ijt}^{itm}
\]

\[
E_{jt} = GDP_{jt} + \sum_{i \neq o} m_{ijt}^{itm}
\]

\[
\omega_{it} = \sum GDP_{it} \times (\text{dist}_{ij})^{1-\sigma} \times \frac{1}{1-\sigma}
\]

where \(\sigma = 4\)

\[
P_{jt} = \text{GDP deflator of destination j at time t}
\]

24 The study does not include mining and petroleum sectors which have peculiar characteristics.

25 The product lists set out by Sturgeon and Memedovic (2010) is based on information from industrial survey related to differentiation and customization of products to identify GVC-related products under the Broader Economic Category (BEC) and Standard Industry and Trade
Classification (SITC) Revision 3.

Consistent with this analysis is Debaere and Mostashari (2010) that find tariff reductions in the exporting countries give the way to new goods being exported to the United States between 1989 and 1999. In addition, OECD (2013b) indicate the larger the share of imported inputs and the longer supply chains, the higher tariff costs embedded in the gross exports. This is because goods cross borders many times in GVCs, as inputs and then as final products, and tariffs are levied on the gross value, not just the value-added, of these goods every time they cross a border. Therefore, the longer the value chains, the more times the goods would cross borders and the magnifier of tariff embedded in the final value.

Estimated coefficients on Internet users in exporting and importing countries are positive and significant at 1% to 5%.

REFERENCES


ASIA-PACIFIC TRADE AND INVESTMENT REPORT 2015


ONLINE DATABASES


Annex A

Outward FDI; trade cost and India’s participation in GVCs: The gravity estimation

An empirical analysis was carried out using the “gold standard” gravity equation in the following form:

\[ PC_{jt} = g(\pi_t + \chi_{jt} + \mu_j + \eta_1 TC_{jt} + \eta_2 OFDI_{jt} + \eta_3 X_{jt}) + \varepsilon_{jt} \]

Where \( PC_{jt} \) stands for India’s exports of parts and components to country \( j \) at time \( t \). \( TC_{jt} \) is bilateral trade cost; \( OFDI_{jt} \) is India’s outward FDI in the export-destination country \( j \); and \( X_{jt} \) stands for additional control variable. The subscript for exporter \( (i) \) is suppressed as the analysis pertains to exports from one country (India).

The estimation was done using (a) within-transformed (linear) fixed effects; and (b) fixed effects Poisson (Quasi-ML) regression to account for zero trade values. In addition, as the adjustment of trade flows to policy changes may not be instantaneous (Trefler; 2004; Olivero and Yotov; 2012); the regression uses 2009 and 2012 data (with a three-year interval).

**Data sources**

Exports of parts and components were sourced from United Nations Comtrade. Following Athukorala (2010); the values of total exports of parts and components at the country level are obtained by aggregating the exports of the 5-digit SITC Rev. 3 commodities (list of parts and components available on request). The trade costs data are from the ESCAP-World Bank Trade Cost Database; outward FDI from Reserve Bank of India (i.e.; compiled by aggregating the firm-level data); and inward FDI from the Ministry of Commerce and Industry of India.

**Variable description**

\( lpc = \) Natural log of parts and components exports of India to partner country \( j \)
\( pc = \) Parts and components exports of India to partner country \( j \)
\( tc = \) Trade cost in manufacturing sector
\( eq = \) Manufacturing outward FDI by India through equity mode in destination country \( j \)
\( eq\_loan = \) Manufacturing outward FDI by India (equity plus loan mode) in destination country \( j \)
\( total = \) Manufacturing outward FDI by India (equity; loan and guarantee mode) in destination country \( j \)
\( ifdi = \) Inward FDI in India received from partner country \( j \)
## Baseline results

<table>
<thead>
<tr>
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<th>Within-transformed fixed effects</th>
<th>Fixed effects Poisson (Quasi ML)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>lpc</td>
<td>lpc</td>
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<tr>
<td>tc</td>
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<tr>
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Note: Robust standard error in the parentheses. Coefficients of time (πt) and partner dummies (μj) are not reported. However, the regression could not be run with partner-time (πj) dummies using this dataset. Log values of the dependent variable in the within-transformed model are generated after adding one to parts and components exports; i.e., to overcome zero trade values. Results are similar with zero trade values. ***<0.01; **<0.05; *<0.10.

Economies covered: Australia; Austria; Belgium; Benin; Botswana; Brazil; Chile; China; Colombia; Cyprus; Czech Republic; Denmark; Dominican Republic; Egypt; Ethiopia; Finland; France; Gabon; Georgia; Germany; Hong Kong, China; Indonesia; Islamic Republic of Iran; Ireland; Israel; Italy; Japan; Jordan; Kazakhstan; Kenya; Republic of Korea; Kyrgyzstan; Luxembourg; Malaysia; Mauritius; Mexico; Morocco; Nepal; New Zealand; Nigeria; Oman; Panama; Peru; Philippines; Qatar; Romania; Russian Federation; Rwanda; Senegal; Singapore; South Africa; Spain; Sri Lanka; Switzerland; Syria; Tanzania; Thailand; Turkey; Ukraine; United Kingdom; United States; Uzbekistan; Viet Nam; and Yemen
Robustness check: control for inward FDI

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<td>Log likelihood</td>
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Note: Robust standard error in the parentheses. Coefficients of time (πt) and partner dummies (μj) are not reported. However, the regression could not be run with partner-time (χjt) dummies using this dataset. Log values of the dependent variable in the within-transformed model are generated after adding one to parts and components exports; i.e., to overcome zero trade values. Results are similar with zero trade values. ***<0.01; **<0.05; *<0.10.

Economies covered: Australia; Austria; Belgium; Botswana; Brazil; Chile; China; Cyprus; Czech Republic; Denmark; Egypt; Finland; France; Germany; Hong Kong, China; Indonesia; Ireland; Israel; Italy; Japan; Kazakhstan; Kenya; Republic of Korea; Luxembourg; Malaysia; Mauritius; Mexico; Morocco; Nepal; New Zealand; Nigeria; Oman; Panama; Philippines; Qatar; Russian Federation; Singapore; South Africa; Spain; Sri Lanka; Switzerland; Tanzania; Thailand; Turkey; Ukraine; United Kingdom; United States; and Yemen.
The gravity models for GVC-related exports by Asia-Pacific economies

Determinants of GVC-related exports by Asia-Pacific economies within and outside the region are systematically investigated in this study based on the framework suggested by Baldwin and Taglioni (2011). The focus of the study was finding effective policy strategies to strengthen the position of Asia-Pacific economies in GVC networks.

The study applies the Baldwin and Taglioni (2011) framework to developing augmented gravity models to understanding the policy impacts on GVC-related exports of final and intermediate products based on the experience of Asia-Pacific economies from 1995 to 2013.

A major distinction of the Baldwin and Taglioni (2011) gravity model from the standard benchmark is in the “mass” variable. Standard theoretical gravity is derived based on Anderson and Van Wincoop’s (2003) consumer expenditure problem. As the GDP of home and destination economies are good proxies of mass variables for the gravity model of final traded goods, mass in Anderson and Van Wincoop (2003) is:

$$mass_{ijt} = \frac{GDP_{it}GDP_{jt}}{\omega_{it}P_{jt}}$$

However, in the presence of a global production network where intermediate goods are crucial factors in trade flows, GDP might not be a good proxy as it cannot be a good representation of true consumer and producer demand shifter. The study follows Baldwin and Taglioni (2011), who suggested the alternative mass that has been adjusted for consumer demand and demand for intermediate input as follows:

$$mass_{ij} = \frac{C_{it}E_{jt}}{\omega_{it}P_{jt}}$$

$$C_{it} = VA_{it}^{mg} + \sum_{j\neq o} m_{ijt}^{itm}$$

$$E_{jt} = GDP_{jt} + \sum_{i\neq o} m_{jit}^{itm}$$

$$\omega_{it} = (\sum GDP_{jt} \times (dist_{ij})^{1-\sigma})^{1-\sigma}$$

where $\sigma = 4$

$P_{jt}$ = GDP deflator of destination $j$ at time $t$

**Specification of the gravity models**

In order to avoid multicollinearity in policy variables, and between policy variables and fixed effects, the gravity model of GVC-related exports is divided into two parts: (a) a gravity model with only trade-policy variables; and (b) a gravity model with, not only trade policy variables but also trade facilitation and behind-the-border factors.

For the model with only trade policy factors, most of trade policy choices are imposed by a particular economy at a specific time to specific partners. Therefore, exporter-time, importer-time and sector-time fixed effects are applied. The baseline specification is:

$$X_{ijkt}^l = \beta_0 + \beta_1 mass_{ijt} + \beta_2 T_{ijkt}^l + \beta_3 T_{jikt}^l + \beta_4 RTA_{ijt} + \beta_5 G_{ij} + \delta_{it} + \delta_{jt} + \delta_{kt} + \varepsilon_{ijkt}^l.$$
For trade facilitation and behind-the-border conditions, data are country-time specific. The model then includes fixed effects separately by reporter, partner, time and sector:

\[ X_{ijkt} = \beta_0 + \beta_1 \text{mass}_{ijt} + \beta_2 T_{ijkt}^I + \beta_3 T_{jikt}^I + \beta_4 \text{RTA}_{ijt} + \beta_5 G_{ij} + \beta_6 F_{it} + \beta_7 F_{jt} + \delta_i + \delta_j + \delta_k + \varepsilon_{ijkt} \]

where

- \( X_{ijkt} \) is the bilateral exports of product \( l \) in sector \( k \) from country \( i \) to country \( j \) in year \( t \).
- \( \text{mass}_{ijt} \) is the economic mass measured under the method suggested by Baldwin and Taglioni (2011).
- \( X_{ijkt}^I \) is a vector of product-variant trade-policy variables imposed by country \( i \) faced by country \( j \) related to trade in product \( l \) of sector \( k \) at time \( t \). The set of policy variables include applied MFN tariffs and non-tariff measures.
- \( X_{ijkt}^I \) is a vector of the same set of policies faced by country \( i \) when exporting product \( l \) to country \( j \) at period \( t \).
- \( \text{RTA}_{ijt} \) is a dummy variable capturing the RTA relationship between country \( i \) and country \( j \) at time \( t \).
- \( F_{it} \) and \( F_{jt} \) are the vectors of behind-the-border indicators at time \( t \) of country \( i \) and country \( j \), respectively. The vectors include indices measuring behind-the-border conditions of a country such as availability of ICT (proxied by Internet users per 100 people), port and logistics conditions (based on ISCC) and behind-the-border conditions that reflect business environment (Doing Business – distance to frontier), are country-time specific variables.
- \( G_{ij} \) is a vector includes time-invariant controlled variables as per standard gravity model, i.e., distance, contingency, and common official language.
- \( \delta_i, \delta_j, \) and \( \delta_k \) included in the model to capture unobserved time-invariant fixed effects by country and sector levels. By adding \( t \) to the subscript, the variables become time-variant fixed effects.
## Data source, variable description and expected signs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit</th>
<th>Expected signs</th>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln_xij</td>
<td>US dollar</td>
<td></td>
<td>WITS</td>
<td>Export of country (i) to destination (j), through import flows(^1)</td>
</tr>
<tr>
<td>mass</td>
<td>-</td>
<td>+</td>
<td>Author’s calculation based on WB-WDI</td>
<td>See Baldwin and Taglioni, 2011</td>
</tr>
<tr>
<td>dist</td>
<td>Kilometer</td>
<td>-</td>
<td>CEPII</td>
<td>Distance between source country (i) and host country (j)</td>
</tr>
<tr>
<td>contig</td>
<td>-</td>
<td>+</td>
<td>CEPII</td>
<td>Dummy variable indicating 1 if 2 countries share common border, 0 otherwise</td>
</tr>
<tr>
<td>comlang_off</td>
<td>-</td>
<td>+</td>
<td>CEPII</td>
<td>Dummy variable indicating 1 if 2 countries share common official language, 0 otherwise</td>
</tr>
<tr>
<td>tariff_ij</td>
<td>1+percent</td>
<td>-</td>
<td>TRAINS through WITS download platform</td>
<td>Simple average tariff of country (i) charging on importation from country (j)</td>
</tr>
<tr>
<td>tariff_ji</td>
<td>1+percent</td>
<td>-</td>
<td>TRAINS through WITS download platform</td>
<td>Simple average tariff of country (j) charging on importation from country (i)</td>
</tr>
<tr>
<td>NTM_num_ij</td>
<td>Number</td>
<td>-</td>
<td>Author’s calculation based on WTO-ITIP</td>
<td>Number of NTM measures that country (i) imposes on country (j)</td>
</tr>
<tr>
<td>NTM_num_ji</td>
<td>Number</td>
<td>-</td>
<td>Author’s calculation based on WTO-ITIP</td>
<td>Number of NTM measures that country (j) imposes on country (i)</td>
</tr>
<tr>
<td>RTA</td>
<td>-</td>
<td>+</td>
<td>de Sousa (2012)</td>
<td>Dummy variable indicating 1 if 2 countries have RTA, 0 otherwise</td>
</tr>
<tr>
<td>d2f_xtab_i</td>
<td>Score (0-100)</td>
<td>+</td>
<td>Doing Business</td>
<td>Ease of doing business index: distance to frontier (excluding electricity) of country (i)</td>
</tr>
<tr>
<td>d2f_xtab_j</td>
<td>Score (0-100)</td>
<td>+</td>
<td>Doing Business</td>
<td>Ease of doing business index: distance to frontier (excluding electricity) of country (j)</td>
</tr>
<tr>
<td>iscc_i</td>
<td>Index</td>
<td>+</td>
<td>UNCTAD</td>
<td>Liner shipping connectivity index of country (i)</td>
</tr>
<tr>
<td>iscc_j</td>
<td>Index</td>
<td>+</td>
<td>UNCTAD</td>
<td>Liner shipping connectivity index of country (i/j)</td>
</tr>
<tr>
<td>intusers_i</td>
<td>Users/100 people</td>
<td>+</td>
<td>WB-WDI</td>
<td>internet users per 100 people of country (j)</td>
</tr>
<tr>
<td>intusers_j</td>
<td>Users/100 people</td>
<td>+</td>
<td>WB-WDI</td>
<td>internet users per 100 people of country (j)</td>
</tr>
</tbody>
</table>

\(^1\) The study uses import flows of, for example, Thailand from the Republic of Korea to represent exports of the Republic of Korea to Thailand. This method solves the missing data problem, especially in small least developed economies.

**Empirical results are available from online Appendix C.**