

The digital economy, GVCs and SMEs

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ABSTRACT

Although small and medium-sized enterprises (SMEs) represent the vast majority of firms worldwide, their participation in international trade remains limited relative to their share of overall economic activity and employment as compared to large firms. The rise of the digital economy could, however, open a range of new opportunities for small firms to play a more active role in global value chains (GVCs). This chapter reviews evidence of SME participation in international trade and production networks and looks at how the digitalization of our economies is already affecting, or could affect future, SME contributions to GVCs. New research by Lanz *et al.* (2018) finds evidence that digitally-connected SMEs in developing countries tend to import a higher share of their inputs than non-digitally-connected firms. Additionally, it is shown

that this positive digital effect is greater for SMEs than it is for large firms. The chapter reviews the various opportunities that the digital economy opens for SMEs, especially in terms of cost reductions and the emergence of new business models, but also discusses policy measures that could be taken to promote SME participation in GVCs. Indeed, significant challenges remain for SMEs to enter GVCs, some of which are exacerbated by the new digital economy. A holistic approach that combines investment in ICT infrastructure and human capital with trade policy measures and measures to improve the business environment, access to finance and logistics, and promote innovation and R&D is necessary. Improving the availability of data would also help to better understand and integrate SMEs in GVCs.

- Although small and medium-sized enterprises (SMEs) represent the vast majority of firms worldwide, their participation in international trade remains limited relative to their share of overall economic activity and employment as compared to large firms.
- The rise of the digital economy could, however, open a range of new opportunities for small firms to play a more active role in global value chains (GVCs).
- New research finds that when a manufacturing SME has a website, this facilitates its participation in GVCs and trade. In particular, such SMEs are more likely to use foreign inputs for production and export their output. Further, information and communication technology (ICT) connectivity is found to be more important for small firms than for large ones in whether or not a firm participates in trade.
- However, SMEs continue to face important challenges when integrating into GVCs. A holistic approach that combines investment in ICT infrastructure and human capital with trade policy measures and with measures to improve the business environment and access to finance and logistics, and promote innovation and R&D, is necessary.
- Improving the availability of data would also help to better understand and integrate SMEs in GVCs.

1. Introduction

Global value chains (GVCs) are often considered the lead story of trade in the modern world, with an estimated 80 per cent of global trade taking place through them (UNCTAD, 2013). At the same time, a growing understanding of the importance of small and medium-sized enterprises (SMEs) to the global economy, and their roles within the digital economy, has been emerging. However, SMEs have been shown to participate less in international trade, including GVC trade, than large businesses despite being the largest firm segment by numbers in the world. Given the substantial changes that the internet and digital technologies that leverage the internet to store and process data (sometimes referred to as Industry 4.0) have made or are making to the global economy, the following questions arise: how has the digital economy changed the landscape for SMEs? What are the new opportunities and challenges they face when it comes to participating in GVCs in the digital era? And what policy changes could be made to support these firms?

SMEs are estimated to account for between 80-99 per cent of firms in any given country as well as between 60-70 per cent of global employment (WTO, 2016; IFC, 2013). They also have a higher rate of sales growth than large firms (Cusolito *et al.*, 2016). This implies a substantial share of any nation's economy is supported by SMEs. However, a more precise estimate of SMEs' contribution to GDP is hampered by the lack of a standard definition for what, exactly, constitutes an SME. Definitions for small firms range from those solely based on number of employees and revenue generated (the European Union defines SMEs as firms with up to 250 employees and turnover of no more than 50 million euros), to one dependent on the industry of operation (in China, SMEs can include firms of up to 3,000 employees and total revenues up to 300 million yen, depending on the industry).¹ These differences in definition make certain comparisons more challenging and must be considered when drawing conclusions.

Regardless of the nebulous way SMEs are defined, they are not well represented in international trade and GVCs (WTO, 2016). This is in spite of the fact that the international fragmentation of production would seem to have increased the opportunities for SMEs, given that production is broken into smaller, more specialized pieces. Yet SMEs face a number of size-related constraints, from limitations related to quantity of production, to in-house administrative resources, that prevent many of them from achieving the full potential of GVC participation (Cusolito *et al.*, 2016).

Given the positive effects GVCs have been shown to bring, it is worth considering how to include more small firms in global production networks. For example, participation in GVCs is associated with increased productivity, the export of more sophisticated (and frequently higher value) products, and a more diversified national export basket. Additionally, GVCs have been demonstrated to be a pathway for economic development for countries (Kowalski *et al.*, 2015).

The internet and digital technologies that leverage the internet to collect, store and process data, such as artificial intelligence (AI), the Internet of Things (IOT) and blockchain, open new opportunities for SMEs, not only for market entry, but also for participation in GVCs and international trade (WTO, 2018). This is particularly true in the services sector where SMEs are most likely to engage in trade (ABAC, 2018).

Given the pervasiveness of SMEs throughout the global economy, the substantial role of GVCs for international trade and the changes ICT is bringing through the new digital economy, further consideration ought to be given to how digital technology could be altering SME GVC participation. Firms of all sizes inherently seek to maximize profits, be it through the use of digital technology or sales via international exports. Given the potential for digital technology to reduce fixed trade costs, it is important to understand how technological change affects SME decision-making with regards to both imports and exports. This chapter explores SME participation, and lack thereof, in international trade, including GVCs; discusses how digital technologies can help SMEs integrate into GVCs; considers the various constraints that restrict SMEs' ability to embrace new technologies and participate in global production networks; investigates how the digital economy has re-shaped international trade for SMEs as well as its potential effects on SMEs in GVCs; and lastly looks into ways the policy environment could be changed to better support SME access to GVCs in the context of the digital economy.

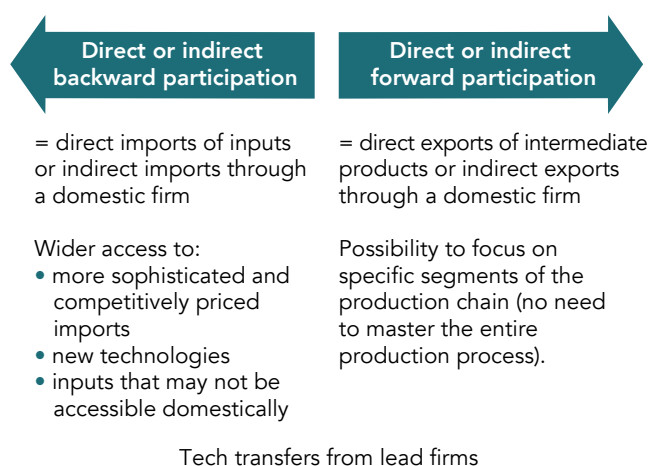
2. SME participation in international trade and GVCs

In theory, global value chains open new prospects for SMEs to participate in international trade. The international fragmentation of production increases the opportunities for SMEs to specialize in niche markets and narrow activities at various stages of the production chain. Nevertheless, in spite of the key economic role played by SMEs in terms of economic output, participation of SMEs in global value chains remains low compared to that of large firms.

2.1 SMEs, international trade and GVCs: direct vs. indirect participation

SMEs can join global value chains by exporting intermediate goods or services directly (direct forward participation) or by supplying inputs to a local firm or multinational company – indirect exports (indirect forward participation). These forms of integration into GVCs are not necessarily exclusive. Some SMEs export both directly and indirectly, highlighting the potential complementarity of these foreign market entry modes (Nguyen *et al.*, 2012). SMEs can also participate in GVCs by importing products as inputs into their own production processes (direct backward participation) or sourcing products from local firms that use imported inputs (see Figure 6.1).² Forward linkages represent the seller's perspective, or supply side, while backward linkages represent the buyer's perspective, or sourcing side, of GVCs.

FIGURE 6.1 How SMEs can benefit from GVCs



Source: Adapted from López González (2017).

The extent to which SMEs participate in GVCs is, however, difficult to assess thoroughly. The availability of international trade data by enterprise size remains limited, making analysis rather difficult and often partial. Most studies rely on a mix of enterprise surveys, case studies, and administrative data, with all the compromises that such approaches entail in terms of incomplete country coverage, different time series, inconsistent definitions

of SMEs, etc. In addition, while GVC trade is usually understood as trade in intermediates, available data sets do not necessarily distinguish between direct exports of final products and direct exports of intermediates. An analysis of data on gross direct exports can, however, provide some indication of SME forward participation in global value chains as such exports, which cover both final and intermediate products, necessarily represent an upper bound.

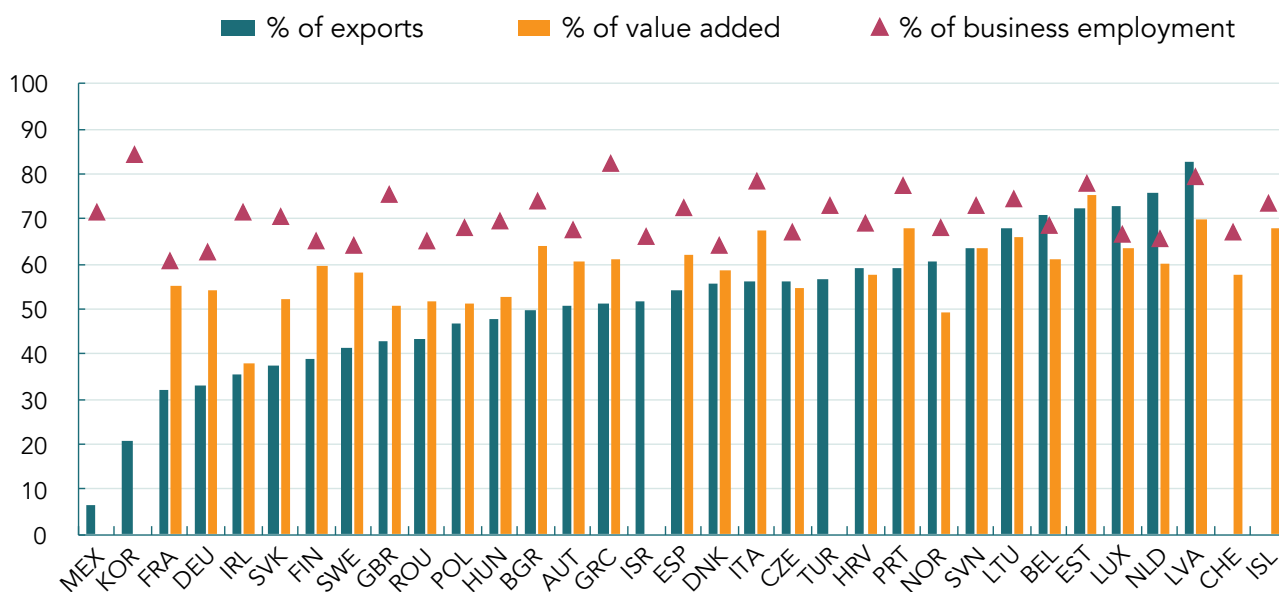
Keeping these limitations in mind, firm-level evidence reveals that despite SMEs making up the vast majority of firms in both developed and developing countries, SME direct and indirect participation in GVCs remains limited relative to their share of overall activity and employment compared to large firms.

Direct participation in GVCs: a “big firm story”?

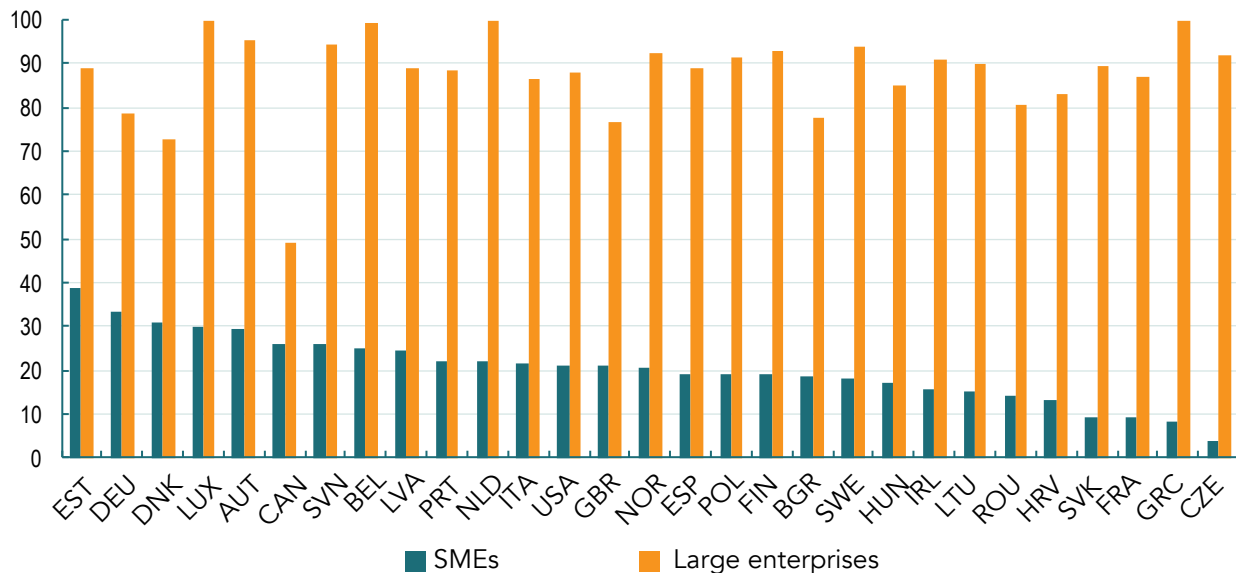
While in most OECD economies SMEs account for 99 per cent of all firms, around two-thirds of total employment and over half of business sector value-added, their contribution to overall exports is much lower than their economic weight in terms of value creation and employment, with only a handful of exceptions (OECD, 2018c) (see Figure 6.2). In countries such as France, Germany, Slovakia and Sweden, SMEs account for only 30 to 40 per cent of gross exports, well below their contribution to value creation and employment. Not only is SME participation in direct exports low compared to their economic weight, only a fraction of SMEs export at all. This is a distinct difference between large and small firms, given that the majority of large businesses are also international exporters. Evidence from OECD countries shows that only 5 to 40 per cent of SMEs export, while more

FIGURE 6.2 SME export activity, value added and employment shares (2015 or latest available year, as a percentage)

(Percentage)



Source: Figure 1.20 of OECD (2018c).

FIGURE 6.3 Industrial firms engaged in exports (2015 or latest available year, as a percentage of total firm size by size class)

Source: Figure 1.21 of OECD (2018c).

than 80 per cent of large firms do (see Figure 6.3). Other studies confirm these numbers. Mayer and Ottaviano (2007) showed, for example, that 1, 5, and 10 per cent of companies account for no less than 40, 70, and 80 per cent, respectively, of Europe's aggregate exports. These numbers would tend to support the view that direct insertion into GVCs via exports is "a big firm story" (Cusolito et al., 2016).

However, these numbers hide considerable heterogeneity across firm size classes. The smaller the company, the less export-oriented it is (see Figure 6.4). Only a marginal number of micro companies export, while the participation of medium-sized companies in exports and imports approaches that of large businesses. Participation in exports remains, to a large extent, a big firm story in developed economies, except in some niche markets.³

The situation is not much different in developing economies, with rough estimates of SME contribution to GDP significantly larger than their relative contribution to international trade, and estimates of SME contribution to international trade being only a fraction of large firms' contribution. SMEs in developing countries are thought to provide about 45 per cent on average of a country's GDP (WTO, 2016), but SMEs' exports represent on average just 7.6 per cent of total manufacturing sales, compared to 14.1 per cent in the case of large manufacturing firms (WTO, 2016).⁴ Recent World Bank micro firm surveys in selected least developed countries (LDCs) confirm the low level of participation of micro firms (i.e., firms of less than five employees) in international trade. Micro firms engaged in exports represented only 6 per cent of surveyed firms in Congo in 2013, around 3 per cent in Ethiopia (2011 data), and less than one per cent in Myanmar (2014 data).

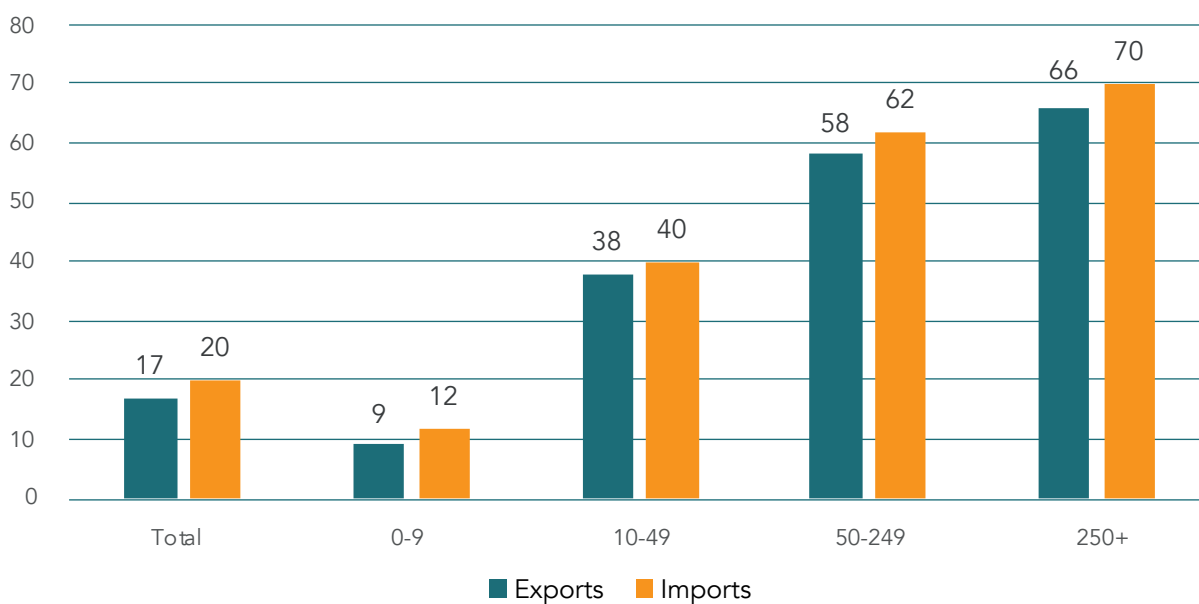
SMEs' contribution to GDP and exports also varies significantly across developing regions. Although SME contribution to GDP is estimated to be relatively high throughout the world,

ranging from an estimated 22 per cent in the Middle East to 70 per cent in some African countries (ITC, 2015a), SMEs' exports are significantly less. For example, SME exports account for 28 per cent of overall exports in developing Europe, 16 per cent in the Middle East, 8.7 per cent in developing Asia, and only 3 per cent in Africa. As in the case of developed economies, big firms account for the bulk of exports. Cebeci et al. (2012) find that the top 5 per cent of firms account, on average, for 80 per cent of exports in low-income countries.

However, while GVC direct participation would seem to be above all a big firm story when considering gross exports, studies that examine exports of intermediates seem to show a more nuanced picture. Evidence from Southeast Asia reveals, for example, that SME exports of intermediates in Thailand represent a bigger share of their overall exports than for large firms – 16 per cent of SME exports are sold to firms abroad for further processing, while only 6 per cent of large firms' exports are (López González, 2017). This finding reflects the opportunities that global value chains open for SMEs to integrate into the global economy by specializing in segments of production and supply of intermediates, rather than having to master the entire production process of finished products. Opportunities in this respect might be even bigger in the services sector. In Viet Nam, for example, the share of SME exports used by other countries to produce other exports increases from 5 per cent when only manufacturing is considered, to 26 per cent when service firms are included (López González, 2017). While these numbers cannot be generalized, they provide an interesting new perspective on SME GVC participation in Southeast Asia.

Another way for SMEs to benefit from GVCs is through imports of intermediate goods (backward participation), which matter for competitiveness (Lopez-Gonzalez, 2016 and 2017). It

FIGURE 6.4 Percentage of industrial firms that are exporting and importing by enterprise size (number of employees), 2013 or latest year



Source: WTO (2016).

has been shown that firms that use more imported products are more productive as they can draw on cheaper and more sophisticated inputs as well as benefit from innovation and new technologies embodied in imports (Bas and Strauss-Kahn, 2014 and 2015). According to WTO estimates, GVC participation by SMEs in the manufacturing sector in developing countries is mainly driven by upstream links (backward participation), with SMEs importing inputs needed in their manufacturing process from abroad (Lanz *et al.*, 2018; WTO, 2016). This is particularly true in countries where companies engage extensively in processing trade. Processing trade allows a firm to conduct intermediate stages of production and assembly on behalf of a foreign party. The firm receives the blueprints and imports all, or part of, the raw and auxiliary materials, parts and components, accessories, and packaging materials from abroad, and re-exports the finished products after processing or assembly. Engaging in processing trade requires less technological know-how and working capital needs – although it may require having certain automated processes in place to ensure quality control and supply reliability, which may or may not be borne by the foreign party. Evidence from China shows that processing trade allows less productive and financially constrained firms to participate in GVCs when they would not have been able to otherwise (Manova and Yu, 2016). Such firms tend to be SMEs.

Among the factors often put forward to explain why SMEs' direct participation in GVCs is lower compared to that of large firms is the fact that engaging in international markets can be costly. Lacking economies of scale, SMEs face higher fixed costs than larger companies and are disproportionately affected by costs associated with the import and export process (WTO,

2016). A simpler route for SMEs to engage in GVCs is often to start by exporting indirectly, through a local firm.

2.2 Indirect participation in GVCs

Smaller firms often participate in global value chains indirectly by supplying intermediates to other local firms – domestic or foreign-owned – that export (indirect forward participation). The enterprise then behaves like an “indirect exporter” by contributing to the production of goods and services exported by other domestic companies. Likewise, the fixed costs associated with direct importing may lead many SMEs to source inputs from local enterprises that use imported products (indirect backward participation). Evidence on indirect participation of SMEs in GVCs is scarce and difficult to collect due to lack of data on value-added at the firm level. Only a few studies have examined SME indirect participation in GVCs, either as suppliers (forward participation) or as importers of inputs (backward participation).

Studies that analyze the role of SMEs as suppliers reveal that focusing only on direct exports significantly underestimates the role played by SMEs in GVCs. In an often-quoted study, Slaughter (2013) showed, for example, that US multinational companies typically purchase more than US\$3 billion in inputs a year from more than 6,000 U.S. SMEs, which represents almost 25 per cent of the total inputs purchased by those firms. Other estimates from the US International Trade Commission (USITC) (2010) find that in 2007 the export share of US SMEs rose from 28 per cent (in gross exports) to more than 40 per cent (in value-added terms) when indirect exports were considered. Calculations using the TiVA database

developed by the OECD and the World Trade Organization show that including the contribution of upstream SME suppliers significantly increases the share of SMEs in total exports of domestic value added. In the Slovak Republic, for example, SMEs account for only 34 per cent of gross domestic exports, but for 56 per cent of the total value added in the country's exports when upstream suppliers are considered (OECD, 2018c) (see Figure 6.5).

Indirect exports of SMEs are particularly significant in sectors where GVCs play an important role and where scale matters, such as in the automobile and transport equipment manufacturing sector (OECD, 2018b; WTO, 2016), and for independent SMEs (i.e., those not owned by a larger domestic firm or foreign firm – OECD, 2018c). Evidence shows that SMEs tend to channel their indirect exports through large firms rather than through other SMEs (Cusolito *et al.*, 2016).

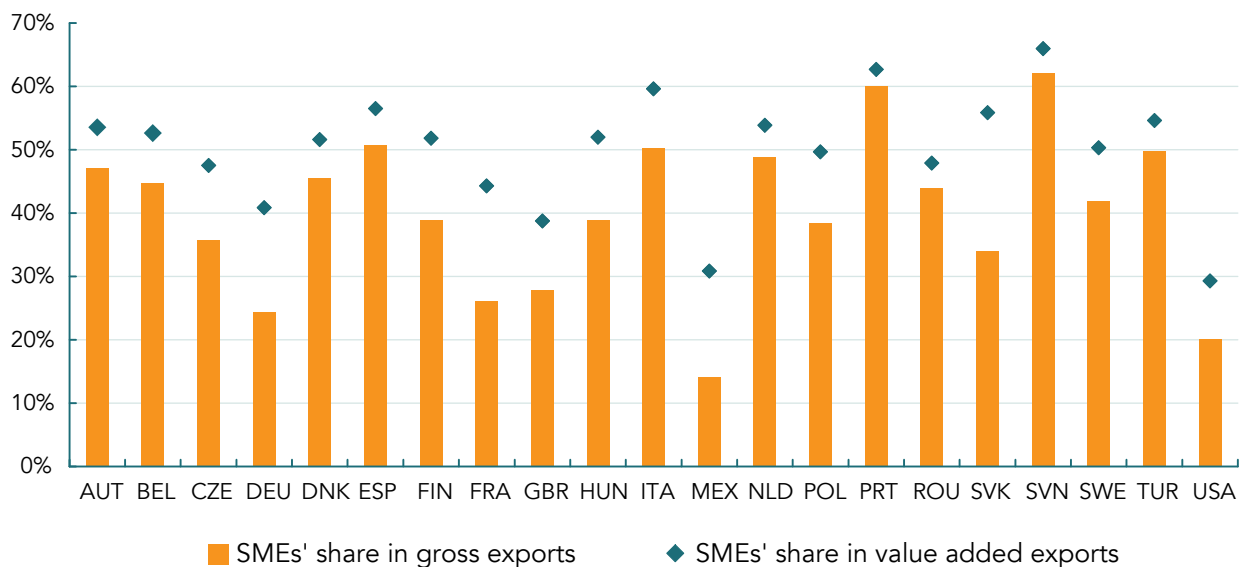
While evidence based on indirect exports shows a higher level of integration of SMEs in GVCs in OECD countries, indirect exports appear to play a lesser role in developing countries. Using data from World Bank Enterprise Surveys, the WTO estimated that indirect exports of manufacturing SMEs from developing countries were 2.4 per cent of total sales on average, or one-third the estimated share of direct exports. Such results, however, hide significant differences across regions, within regions, and at the product level. While SME indirect participation in exports is estimated at more than 9 per cent of total sales in developing Europe, it accounts for 2.4 per cent in the Middle East and only 1 per cent in Africa (WTO, 2016). At the country level, a recent study carried out in Chile reveals that three times as many SMEs engage in indirect exports compared

to direct exports (6.5 per cent vs 2.2 per cent). However, despite there being more SMEs that engage in indirect exports, overall SME participation in GVCs is small and they remain largely dominated by large companies. In the case of Chile, the gap is striking: more than 46 per cent of large companies engage in direct exports, while only 9 per cent of SMEs export, including both direct and indirect exports. The situation at the product level varies, however. Indeed, the share of indirect exports of SMEs in total sales outpaces that of large firms in some specific sectors, such as certain types of machinery, publishing and printing, and in paper and paper products manufacturing (WTO, 2016). Services SMEs were also found to participate more in indirect exports than direct exports. Overall, however, backward and forward GVC participation of SMEs in developing countries remains low (see Figure 6.6).

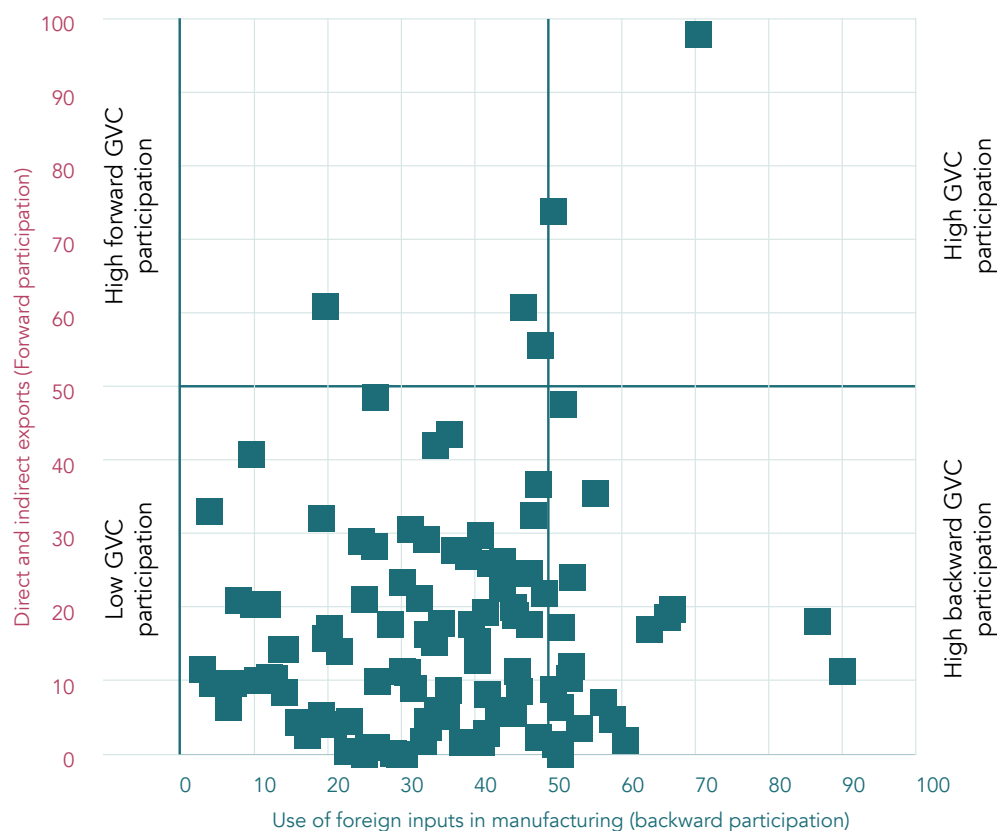
The role played by indirect forward participation of SMEs, especially in developed countries, would tend to suggest that indirect participation serves to a certain extent as a substitute for direct participation in GVCs. The question then arises as to whether such indirect participation benefits firms and impacts their performance in the same way as direct participation. Assessing the relative impact of direct versus indirect participation on firms' performance is an issue that requires further attention from researchers. Likewise, studies that distinguish between direct and indirect participation usually focus on exports. It would be equally interesting to examine SMEs' participation in GVCs through indirect backward participation. Indeed, like in the case of direct exports, the high fixed costs associated with direct imports may lead many SMEs to source inputs from local companies that use imported intermediates rather than to import directly.

FIGURE 6.5 Direct and indirect exporting activity of SMEs in OECD countries, 2014

As a percentage of gross export



Source: OECD (2018a).

FIGURE 6.6 SMEs in developing economies: backward and forward participation in GVCs

Note: Each square represents the average GVC participation of SMEs in a given developing country.

Source: WTO estimates based on World Bank Enterprise Surveys (Figure B.19 of WTO (2016)).

2.3 Constraints on SME participation in global value chains

Two key challenges persist in limiting SME GVC integration: the challenge of informality⁵ and the relative resource advantage that large firms have over SMEs.

Global value chains operate in the formal sector, but it is estimated that around 80 to 90 per cent of SMEs worldwide are informal (IFC, 2012). Informality is pervasive in the developing world. The majority of firms in many developing countries are informal (Andrade *et al.* 2015; Bruhn and McKenzie 2014; Cusolito *et al.* 2016). In Brazil, for example, nearly two-thirds of businesses, 40 per cent of GDP and 35 per cent of employees are informal (Ulyseay, 2015). Similarly, in Sri Lanka only one-fifth of firms operating without paid workers are registered and even among firms employing paid workers, more than half are unregistered with one or more pertinent agencies (de Mel, McKenzie, and Woodruff 2013). Overall, the ILO estimates that the informal economy comprises more than half of the global labor force (ILO website⁶), with most informal workers in developing countries being women.⁷ Informal firms tend to be much smaller than formal firms (La Porta and Shleifer, 2014). In fact, the large majority of informal firms – up to 90 per cent in Sri Lanka for example – are small, subsistence enterprises with no paid employees.

Various factors have been found to play a determining role in explaining the size of the informal sector, including the tax burden (e.g. Cebula, 1997; Giles and Tedds, 2002); financial market development (Straub, 2005); and institutional quality, regulatory burden and quality of the legal system (Friedman *et al.*, 2000; Johnson *et al.* 2000; Botero *et al.*, 2004; Dabla-Norris *et al.*, 2005).

High levels of informality can affect growth and productivity of a country and hold back inclusion into GVCs. Informality can generate inefficiencies in the production process, as informal firms may choose to limit their growth to avoid detection (Farazi, 2014) and tend to use less advanced production technologies (Perry *et al.*, 2007). Corruption is also often a side-effect of informality, and even where it is not, recent work looking at Chinese firms has shown corruption to have a larger negative impact on the productivity of SMEs than on the productivity of large firms (Lu *et al.*, 2018). Informal firms also face greater difficulties accessing finance, which can result in sub-optimal levels of investment in research and development, physical capital, and training (Farazi, 2014). Informality is a binding constraint to integrating into global value chains, but it is also a constraint for firms operating in the formal sector. A study by the Independent

Evaluation Group, a World Bank institution, finds that about 32 per cent of formal firms with 10–99 employees in a sample of developing countries report informality as one of the top five constraints they face in doing business (cited in Cusolito *et al.*, 2016).

Other factors commonly cited to explain the difficulties faced by SMEs, in particular those from developing countries, to integrate in global value chains range from limited resources and access to finance, to the difficulty some SMEs face in meeting product and quality standards. Noted constraints that affect SMEs include lack of knowledge about foreign markets as well as missing in-house skills such as marketing; insufficient knowledge of cumbersome trade regulations and border procedures; and poor physical and ICT infrastructure that limits distribution and operational support (ADB, 2015; Cusolito *et al.*, 2016; ITC, 2015b; WTO, 2016).

Can the rise of technologies based on the internet and the remodeling of economic activity that accompanies it open new opportunities for smaller firms to more actively participate in global production networks? Can the digital economy help small traders integrate into global value chains? Evidence suggests that the potential could be significant.

3. Digital technologies can boost SME trade and GVC participation

Digital technologies continue to make substantial changes to the economy with cascading implications for international trade. For small firms, the internet has increased access to international markets, with the WTO finding that on average 97 per cent of internet-enabled small businesses export (WTO, 2016). Companies also acknowledge the importance of new internet-enabled technologies. For example, a study of 600 European SMEs found that more than 70 per cent of those surveyed not only consider that they benefit from the ongoing process of digitalization, but also that digitalization makes it easier to integrate foreign customers and suppliers into their own value chains (Abel-Koch, 2016). Additionally, a joint OECD and World Bank study (Cusolito *et al.*, 2016) finds that the use of the internet reduces SME exporting costs, thereby increasing export participation, and that SMEs are more likely to be involved in technologically-enabled trade than traditional trade. At the same time, there are also many factors limiting SME participation in GVCs in the context of the digital economy. For example, it has become clear that internet access is now often a requirement for joining many GVCs (ADB, 2015) and that the ICT level of operation is one of the key attributes that multinational corporations assess when they want to enter a business relationship with SMEs (APEC, 2014). However, few studies have looked directly at the impact the new digitally-based economy is having on SME participation in GVCs.

3.1 The impact of digital connectivity on SME GVC participation

Recent work by Lanz *et al.* (2018) has looked more closely into the differences between ICT-enabled SMEs and large firms in developing countries with regards to trade, as well as the relationship of

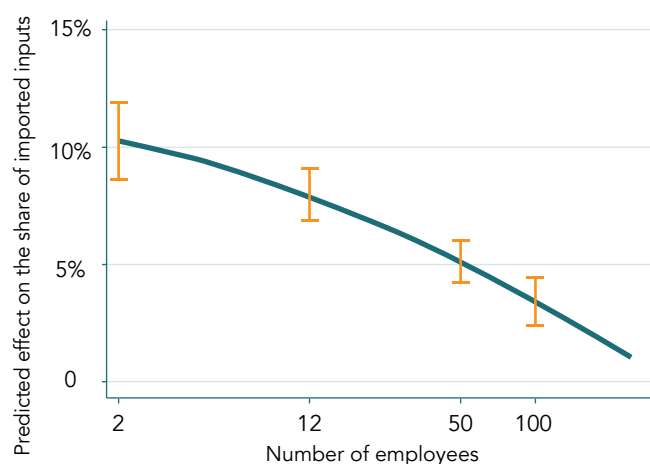
being digitally connected with GVC participation. Evidence backs the theory that these digital changes can support SME participation in GVCs, particularly import-based (backward-linked) GVCs. This is an important insight given that limited SME participation in GVCs continues to restrain participation in international trade. However, the importance of the divide between firms with access to the internet and those without is underscored by this research.

Using World Bank Enterprise Survey data, the authors demonstrate that, for firms, having a website (a proxy for being ICT-enabled) in a developing country has a larger predicted impact on both an SME's share of imported inputs for production and on an SME's share of direct exports, than it does for large firms. An ICT-enabled small firm of 2 employees would have a predicted share of imported inputs that is 10 percentage points higher than a firm of the same size that is not ICT-enabled. Similarly, a firm of 12 employees would have a predicted share 8 percentage points higher. This is significantly greater than the estimated difference for larger firms. In the case of firms of 50 employees, the predicted effect of being ICT-enabled on the share of imported inputs, versus for firms that are not connected, is only 5 percentage points and for firms of 100 employees it is only 3 percentage points (see Figure 6.7). For total exports, the effect of being ICT-enabled is highest for firms with between 15 and 25 employees, with a steep decline as the number of employees grows (see Figure 6.8). In both cases, being ICT-enabled shows a stronger result for SMEs' participation in trade than for large firms, meaning the impact of being digitally-enabled is significantly greater for small firms than for large ones. This is in line with evidence that small businesses with a website were almost four times more likely to export than those without (Oxford Economics, 2017).

The study also considers country-level digital connectivity and its effects on participation in trade by firm size. Using the number of fixed broadband subscriptions in a country to proxy digital connectedness, the paper again demonstrates that for developing countries, increased digital connectivity seems to increase small firms' share of imported inputs used for production more than for large firms. Or, in other words, a small firm's participation in backward-linked GVCs will benefit more than a large firm's if a country has better digital connectivity. Similarly, for total exports, the findings suggest that more broadband subscriptions at the country level leads to a greater positive effect on SME exports than for large firms. These findings imply that large firms have established other non-ICT enabled means of communication with overseas suppliers and customers, such as analogue telephones or in-person traveling, that might not be so easily available to SMEs.

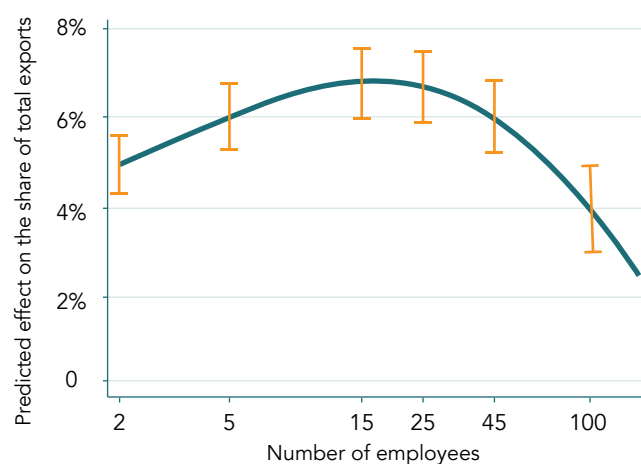
3.2 How can digital technology support SME trade?

There are many reasons why access to digital technologies can increase SMEs' participation in trade. Internet access can reduce barriers and costs to trade for all firms (but especially for services SMEs (Cusolito *et al.*, 2016)) as well as increase access to foreign markets through online sales and e-commerce. The rise of smartphones has also allowed leapfrogging of some capital- and/or infrastructure-intensive technology, especially by firms in developing countries. Additionally, the digital economy itself

FIGURE 6.7 Effect of being ICT-enabled on the predicted share of imported inputs for production

Note: Figure marks represent the estimated range for the predicted effect of being ICT-enabled on a firm's imports for inputs.

Source: WTO estimates based on WB Enterprise Survey Data.

FIGURE 6.8 Effect of being ICT-enabled on the predicted share of exports out of total sales

Note: Figure marks represent the estimated range for the predicted effect of being ICT-enabled on a firm's total exports.

Source: WTO estimates based on WB Enterprise Survey Data.

is creating new opportunities by increasing the number of participants in international trade, as well as creating new business models that affect the structure of supply chains, including being "born global." For example, there are new services on offer, including programming or logistics, that require only the necessary technical skills and being ICT-enabled (ITC, 2015a). Online sales are also making smaller "just-in-time" purchases more common than large advanced orders, a development that could benefit SMEs (AliResearch, 2017). Only SMEs with resources and managers willing to adopt these new technologies are in the position to take advantage of these opportunities (ITC, 2015a). All of these topics will be explored further in this section.

Cost-reducing properties of digital technology

Entering international markets is difficult and costly, disproportionately affecting small firms that face a host of constraints as discussed earlier, including higher relative fixed costs than larger companies, insufficient R&D and skills training, and insufficient knowledge of foreign markets and regulations. However, digital technologies can ease a number of these constraints and reduce SME expenditures in a range of areas, from market research to operational support (see Figure 6.9). New websites and digital processing tools can bring services to SMEs that were formerly unaffordable. The following will look more closely at the ways digital technology supports SMEs.

In terms of market research and general marketing, the internet provides access to a wide variety of information, including information related to potential consumers or national regulatory compliance and how to trade across borders. Online marketing has also been shown to be important for SMEs, with digital access reducing estimated marketing costs by 57 per cent according

to AMTC (2018). Online reviews can also be a powerful tool to attract potential customers from anywhere in the world (Oxford Economics, 2017) and new adwords, or other targeted advertising, can help firms with limited resources reach new consumers (AMTC, 2018). In fact, marketing for both SME manufacturing and services firms is projected to have the largest savings in export related costs in a digital environment (AMTC, 2018).

Additionally, online and mobile banking or finance (which may even be provided through e-commerce platforms), as well as new financing tools like online crowdfunding, can supplement traditional finance for SMEs. For example, services such as Alibaba's e-Credit Line, or IndiaMart's Payment Protection insurance, can be important trade finance resources for small companies. Blockchain could also open new opportunities for SMEs to access trade finance by making it easier for small companies to build a credit history as well as by opening up the possibility for small firms and producers to make transactions on a peer-to-peer basis without the need to secure traditional trade finance or even to go through banks (Ganne, 2018).

Besides reducing financial costs, online access to information also has significant time saving benefits by reducing the need for some in-person interactions, such as with banking. This has been shown to save SMEs up to 29 per cent of the time previously required (AMTC, 2018). Related to time saving, regional SME networking platforms have also been created to bring information together in one place and to facilitate networking among SME suppliers (see Box 6.1). To expand these benefits, the World SME Forum has proposed plans to create eWSF,⁸ a global equivalent to regional networks such as ConnectAmericas. This can result in significant savings related to export activities and benefit SMEs in the international market.

FIGURE 6.9 Ways the digital economy can reduce SME business costs

Export value chain		Impact of digital	
	Details	Traditional scenario	Digital scenario
Market research	<ul style="list-style-type: none"> • Identification and quantification of foreign business opportunities • Obtaining information and a rigorous understanding of the target market 	<ul style="list-style-type: none"> • Labour intensive: dedicated staff, market research agency, potential field trip • Potential travel to market 	<ul style="list-style-type: none"> • Desktop research • Digital market research tools (e.g. online surveys) • Reduced need for travel
Marketing	<ul style="list-style-type: none"> • Targeting of customers in the foreign market through advertising • Dissemination of promotional material through various advertising channels 	<ul style="list-style-type: none"> • Procurement of local advertising space in foreign market (e.g. newspaper, radio & TV ads) 	<ul style="list-style-type: none"> • Digital advertising channels (search engine optimisation, display, social, video) • Leveraging market platforms
Insurance and financing	<ul style="list-style-type: none"> • Access to product shipment insurance for and securing funding for export ventures • Obtaining information on and procuring to insurance and securing loans 	<ul style="list-style-type: none"> • Limited transparency • Time intensive paper based approach • Dedicated brokers 	<ul style="list-style-type: none"> • Product comparison sites • Single window view into market • Digital financial products
Regulatory compliance	<ul style="list-style-type: none"> • Regulation, rules and laws in the foreign market the MSME has to comply with • Costs of complying with foreign regulation such as filing documents and legal costs 	<ul style="list-style-type: none"> • Time intensive paper based approach • Dedicated consultant 	<ul style="list-style-type: none"> • National single window
Distribution	<ul style="list-style-type: none"> • Physical delivery of goods to the foreign market • Product delivery and channels through which sales occur 	<ul style="list-style-type: none"> • Manual management of supply chains • Limited information on causes of inefficiencies 	<ul style="list-style-type: none"> • Automated and digitalised supply chain management (e.g. Internet of Things)
Operational support	<ul style="list-style-type: none"> • Day to day operations of the business e.g. processing orders, back offices tasks • IT heavy tasks such as database management, accounting, communication 	<ul style="list-style-type: none"> • Special IT equipment (e.g. servers, office software) • Communication services • Dedicated travel agents 	<ul style="list-style-type: none"> • Cloud computing and software • Voice over IP • Online travel services

Source: Alphabeta framework (from AMTC, 2018).

BOX 6.1

ConnectAmericas, an online network for businesses in the Americas

Online networks for businesses are an important tool provided through the internet for SMEs to connect to international markets. ConnectAmericas, a business network initiative by the Inter-American Development Bank (IDB) with the support of Google, DHL, Visa and Alibaba, seeks to promote international trade and investment by SMEs in the Americas through its platform. Two examples illustrate its usefulness to small digital businesses working to enter international markets. The first is Rodrigo Olivares and his online engineering training services and the second is GlamST, a virtual makeup application founded by Carolina Bañales and Augustina Sartori.

After registering on ConnectAmericas, Mr. Olivares quickly received verification of his company by ConnectAmericas. Mr. Olivares next indicated his desire to expand his training services beyond his Chilean base. Within a short amount of time he was contacted online by his now

partner from Curaçao regarding a potential business relationship. Following a Skype conversation, they agreed to work together, with the new partner in Curaçao using his established business to actively promote and advertise Mr. Olivares' training services.

GlamST was created by two telematics engineers, Carolina Bañales and Augustina Sartori, to enhance the customer experience, both online and in-store, for retail cosmetics brands through a virtual makeup application they developed. ConnectAmericas provided GlamST with a way to research and verify potential business clients for the app. Further, Ms. Bañales noted that ConnectAmericas provides resources via their platform for accessing start-up capital as well as client and product development tools.

Source: <https://connectamericas.com/video/rodrigo-olivares-did-business-3-days-thanks-connectamericas>

Digital technologies can also help reduce regulatory compliance costs by making information available online. For example, government tax compliance regulations or export requirements can now often be found on the internet and necessary information can sometimes be submitted via e-documentation. This is important for SMEs, a majority of which were found to outsource customs-related regulatory compliance in a recent ITC survey (ITC, 2017a). Recognizing the potential for the internet to facilitate SMEs' access to information for international trade, the ITC with the WTO and UNCTAD has developed the Global Trade Helpdesk (GTH) as a one-stop shop (see Box 6.2). New technologies like blockchain can also contribute to greater transparency, making it easier to trace supply chains and prove product origins (Ganne, 2018). It is estimated that manufacturing SMEs can see as much as a 40 per cent reduction in compliance costs and a halving of the time required to comply thanks to digital technologies, while services SMEs can see the costs eliminated entirely (AMTC, 2018).

Other cost reducing services are available as well, particularly with regard to distribution services. Digital logistics that leverage IoT and artificial intelligence now permit much closer tracking of shipments and inventory, allowing firms to better assess their production and demand (AMTC, 2018; WTR, 2018. See also chapter 5). Additionally, recruitment websites make it easier to list and fill vacancies and price comparison sites can significantly reduce firm expenditures on their required goods and services. Cloud technologies can also reduce a firm's expenses on hardware, software, web hosting and the associated administrative costs (AMTC, 2018). These services are used by "lean start-ups" to lower their fixed costs, thereby increasing competitiveness in the fast-changing digital environment (OECD, 2017a).

Related to distribution services, studies have also shown that small and financially constrained firms rely heavily on intermediation services (Ahn, 2011; Chan, 2015) and often do not have direct export market access (Felbermayr, 2011). This is especially true when market access costs are high, leading to trade intermediation services taking a larger revenue share from exporters than would be predicted by standard trade models (Schroder, 2003). Digital technology can work to reduce the distortion posed by

intermediaries by reducing the costs of international trade, especially with regards to logistics services.

At a basic level, digital technology has been crucial in lowering the cost of operational support needed for business generally, but especially for cross-border initiatives. Email, voice over internet protocol (VOIP) systems and online video conferencing now mean that firms can be in touch at reasonable cost, especially internationally. Further, the use of machine learning to provide real-time translation is also bringing down language barriers.

Altogether, these reduced business and trade costs have the potential to be relatively more beneficial for SMEs, especially SMEs in the services sector, than for large firms with regards to international markets. This is even more true for SMEs in developing countries where the relative burden has been noted to be the highest (WTO, 2018). In fact, it is estimated that digital technologies can lower SME export costs by as much as 82 per cent and reduce foreign market operating costs by up to 59 per cent (AMTC, 2018). Digital technologies have lowered the cost to internationalize, thereby widening the scope for SME participation in international trade and GVCs (OECD, 2018b; WTO, 2018). It is estimated that the rise of digital technologies such as IoT, artificial intelligence, 3D printing and blockchain could lower trade costs by another 10.5 per cent over the next 15 years, with such decline especially benefiting SMEs and firms from developing countries, provided appropriate complementary policies are put in place (WTR, 2018).

E-commerce as an enabler or alternative to GVC participation

Access to online sales platforms has been a very important development for SMEs, especially as it relates to GVCs and international supply. Lendle *et al.* (2014) shows, in a sample of 18 countries, that between 88 to 100 per cent of eBay sellers are merchandise exporters, compared to only ten per cent of small firms operating through traditional non-platform methods. Further, SMEs participating in e-commerce tend to remain exporters longer than those in purely traditional markets (ITC, 2016) and growth of e-commerce yields productivity gains of 6 to 15 per cent for SMEs (ABAC, 2018). Although SMEs with access to

BOX 6.2

The Global Trade Helpdesk, international trade information in one location

The Global Trade Helpdesk (GTH) is a joint ITC, UNCTAD, WTO initiative that aims to improve the quality, transparency and accessibility of trade-related information by providing a unique entry point to existing trade-related information. The GTH specifically targets SMEs who often do not have the resources to access fee-based information.

The beta version of the GTH was launched at the 11th WTO Ministerial Conference in 2017. The GTH integrates comprehensive information from various sources on market requirements, including customs tariffs, taxes, rules of origin,

non-tariff measures, and notifications of WTO Members; export/import procedures (e.g. pre-shipment formalities, certification and inspection processes, transport documents); business opportunities (market prices, company directory, upcoming events); and policy outlook (trade statistics, export potential analysis, trade agreements).

In the coming years, the GTH will be translated to all six official United Nations languages to be accessible to people around the world.

Source: www.helpmetrade.org

e-commerce may not immediately participate in GVCs, SMEs often enter international trade and supply chains as e-commerce importers before becoming exporters and suppliers themselves (cited in Lanz *et al.*, 2018).

In general, small firms that use e-commerce also have more access to international markets and supply chain demand. For example, SMEs are able to reach 30 different economies on average using online platforms (ARTNeT, 2018). On top of this, e-commerce has changed supply chains more fundamentally via the noted trend for firms to retain a reduced inventory and instead purchase high frequency, small volume shipments online (see chapter 5 and AliResearch, 2017). SMEs might be able to take advantage of this change given their potential for greater business agility and the evolving need for smaller quantities.

An estimated 90 per cent of e-commerce transactions are B2B (ITC, 2017a), thereby implying underlying value chain transactions. Although the majority of e-commerce consists of domestic transactions, cross-border retail e-commerce is expected to grow at twice the rate of domestic e-commerce, potentially boosting international trade (ARTNeT, 2018). E-commerce and digital platforms have also been crucial for facilitating international trade by SMEs, and e-commerce in general is becoming increasingly international (ITC, 2017a). Thus, e-commerce can be an alternative to participation in GVCs by SMEs through multinational companies. Depending on the business model employed by a given producer or manufacturer, SMEs may search online for inputs meeting their criteria rather than having a formal agreement with a supplier, thereby creating potential opportunities for firms of any size.

Online sales platforms, and e-commerce generally, have also been shown to provide more inclusive environments for SMEs through anonymity given that firms might otherwise be discriminated against based on size or ownership if operating in a traditional market (WTO, 2016; WTO, 2018). For example, women-owned businesses are frequently better represented in online platforms than offline, with the share of women-owned online firms double the share of offline firms (ITC, 2017a). In China, 49.4 per cent of Alibaba's active online storeowners are female, and Etsy reports that more than 80 per cent of its retailers are women (AliResearch, 2017; TechCo, 2015; additionally, see Box 3.1 in Chapter 3). However, despite the possibility for e-commerce to open new doors for SMEs, large firms conduct the vast majority of e-commerce transactions (see Figure 6.10).

New business structures and opportunities

Digital technologies can indirectly increase SME trade by ways other than reducing costs. The scaling up of small firms, including the "born global" phenomenon, sometimes referred to as "micromultinationals" (Cusolito *et al.*, 2016), is one important way that SMEs can enter international markets and value chains. Micromultinationals achieve scale without mass, which has typically been required to expand abroad in the past (OECD, 2017a). Although born global firms can start from any size, given the short time span for expansion they frequently are SMEs.

Separately, fully digital products and their creation services, such as electronic games, smartphone applications, or even software

generally are also areas that SMEs can take advantage of. SMEs can join GVCs as independent service contractors for digital products that may be exported indirectly over the web. Besides online and mobile apps, online content creators in general have also sprung up as ways small businesses, even individuals, are employed. The employment share of SMEs in the ICT sector in OECD countries grew from 3.8 per cent to 4.7 per cent between 2010 and 2016, and SMEs' share of value added in this sector increased in nearly all OECD countries, with the most substantial increases in publishing activities and telecommunications (OECD, 2018c).

The opportunities opened by digital technologies are multifaceted, and some studies estimate that digitalizing MSMEs is the largest contributor to kick-starting virtuous cycles, especially for firms engaging in cross-border trade (ABAC, 2018).

3.3 Digital challenges for SMEs to enter GVCs

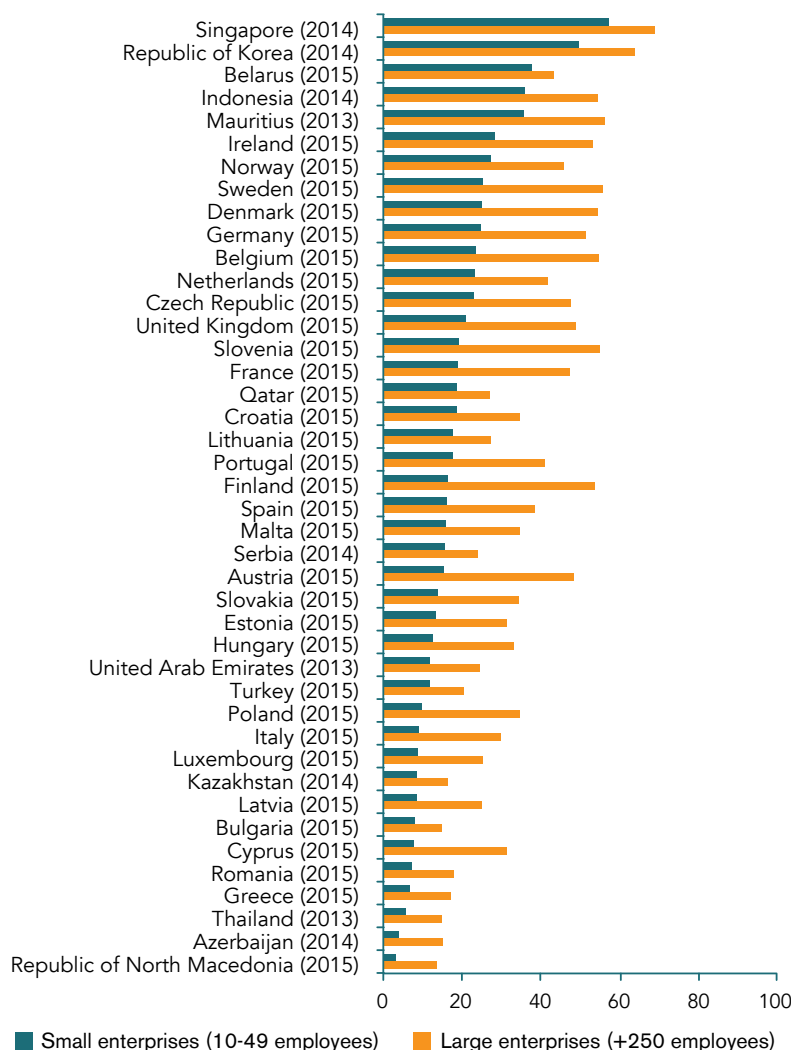
The digital economy, and ICT generally, are significant enablers for SME participation in GVCs. However, challenges related to SME participation remain. SMEs lag in terms of digital technology adoption for a variety of reasons, from cost of implementation to management (OECD, 2017a). Moreover, large firms have implemented a wide range of technologies with a diverse set of requirements (see chapter 5 for a discussion on company use of advanced supply management techniques). As a result, the ability to interact effectively with these technologies has now frequently become a precondition in big industries for other firms to become suppliers, thereby becoming a requirement for certain types of GVC participation and potentially excluding some suppliers (see Box 6.3). Without the required capital and skills, firms can be left farther and farther behind when it comes to GVC participation.

In addition to the difference between small and large firm adoption of digital technologies, the "digital divide" between developed and developing countries is also a prominent issue for the new digital economy. Developing countries often have a lower level of internet access, and the internet that is available may have a lower bandwidth than that in developed countries. Because of this reduced accessibility, there is also often a deficit of internet and related technical skills, posing additional barriers for SMEs. LDCs in particular often lack the necessary infrastructure for their SMEs to access the internet. Additionally, e-commerce platforms may not have expanded to certain developing countries, especially LDCs, given low demand, lack of online financial infrastructure, and liability concerns (Lanz *et al.*, 2018). Lastly, an issue that affects all online firms, but developing country firms, is visibility. Although a firm may have a website, if the firm lacks the skills required to market the business both online and offline, potential customers will not know of the service or product's availability (AMTC, 2018).

Even with digital capabilities, firms still face significant barriers to participate in the digital economy, such as with access to payment systems and online sales platforms (AMTC, 2018). Further, e-commerce platform requirements can often be challenging for SMEs to comply with and are sometimes labelled as "gatekeepers." These barriers include membership requirements, such as the use of specific logistics suppliers; the requirement to deliver products to purchasers within tight timeframes; and a return policy that

FIGURE 6.10 Proportion of small and big firms selling online in 2014 and 2015

(Per cent)



Source: (UNCTAD, 2017) based on World Bank data.

is often more accommodating than the seller's default (ARTNeT, 2018). Additionally, developing country firms in particular note the high costs associated with many of these platforms, including sales commission charges that range from 15 to 40 per cent of the sale depending on the seller's location (WTO, 2018). A new technology, blockchain, could help to remedy some of these challenges. The technology is already being used to implement peer-to-peer marketplaces that operate without the need for a central actor (such as OpenBazaar). However, such initiatives remain, for the time being, very limited in scope, and it is difficult to tell whether they will offer real benefits compared to existing platforms (Ganne, 2018).

Separately, a recent study by the OECD (2017) also notes that the digital economy has led to increased complexity, changes in required skills and business models, and a "winner-take-all" environment whereby the leading player can often dominate a market at the global level. Firms may be locked out of markets by the "instant upscale" effect of winner-take-all firms that seize the market.

As with all change, the digital economy has had, and will continue to have, significant disruptive effects on traditional markets. All of these issues have implications for SMEs and their participation in digitally facilitated trade and changing GVCs.

4. How to promote SME participation in GVCs?

Reaping the benefits of digital trade is not automatic. While the rise of the internet has opened new opportunities for SMEs to participate in global value chains, challenges remain that relate both to access and use of digital technologies, and to the broader ecosystem in which SMEs evolve. SMEs continue to face significant constraints in terms of connectivity and level of digital skills, especially in developing countries, and market barriers and inefficiencies in the business environment continue to disproportionately affect them. Increasing SME participation in

BOX 6.3**Connecting SMEs to the digital supply chain – challenges for the European automotive industry**

A challenge for SMEs to integrate as suppliers into the European automotive industry in the digital economy arose with the industry's adoption of automated electronic data interchange (EDI) systems (see chapter 5 for a more in-depth description of EDI). Large automobile manufacturers insisted on compliance with their selected EDI standards to avoid complications and errors. However, these systems often required large upfront investment that acted as barriers to entry for SMEs. The development of WebEDI, a method of conducting EDI through an internet browser rather than

specific EDI software reduced the ICT burden for suppliers, but there were hidden costs related to data entry errors and employee time requirements on the part of the supplier.

Although the digital economy has created many opportunities for SMEs to become suppliers, issues relating to integration and specification requirements – not only of the manufactured product but also with the delivery systems themselves – will continue to pose challenges for SMEs that tend to have relatively smaller resources for compliance.

Source: EC (2012).

global value chains requires more than simply the technology. It requires a conducive business environment that allows SMEs to seize the opportunities that the digital economy opens.

4.1 Improving SMEs' access and use of digital technologies

SMEs' access and use of digital technologies remains constrained by various factors ranging from the most basic, such as access to a steady supply of electricity in many developing countries, to the more complex, such as a lack of high speed internet cables (ITC, 2016; Darsinouei, 2017; Lanz *et al.*, 2018). The development of an efficient ICT infrastructure is essential to access global markets (BIAC *et al.*, 2016; OECD, 2017a; OECD, 2017b), and when it comes to e-commerce, the most important technological requirement remains basic access to the internet. E-commerce can only develop if the internet is present (Fernandes *et al.*, 2017). It is therefore vital that governments provide their business sector, and in particular SMEs, with affordable, high-quality internet infrastructure. Mobile technology is also very important for businesses, in particular in developing countries, and government should support both mobile infrastructure and efforts to create mobile-friendly, paperless e-government systems (ABAC, 2018). Key policy aspects include the mobilization of investment in ICT infrastructure, both public and private, as well as the creation of a regulatory environment that provides for sound competition in the telecommunications sector (Lanz *et al.*, 2018).

However, improving access to the internet and mobile technology is, on its own, not sufficient to support integration of SMEs in international production networks if they are not aware of the opportunities that the digital economy opens and if they lack the digital skills required to participate in such networks. Awareness among SMEs of how to participate in the digital economy, and how to benefit from the opportunities that digital technologies offer, remains relatively limited (OECD, 2018c). In middle-income countries, many SMEs have internet access but they often have limited understanding or capability to leverage the internet as part of their business plan (Cusolito *et al.*, 2016). Further, the gap in technological adoption by SMEs relative to large firms remains in part because of other missing components such as insufficient R&D, human resources, and organizational and process innovation (OECD, 2018c). The lack of technical digital skills

is regularly pointed out as one of the key impediments to SME participation in e-commerce activities and global value chains more generally. In a recent ITC survey of 2,200 SMEs in 111 countries, the lack of technical skills was ranked second out of all reported challenges for e-commerce participation, behind online visibility. In fact, insufficient knowledge of online marketing tools, or technical skills, was one of the key reasons put forward to explain the lack of online visibility for these firms. Improving online visibility requires more than simply having a webpage or access to an online platform; it requires specific digital skills to master online marketing techniques (ITC, 2017a).

To promote SME participation in global value chains, policy makers need to ensure that SMEs and workers have the digital skills and knowledge to use ICT technologies efficiently in the different business functions involved in international trade, from market research, to product development, sourcing, production, sale, and after-sale services, and actively support the development of ICT (and mobile) infrastructure.

4.2 Other policy measures to support SME trade and integration into GVCs

Even when connected online, SMEs face a host of other barriers that can prevent them from joining GVCs or participating in international trade in the new digital economy. Many of these are ongoing obstacles, such as informality or access to finance and logistics. However, some have become even more relevant in the digital age. For example, de minimis import thresholds are particularly important given the increase in small shipments that has come with e-commerce. Closer inspection of these peripheral issues can provide an indication of ways to improve SME participation in GVCs and international trade.

Trade policy

Trade policy can have important simplifying effects on cross-border trade, which can increase the use of GVCs. For example, de minimis policies that set thresholds under which shipments are not required to pay duties can reduce the tariff accumulating impact on trade, or, in other words, reduce the effect of adding the tariff cost of every border crossing to the final product price (ITC, 2017a). This not only makes it less expensive to import intermediate products, but

also can make exports more competitive by reducing the final mark-up price required for profitability. *De minimis* thresholds vary considerably from one country to another, ranging from none (meaning all imports require a customs duty regardless of value) to 1,000 USD.¹⁰ Low *de minimis* thresholds pose particular barriers for SMEs involved in ecommerce, which may have frequent low volume shipments of sometimes low-value articles that still might be required to pay customs duties (Suominen, 2017). Import tariffs in general apply a cost to GVC participation, and areas with low average import tariffs, such as Southeast Asia, are much more integrated in manufacturing GVCs compared with areas that have high average import tariffs, such as South Asia. Greater use of foreign inputs has been shown to have a positive impact on the level of sophistication and diversification of exports. This suggests that policies that reduce import tariffs and facilitate border procedures are likely to help SME integration into GVCs (Cusolito et al., 2016). Indeed, complicated customs procedures have been shown to be especially harmful to SMEs (WTO, 2016).

Beyond tariff reductions and trade facilitation measures, deepening trade integration is positively correlated with value chain activity. In a recent study, the ITC finds that increasing the number of trade provisions covered by trade agreements leads to more value chain integration between firms of all sizes in the participating countries, with small firms benefiting the most (ITC, 2017a). Integrating investment provisions in a preferential trade agreement rather than in a separate bilateral investment treaty was also found to increase the level of domestic value added in exports (ITC, 2017b).

Finally, significant barriers remain in the services sector, which affects SMEs disproportionately (WTO, 2016). Further liberalization of trade in services, in particular of services that allow companies to connect to global value chains, such as ICT and logistics, could act as important enablers of SME GVC participation.

Logistics and cost of delivery

For physical goods, a key issue for trade participation by SMEs is the cost of delivery. In a survey conducted by the ITC (2017a), SME respondents noted their main trade challenges were costly postal and courier delivery services. Other logistics difficulties for SMEs include the costs of shipment warehousing. These issues are particularly important for developing countries where the share of logistics costs in final prices is estimated at 26 per cent, almost twice the share for developed countries (ITC, 2017a). While some of these issues can be addressed at a regulatory level by further opening services sectors, others require proactive investment measures. Indeed, a large part of the logistics challenge faced by SMEs is linked to infrastructure. Without developed ports, roads, and cargo-handling facilities, shipping costs are more expensive (Cusolito et al., 2016). For example, it has been estimated that it is cheaper to ship goods across the Pacific or Atlantic oceans than it is to ship within the ASEAN region (ARTNeT, 2018).

Promoting innovation and R&D

Participation in international trade and innovation are closely linked. Firms that innovate tend to engage more actively in international trade (Tian et al, 2017) and firms that participate

in international trade have been found to be more innovative (WTO, 2016). Promoting participation in international trade and innovation are two sides of the same coin that should be pursued in tandem. Although few SMEs have the resources to invest in R&D, those that do can contribute significantly to innovation (ADB, 2015). Firm R&D spending is closely linked with manager's education and experience (Gao, 2015; OECD, 2007) and can be supported by investment in areas such as technical skills or protection of IP. Further, as previously mentioned, SME participation can be limited by system incompatibility or lack of R&D (OECD, 2007), all of which supports the idea that more R&D by SMEs can contribute to greater internationalization and GVC participation.

Improving the business environment

Inconsistencies and uncertainties in regulation are detrimental to businesses, whatever their size, but they affect SMEs more than large businesses. Indeed, SMEs' limited resources make it more difficult for them to follow and deal with regulatory changes. As a result, they often incur relatively higher costs to gain market share (OECD, 2017a). A complex, inconsistent and unstable regulatory environment can hold SMEs back (see Box 6.4). Regulatory costs and administrative burdens can also prevent SMEs from participating in formal sector activities, thereby also preventing them from expanding their operations internationally (OECD, 2017a).

When it comes to digital trade, particular consideration ought to be given to laws and regulations that relate to the flow of data, consumer protection, and the recognition of digital documents and signatures. Although countries may unilaterally enact many reforms to improve the trading environment, especially in the area of digital trade, other measures related to data privacy rules and standards, data movement, and recognition of e-contracts may require international cooperation (ARTNeT, 2018; Lanz et al., 2018).

Finally, there is no sound business environment without sound competition. The rise of the internet has raised new issues in this respect. The "network effect" has enabled some internet companies to expand rapidly, often using a subsidized fee model whereby they price user access below their own business costs to gain market share. As a result, smaller firms cannot compete in, or may be priced out of, the market entirely (ITC, 2017a).

Improving access to finance

It is well-established that SMEs are less able to access finance than large firms, be it for trade or other costs. In fact, it is estimated that the gap in available credit for formal SMEs is around 1 trillion US dollars, and more than half of formal SMEs in emerging markets do not have adequate access to financial institutions (Salman et al., 2017). For trade finance in particular, the WTO has found that over half of SME requests are rejected, compared to only 7 per cent of large firm requests (WTO, 2018). Much of SMEs' lack of access to trade finance stems from the cost of SME evaluation by established lenders using traditional means like credit histories. However, new technologies such as Blockchain that enhance traceability (Ganne, 2018) or Alibaba's e-Credit Line that takes advantage of its large store of transactions history to determine credit-worthiness, could help SMEs access trade finance.

BOX 6.4**Regulation can hold SMEs back**

Regulatory standardization not only benefits cross-border goods trade, but also international trade in digital services. Pegaxis, a Singapore-based property management service platform that connects property managers with providers of services such as landscaping or building maintenance, has encountered difficulties expanding to new markets in the region. For example, Pegaxis is concerned at potential data server localization requirements. These would impose costly burdens on the firm, which already has a cloud-based business model using servers across the globe. Server localization requires switching to a new provider with potentially less experience in the

business of cloud computing, uncertain quality and reliability, and different operating procedures and infrastructure that may require changes within Pegaxis. Additionally, proposals by countries like Indonesia to require within-country incorporation reduce the geographical benefits of an online business model and impose time and financial costs. Uncertainties about liability are also a concern for Pegaxis, such as regarding who would be considered at fault for defamatory reviews left on their website. This highlights how regulatory consistency, especially in the digital age, can benefit SMEs seeking to operate internationally.

Source: EC (2012).

Further, lack of finance is the primary barrier to SME formalization in developing countries (OECD, 2017a). Without access to finance, SMEs are constrained not only in their ability to export, but also to increase their business generally, thereby making GVC access and even formalization substantially more difficult.

Improving the quality of data

As the previous sections have shown, lack of data and information about SME operations represents an important barrier to better understanding and integrating SMEs into GVCs. Without good information on SMEs, it is difficult to know where to target policies, or whether a particular action has been effective. In this vein, efforts are being made to develop the Trade in Value Added (TiVA) database for improved GVC analysis, with initiatives to include firm size breakouts in future editions. However, the number of economies it contains are still limited, and developing countries, particularly low-income countries, are not well represented. In general, efforts are underway to sensitize countries to break down their statistical information by firm size, as recommended by the OECD Expert Group on Extended Supply-Use tables that was created in 2014 (see chapter 8). Overall, better information on firm operations within a country, including the size of the firms, the industries they participate in, and the value and volume of trade they conduct (including whether the trade is direct or indirect) are all crucial pieces of information to understand the basics of SMEs and value chain participation.

5. Conclusions

The international fragmentation of production that has remodeled international trade over the last decades should have made it easier for small companies to participate in global supply chains, by allowing them to focus on niche markets and narrow segments of international production chains. However, evidence suggests that participation of SMEs in global value chains remains limited relative to their share of overall economic activity and employment, especially in developing countries.

This could be changing, however, as the rise of the digital economy is reducing information search costs, facilitating exchanges, and providing new marketing, finance and networking opportunities. New research by Lanz *et al.* (2018) reveals that in developing countries, access to digital technology appears to have a positive effect on SME participation in backward-linked GVCs as well as on total exports by SMEs. This is in line with other research that has shown the cost-reducing effects that digital technology can have on business operations, such as improved access to information or access to online services. Additionally, e-commerce provides new ways for firms of all sizes to access global markets, both for buying and selling intermediate or final products. Lastly, the digital economy has created new business structures that make it possible for small firms to scale up in ways previously unattainable, such as the “born global” phenomenon, which can lead to increased SME international trade and GVC participation.

Despite new avenues, such as online platforms that SMEs can now use to access international markets and GVCs via the digital economy, barriers continue to hinder SME access. There are a number of ways policies, and the trading environment, can be changed to better support SMEs in the new digital economy. If internet access is available then an online purchase may be made, but without appropriate shipping logistics, straightforward customs formalities and processes, a favorable business and regulatory environment and access to finance a firm will be unable to complete the transaction.

Overall, reducing barriers to digital trade will require a holistic approach. Even though digital technologies can facilitate SMEs’ integration into GVCs, they are only one element of the ecosystem required for an SME to reach full trading potential and the development of coherent national strategies is essential. On a policy level, better data is also required in order to understand where the trading difficulties are in a given economy. Availability of data by firm size is critical to allow policy makers to better target their actions and effectively support SMEs’ integration into GVCs. Increased availability and quality of data, and further analysis of direct vs indirect backward participation and of the impact of direct versus indirect participation on firms’ performance would help to better understand and integrate SMEs into GVCs.

Notes

1. <http://blogs.worldbank.org/psd/a-universal-definition-of-small-enterprise-a-procrustean-bed-for-smes>
2. The terms forward and backward participation are also often referred to as “forward linkages” and “backward linkages”.
3. In Germany, for example, SMEs hold between 70 and 90 per cent of global market shares in some specialized manufacturing segments, and SME merchandise exports in textile, apparel and wood manufacturing represented more than 60 per cent of total exports across twelve OECD countries in 2015 (OECD, 2018b).
4. This is based on data from World Bank Enterprise Surveys for over 25,000 SMEs in the manufacturing industry in developing economies. The World Bank Enterprise Surveys collect data from key manufacturing and service sectors in every region of the world. The surveys are conducted according to the global sampling methodology which uses stratified random sampling to minimize measurement error and to yield data that are comparable across economies. The sampling methodology generates a sample representative of the whole non-agricultural private economy, including services industries, and generates large enough sample sizes for selected industries to conduct statistically robust analyses with levels of precision at a minimum of 7.5 per cent for 90 per cent confidence intervals. Years covered differ from country to country.
5. A commonly used definition of informality (or informal economy) in the literature is the one proposed by Schneider *et al.* (2010) who define the informal economy as comprising market-based legal production of goods and services deliberately concealed from public authorities to avoid paying taxes, social security contributions, and meeting legal obligations/requirements and market standards.
6. <https://www.ilo.org/global/topics/employment-promotion/informal-economy/lang-en/index.htm>
7. The share of women in informal employment in developing countries according to the latest available data was 4.6 percentage points higher than that of men including agricultural workers and 7.8 percentage points higher without (ILO, 2018). In some sub-Saharan African countries, the gender gap between the formal and the informal sector even exceeds 20 per cent (ILO, 2018).
8. eWSF is intended to be a global platform for SMEs to capture GVC and B2B opportunities. Although the site is still in development, the goal is to develop modular pieces to come online as each part is created. http://www.worldsmeforum.org/wp-content/uploads/2016/12/EcelandKasap_CACCI_Nov24.pdf
9. Born global firms are generally defined as those that achieve 25 per cent foreign sales out of their total sales within their first 3 years (Nordas, 2015).
10. For a list of *de minimis* levels as of 28 March 2018 please see https://global-express.org/assets/files/Customs%20Committee/de-minimis/GEA%20overview%20on%20de%20minimis_28%20March%202018.pdf.

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Should high domestic value added in exports be an objective of policy?

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ABSTRACT

Global value chains make it easier for developing countries to move away from export reliance on unprocessed primary products to become exporters of manufactures and services. Global value chains (GVCs) allow countries to specialize in a particular activity and join a global production network. As a developing country moves from export of primary products to export of manufactures and services via GVCs, *the ratio of domestic value added to gross export value tends to fall*. Many developing country policy-makers worry about this trend and aspire to increase their value added contribution to exports. There are a number of reasons why this objective

is not good policy. It may seem like simple math that a higher domestic value added share means more total value added exported and hence more GDP. But that simple idea ignores the reality that imported goods and services are a key support to a country's competitiveness. The chapter documents this via the history of the successful East Asian industrializers as well as more recent evidence from Association of South-east Asian Nations (ASEAN) economies. If a country artificially replaces key inputs with inferior domestic versions, the end result is likely to be fewer gross exports and less, not more, total value added exports.

- In almost all countries, developed and developing alike, the share of domestic value added in exports has tended to trend downwards recently. This reflects the expansion of global value chains.
- Many developing countries worry about this phenomenon and aspire to increase their value-added contribution to exports. This objective should be approached cautiously. Imported goods and services are a key support to a country's competitiveness. If a country artificially replaces key inputs with inferior domestic versions, the result is likely to be fewer gross exports and fewer, not more, total value-added exports.
- China's recent experience is often given as an important counter-example, since its domestic value-added ratio has been rising over the past decade, but our research indicates that this trend is primarily the result of technological advances in China.
- Consequently, the Chinese ratio can be expected to peak and later decline if China further opens up and follows in the steps of other earlier Asian industrializers, such as Japan and the Republic of Korea.

1. Introduction

Global value chains make it easier for developing countries to move away from export reliance on unprocessed primary products to become exporters of manufactures and services. Before the development of GVCs, a country had to master the production of a whole product in order to export it. GVCs allow countries to specialize in a particular activity and join a global production network. As a developing country moves from export of primary products to export of manufactures and services via GVCs, *the ratio of domestic value added to gross export value tends to fall*. Developing countries often start out at the end of value chains, with labor-intensive assembly of parts produced elsewhere. For some individual products the ratio of domestic value added to gross export value can be very small, maybe only a few percentage points. The gross exports from the country can be very large, but this is an artifact of the position in the value chain. The country's value added contribution to the export is much smaller. Many developing countries worry about this phenomenon and aspire to increase their value added contribution to exports. There are a number of reasons why this objective should be approached cautiously. It may seem like simple math that a higher domestic value added share means more total value added exported and hence more GDP. But that simple idea ignores the reality that imported goods and services are a key support to a country's competitiveness. If a country artificially replaces key inputs with inferior domestic versions, the end result is likely to be fewer gross exports and less, not more, total value added exports.

In this chapter we examine this issue. Section 2 looks at the historical experience of the successful East Asian industrializers, Japan, the Republic of Korea, and Chinese Taipei. Section 3 then focuses on the more recent experience of ASEAN economies as well as general literature on the issue of domestic value added content of exports. Section 4 looks at policy measures that economies can consider in order to move up the technological ladder. In general, artificially trying to boost domestic content is going to be a losing strategy. Countries would do better to focus on human capital development, support to R&D, intellectual property rights protection, and opening up remaining closed sectors of the economy, especially services.

2. The decline of domestic value added in exports in Japan, the Republic of Korea, and Chinese Taipei

After two decades of dedicated work among international economists in measuring international fragmentation, a consensus has more or less formed, that the trend of domestic value added in exports is declining. Starting from autarky, when the economy opens to trade, there are several reasons why the domestic content of exports would begin to decline. Opening up to imports of intermediate goods and services means that a country's producers have access to the most competitive inputs

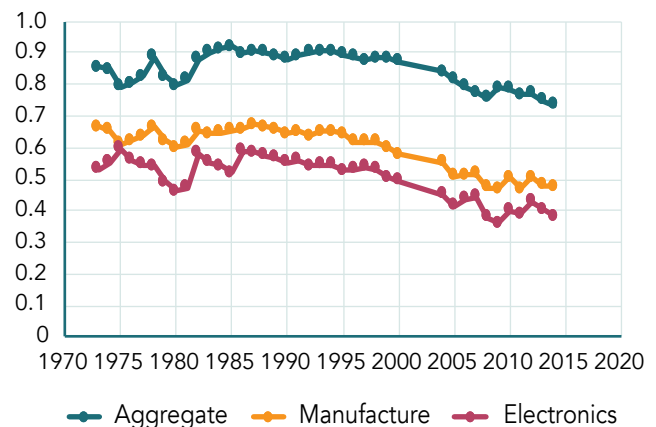
and will make use of some of them. The decline in the share of domestic value added in exports in many cases is also the result of structural change in the export basket. Economies that open up after an autarkic period often start by exporting primary products, which tend to be relatively homogeneous worldwide. Manufactures produced in closed economies are low-quality and find few markets. Over time, however, with openness to imported inputs, a competitive manufacturing sector may emerge. China, Mexico, and Viet Nam are all examples of economies that initially exported primary products after opening up, but soon moved to manufacturing exports. That structural shift will tend to reduce the domestic content share of overall exports because that share is generally higher for primary products and lower for manufactures. So, in general, we observe a declining domestic value added ratio over time. Further, this indicator does not have direct welfare implication, so it is not appropriate to formulate policies around pursuing a higher domestic content ratio in exports.

In this section we examine historical data for three industrializing economies in East Asia to study the development of domestic content in exports. We proceed in three steps of analysis, namely the aggregate trend for the total economy, the trend for manufacturing products, and the trend for the electronics industry, a high-tech sector.¹

2.1 The case of Japan

For Japan, annual input-output tables date back to 1973. It is evident that the domestic content in overall exports has declined, decreasing roughly 0.12 points from 1973 through 2014 (Figure 7.1). Several factors may account for this decline. It can be seen that the domestic value-added ratio (DVAR) in manufactures is always below that of total exports, reflecting differences between

FIGURE 7.1 Domestic value added in Japanese exports



Source: Authors' calculation based on Japan's national IO table.

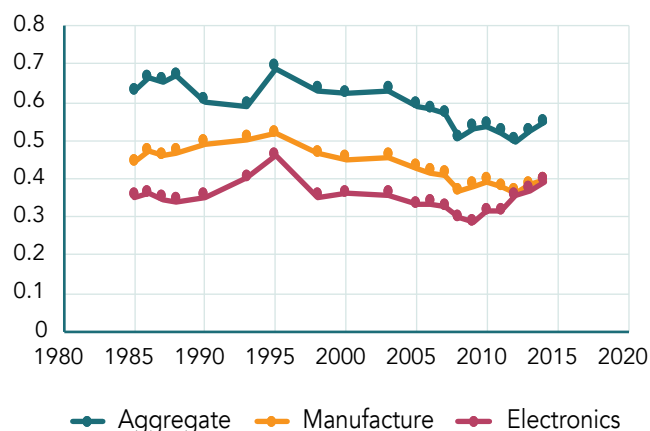
manufactures and primary products. The latter have relatively few intermediate inputs, and hence few imported inputs. The structural shift away from primary exports towards manufactured exports would pull down the DVAR in overall exports. In addition, various waves of trade liberalization gave Japanese producers better access to imported goods and services for production.

Clearly, this decline trend is more pronounced for manufactured products, as well as for the high-tech electronics sector, especially after 1990 when Japan's serious trade liberalization accelerated. The general pattern is similar, while the ratio for manufacturing products and electronics are much lower than the aggregate. In addition, they decrease 0.19 and 0.15, respectively, comparing with 0.12 for the aggregate value. Arguably, the expanding international production fragmentation is well observed in Japan's case. It is also notable that electronics is the most high-technology sector, and here Japan's domestic value added in less than 40% of the gross export value in the most recent year. Thus, success in the high-tech sector goes hand-in-hand with extensive use of imported inputs and services.

2.2 The case of the Republic of Korea

For the Republic of Korea, annual input-output tables date back to 1985. It is observed that the aggregate ratio of the domestic content in exports declined, with most of the change since 1995 (Figure 7.2). Between 1995 and 2014 the ratio dropped roughly 0.15. Next, we observed that the decline was similar for manufactured products; while the general pattern is similar, the ratio for manufacturing products is much lower than the aggregate. DVAR for aggregate exports was about 0.55 in the most recent year, compared to less than 0.40 for manufactures. The trend for the electronics sector is similar.

FIGURE 7.2 Domestic value added in Korean exports



Source: Authors' calculation based on the Republic of Korea's national IO table.

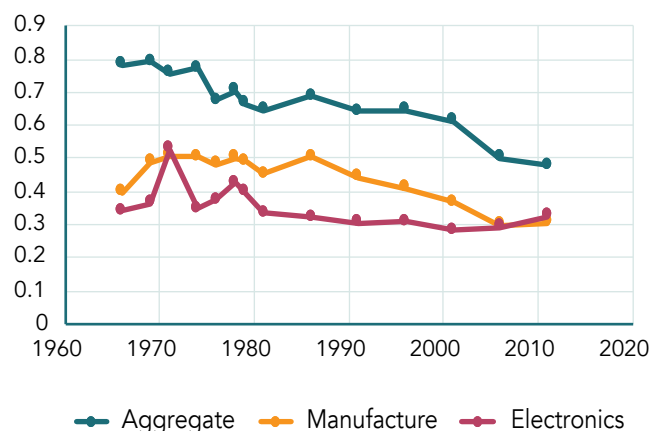
As in Japan's case, several factors may account for the decline in the ratio of domestic value added to export value, such as the continuing trade liberalization, international production fragmentation, and structural shift from primary exports to manufactures. As with Japan, the DVAR in electronics is particularly low. The Republic of Korea has very successfully developed its own brands in televisions and smartphones, yet the DVAR in electronics has generally been below 40%. The Republic of Korea's success results from combining domestic value added with imported components and services.

2.3 The case of Chinese Taipei

For Chinese Taipei, annual input-output tables date back to 1960s, and the domestic content of exports peaked in 1969 with a ratio of roughly 79 percent (Figure 7.3). Domestic content has fallen sharply over time, reaching 48 percent in 2011. Hence, the overall decline was around 30 percentage points (comparing with the world average ratio of value added to exports falling by roughly 10 percentage points, as reported in Johnson and Noguera, 2016), which is remarkable. Different from its Asian peers such as Japan and the Republic of Korea, Chinese Taipei is a typical small open economy. Given the growth of international production fragmentation, along with Chinese Taipei's steady trade liberalization, it is expected that the ratio of domestic content to exports would see a sharp decline.

As a strategy for the developing regions to integrate into the world economy, joining global production is one of the shortcuts. This is particularly true for small open economies. In this way, the domestic industry structure is no longer a prerequisite for producing internationally competitive products, as they can specialize in some particular stage of production, e.g. processing and assembly activities.

FIGURE 7.3 Domestic value added in exports of Chinese Taipei



Source: Authors' calculation based on Chinese Taipei's IO table.

3. Developing countries' experience of joining GVCs

This section will analyze the recent experiences of developing countries by comparing the domestic value-added (DVA) in exports and its implications for the labor market. In the last few decades, we have noticed that many developing countries have been joining at the lower end of the value chain and have been able to increase their gross exports, achieve higher GDP per capita growth, and generate employment opportunities despite the reduction in DVA in gross exports. However, the policymakers in some of these economies are now targeting to increase the DVA in gross exports by using tariff and non-tariff barriers to imported inputs. They believe that the best way to utilize the exporting activity for development is by increasing the DVA content in gross exports as it will create more and better job opportunities for domestic workers, given everything else remains constant.

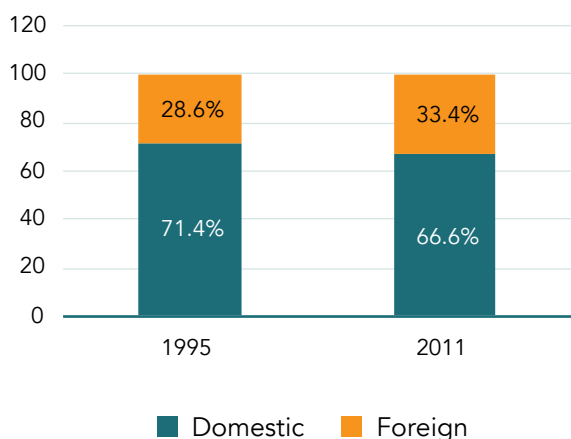
Figure 7.4 compares the ASEAN exports in 1995 and 2011. From 1995 to 2011, DVA share in exports dropped from 71% to 67%, though, it can be seen that the absolute value of exports increased many folds. Much of this increase has been attributed to increase in the intermediate exports i.e. exports related to the GVCs. This tremendous increase in gross exports also led to remarkable growth in jobs. Using empirical evidence, Lopez-Gonzalez (2016) has shown that the foreign value-added, in form of intermediate imports as well as services, plays a significantly positive role in enhancing the employment as well as productivity (value-added per worker) in the ASEAN countries.

Intuitively, importing better quality intermediates as well as services, increases the competitiveness of the domestic firms in the international market and leads to higher demand for the product as well as employees in exporting sector.

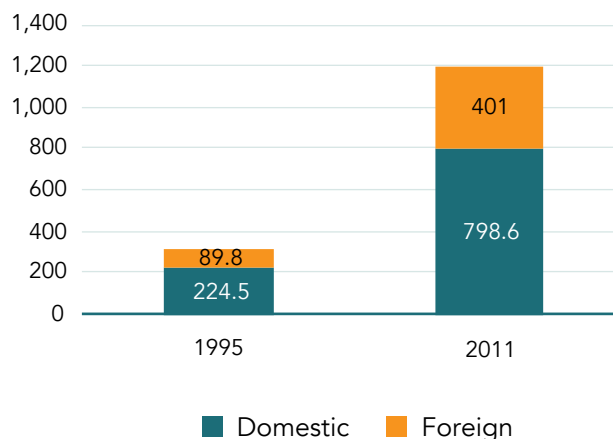
There is no single strategy that works for every economy. Each country has to realize the economic activity that can be integrated into the GVCs. Figure 7.5 shows backward and forward GVC linkages for Asian economies in 1995 and 2011. Viet Nam, for example, has increased the backward linkages, that is, the use of imported goods and services in its production of exports. Viet Nam has primarily participated at the production and assembly stage of manufacturing sector (light manufacturing, electrical equipment, electronics etc.) in the GVCs. Viet Nam's DVA share in gross exports fell from 79.1% to 63.7% during this period. During the same period, GDP per capita in Viet Nam increased from \$288 in 1995 to more than \$1500 in 2011. Viet Nam has been able to shift a significant proportion of workers from the relatively less productive agricultural sector to the more productive manufacturing and services sectors. This remarkable progress has been achieved by embracing trade and investment openness by signing a Bilateral Trade Agreement with USA in 2002 and joining the WTO in 2007. These agreements encouraged Viet Nam to reduce the import tariffs and improve infrastructure to attract foreign direct investment (FDI). These policies resulted in importing better quality inputs as well as related services and focusing on the stage of production (primarily assembling and processing) where the Vietnamese firms/workers have comparative advantage. In 2017, nearly a third of

FIGURE 7.4 Enjoying a smaller share of bigger pie, ASEAN exports

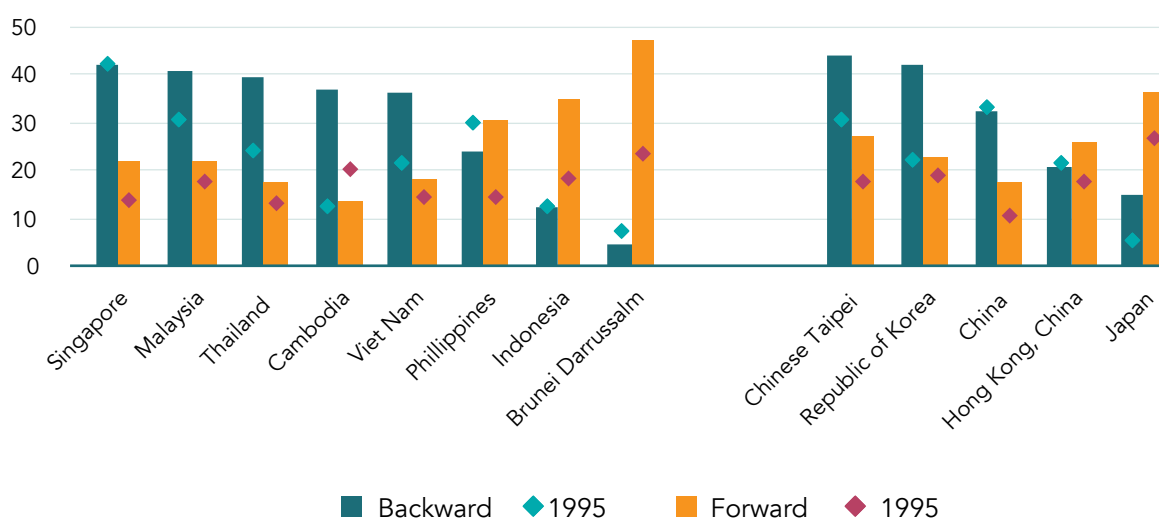
Value added content of exports (share)



Value added content of exports (Value in billion USD)



Source: Lopez-Gonzalez (2016).

FIGURE 7.5 GVC participation in Factory Asia

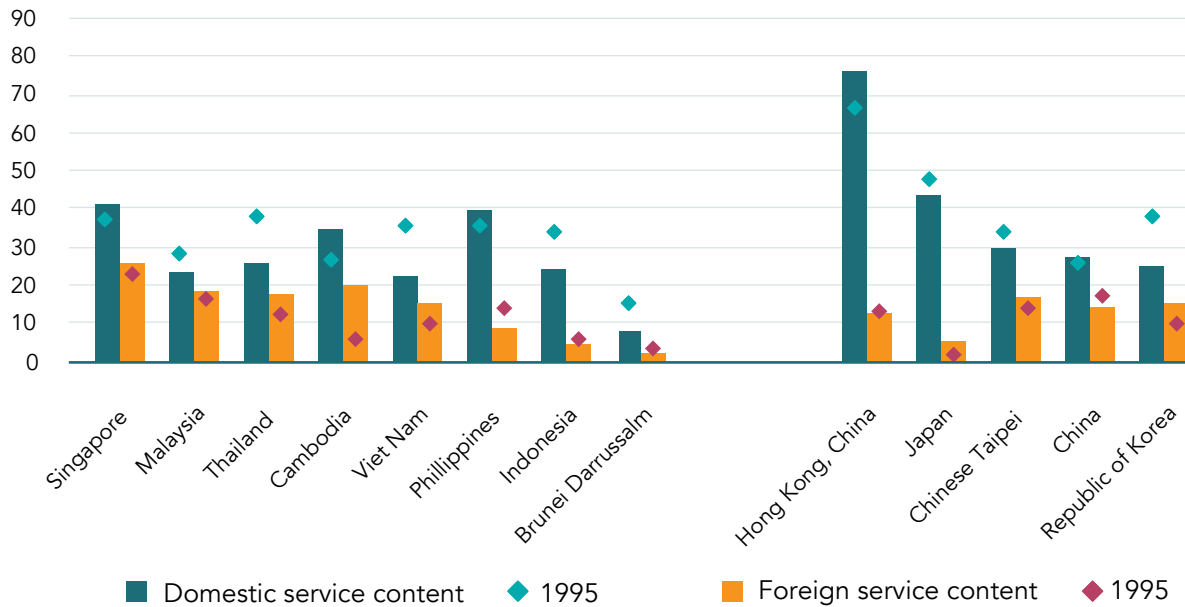
Source: Lopez-Gonzalez (2016).

the Viet Nam's exports as well as imports consisted of electrical and electronics equipment despite having a shortage of skilled workers in the labor force. This has been possible only by joining the GVCs in electronics and electrical equipment.

In contrast, Indonesia has not seen much change in backward linkages since 1995 as its specialization lies in natural resources and hence, it has strengthened its forward linkages since then. Indonesia joined the global value chains in relatively upstream industries. Indonesia's GDP per capita has also grown three times during the same period, though, this phenomenal growth has come through forward linkages in GVC participation. We can also notice that most of the other countries in ASEAN followed a similar pattern of achieving higher growth in GDP per capita as well as exports related to the GVCs.

Figure 7.6 shows that the share of foreign value added in gross exports of the domestic economy is not only increasing through importing more intermediate products but also through utilizing foreign services in exports. These foreign service providers, being much more efficient than the domestic providers, also play a significant role in enhancing the competitiveness of the exports. It must be emphasized that different economies in ASEAN entered at different stages of GVCs and specialized in different industries (or possibly within the same industry but at different stages of production) based on the comparative advantage of the domestic economy. Most of the ASEAN economies have integrated well into the regional as well as global value chains depending on the relative comparative advantage of the domestic economy. This integration helped these economies to achieve much higher GDP growth and create millions of job opportunities for their workers and helped a significant proportion of the population to lift out of poverty.

In order to highlight the implications of directly targeting the DVA in exports as a national policy for development, we can compare Bangladesh and Pakistan's approach towards the exports in the textile and clothing sector. The biggest exports of both countries have been textiles and clothing. In 1990, Bangladesh's exports (\$1.09 bn) were a third of Pakistan's exports (\$3.5 bn) in textiles and clothing. Since then, Pakistan, being a cotton producer, incentivized the textile producers to use the local inputs and export the finished products. Bangladesh, mostly importing the raw materials for textile and clothing, focused more on the trade reforms and opening up the economy to foreign investors. Bangladesh integrated its textile and clothing sector in the global value chains, sourcing most of the raw material from abroad and exporting readymade garments to the developed world. This helped Bangladesh to slowly convert its comparative advantage in *clothing* into competitive advantage over time by using better quality inputs as well as foreign services by collaborating with the leading garments manufacturers. In 2016, Pakistan's textile and clothing exports (\$12.4 bn) were less than half of Bangladesh's exports (\$28.3 bn).² Using Johnson (2018), we can calculate the DVA in the Textile and Clothing sector for these two economies in 2014.³ Bangladesh's DVA in the Textile and Clothing sector was 64.5% as compared to 80.3% for Pakistan.⁴ It can be seen that Bangladesh's exports have risen much faster as compared to Pakistan despite having lower DVA in exports. As the labor costs are rising in China, many garment producers might look for opportunities abroad to relocate their plants. Bangladesh, being well integrated into the GVCs in textile and clothing, the second biggest exporter of garments and offering lower wages, will be the first choice of these firms to relocate. The textile and garment sector in Bangladesh has also

FIGURE 7.6 Service content of exports in Factory Asia

Source: Lopez-Gonzalez (2016).

helped to achieve twice the female labor force participation rate as that of India and Pakistan as nearly 85% workers are females in this sector. Bangladesh's GDP per capita also surpassed Pakistan's GDP per capita in 2017.

Another good example of the contrast between global integration and import substitution comes from the auto sector in Malaysia and Thailand, neighboring countries at similar stages of development. Malaysia tried to develop an indigenous auto industry and a national champion brand through protectionist policies, whereas Thailand strove to join GVCs around existing brands by attracting FDI from Japanese and American companies. Thailand's strategy enabled it to integrate into successful value chains and become a significant exporter of auto value added, primarily via parts. Malaysia's effort did not produce a globally competitive car and eventually had to be abandoned (Wad 2009).

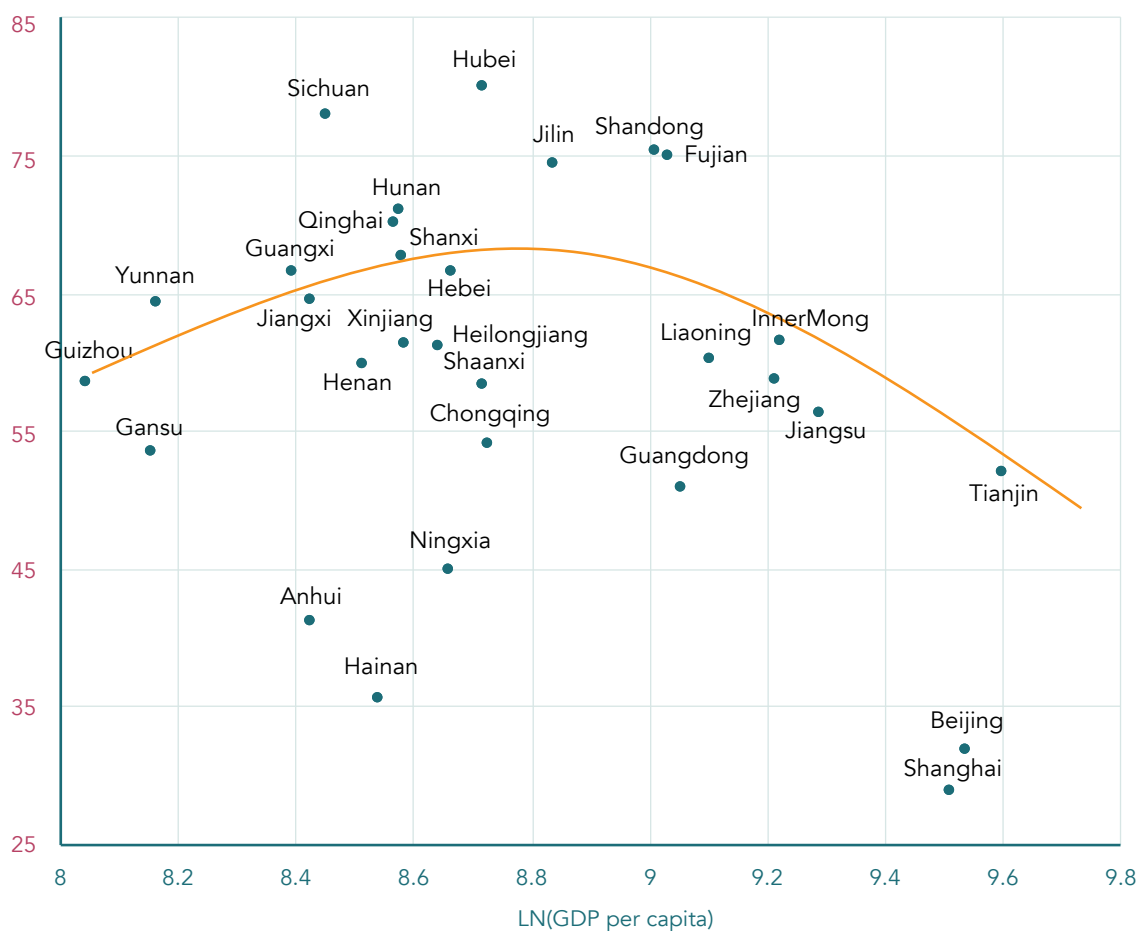
All the examples discussed above suggest that participation and integration into the GVCs help the economies to improve their trade competitiveness, achieve higher GDP per capita growth and improve female labor force participation despite falling DVA in gross exports. Global technological advancement as well as falling trading costs have resulted in the fragmentation of production across borders. This reduction in trade costs helps the firms to exploit the comparative advantage of each country in the specific stage of production and hence, there is a reduction in DVA in gross exports. The only country that has been able to buck the trend of global decline in DVA in gross exports despite increasing GDP per capita as well as rising exports has been China. China has been able to increase the DVA in exports

as well as achieve higher GDP growth rate since joining WTO. Tang *et al.* (2018) have suggested that the substantial improvement in technology in China, along with falling trade costs, have been the reason for the rising DVA in gross exports recently. China has also invested hugely in improving human capital in the last two decades to complement the advanced technology adoption by Chinese firms. Though, as we can see from the experiences of the Republic of Korea and Japan, this might be a short-lived phenomenon. Once the Chinese economy catches up in technology with other economies and achieves the maximum DVA in exports, rising labor costs and stringent environmental standards might push the firms to outsource the low value added segment in production to the other regions in the world to maintain competitiveness by the exporting firms.

The regional experiences within China provide some additional perspective on the relationship between DVA and level of development. Across Chinese provinces there is an inverted-U shape relationship in which DVA tends to rise with per capita GDP and then decline beyond a certain threshold (Figure 7.7). In general, the richest provinces in China have low ratios of domestic value added to exports. Beijing and Shanghai have particularly low ratios. But the export powerhouse of Guangdong also has a low domestic value-added ratio, and hence a high ratio of imported inputs. This is consistent with the view that export success requires access to the best inputs in terms of manufactured parts and supporting services. As more Chinese provinces develop in the direction of the already successful ones, the national ratio of domestic value added to gross exports is likely to fall.

FIGURE 7.7 Relationship between per capita GDP and the provincial VA rate of exports

Intra-provincial VA rate of export: %



Source: Li et al. (2018).

These results have also been supported by the empirical analysis for other developing countries in the literature. Using the manufacturing firms' data from Indonesia, Amiti and Konings (2007) find that a 10% reduction in import (input) tariffs would lead to 12% productivity gains for the importing firms, at least twice as high as gains from reducing the output (final goods) tariffs. Interestingly, Goldberg et al. (2010) show that removing (or lowering) the import tariffs on newer inputs also assists the domestic firms to introduce newer products. They show that the lower input tariffs accounts for an average of 31 percent of the newer products introduced by domestic firms in India. Kugler and Verhoogen (2012) study the impact of quality of inputs and outputs on the plant size, in terms of employment, for Colombian manufacturing sector. They found that the more productive plants use higher-quality imported inputs as indicated by comparing the price of domestic input in the same category by the same plant. They also showed that there is positive correlation between the quality of inputs and the plant size and the price of the output, an indicator of quality of the product. Since reducing

the import tariffs on intermediates will help the firms to import higher quality inputs, it will also help to increase the employment in the plant, along with improving the quality of the output, irrespective of the firm being an exporting firm or producing for the domestic market. These results from the existing literature suggest that adding tariffs on the imported inputs will not only adversely affect the quality, employment and number of products of the firms in exporting sector but also of the domestic firms.

4. Policies for technological upgrading

Technological upgrading is an important part of the convergence process. Developing countries that are integrated into the global economy generally have had more rapid total factor productivity growth – our best way to measure technological advance – than the already developed economies. Developed economies are at the frontier and have to invent new technologies, which is costly and difficult. Developing countries can absorb already existing

technologies through direct foreign investment and learning. As they progress, it is natural for developing countries to begin spending resources on inventing new technologies so the more advanced developing economies are both absorbing existing technologies and innovating new ones.

We have seen earlier in this chapter that, at certain stages of development, technological advance goes hand-in-hand with higher domestic value added content of exports. We see the causality here running from technological advance to GVC structure, not from domestic content to technological advance. The reason for this conclusion is that, for Japan, the Republic of Korea, and Chinese Taipei, as well as for the other technologically advanced economies such as Germany and the U.S., the clear trend is for DVAR to fall. The most advanced technological economies are all extremely open, capitalist economies. Firms are choosing in competitive markets which inputs – goods and services – to source locally and which to source internationally. The result in all of these economies is more international sourcing over time.

We conclude from these patterns that it is reasonable for a developing economy to aspire to more rapid technological advance, which will contribute to higher living standards both directly and indirectly (because technological advance raises the return to investment and encourages capital accumulation). In certain periods, this may lead to an increase in the DVAR, but in the long run it is likely to lead to declines in DVAR as has been witnessed in all of the advanced economies. It is an easy mistake for developing countries to see the causality going the other way. If all else were equal, then increasing DVAR would mean more total value added and typically higher productivity. The problem with this thinking is *all else will not be equal*.

Firms in competitive economies source goods and services internationally if they are superior in quality and/or lower cost. If a country artificially induces firms to source locally, it will reduce their competitiveness and lead to less total value added and productivity. From a policy point of view then, developing countries should encourage technological advance but remain indifferent to whether inputs are sourced locally or internationally. That is a choice best left to the firm. There are policies that countries can use to encourage technological innovation, such as support for STEM (science, technology, engineering, and mathematics) education, subsidies to R&D, intellectual property rights (IPR) protection, and openness to foreign trade and investment.

The leading countries in the world producing STEM graduates are now China and India. In 2016 China produced almost 5 million STEM graduates (undergraduate and graduate combined), and India, nearly 3 million (Figure 7.8). This was far in excess of the 568,000 graduated in the U.S. Russia, Iran, and Indonesia also produced significant STEM graduates. This increasing pool of technical labor in emerging markets naturally encourages hi-tech industries to expand there, including the establishment of research centers. Aside from quantity of graduates, there is also the important issue of *quality*. Most of the top research universities in the world are in the U.S. and Western Europe, but Chinese and Indian universities are starting to climb the ranks. In 2018, 43 of the top 100 research universities in the world were in the U.S., followed by Continental Europe, Australia and Canada (Figure 7.9). China came next. The highest ranked universities from China were Peking University (#27) and Tsinghua University (#30). No Indian university has yet cracked the top 100.

FIGURE 7.8 Countries with the most STEM graduates (2016)

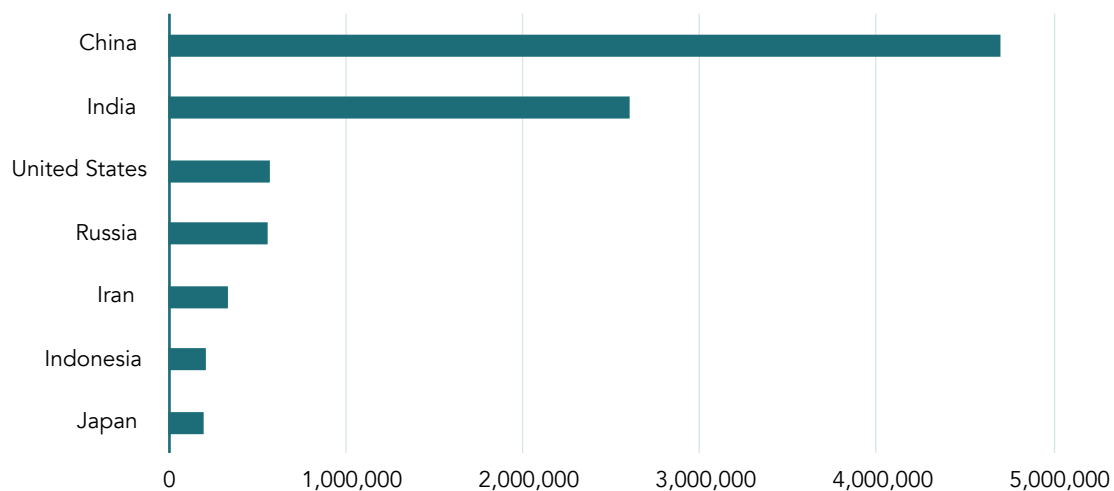
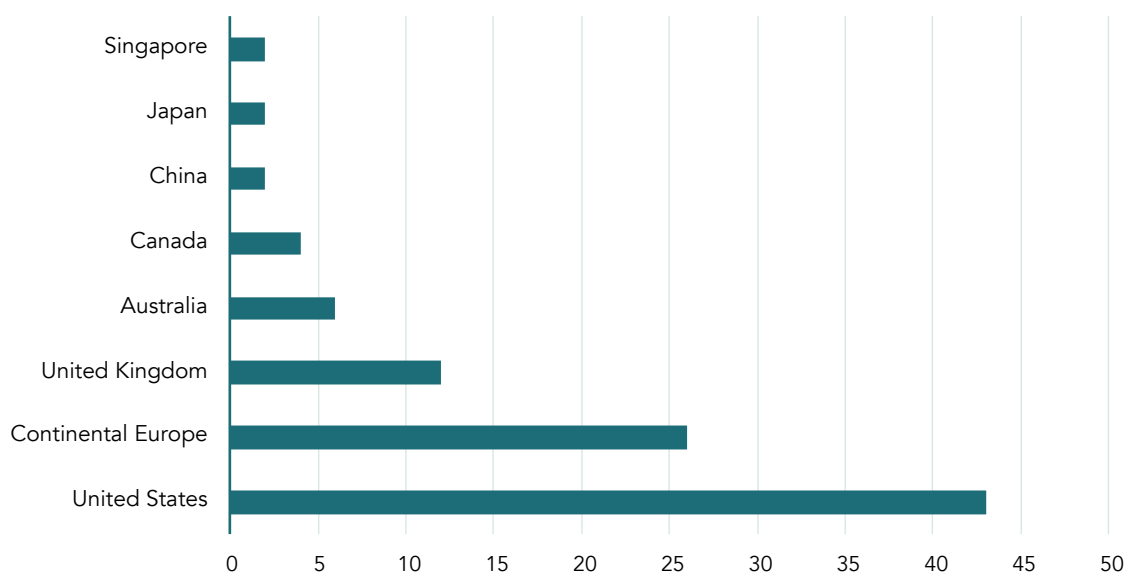


FIGURE 7.9 Top 100 world research universities, by area (2018)

Source: The Times Higher Education World University Rankings 2018.

Emerging markets in general still spend very little on research and development. India, despite its success in certain hi-tech areas, spends only about half a percent of GDP on R&D. In fact, most emerging markets do not even report consistent data on R&D because it is such a small part of their economies. China is the notable exception. As recently as 2001 China spent less than 1% of GDP on R&D, but that figure has been climbing steadily in recent years and in 2015 China spent more than 2% (Figure 7.10). The advanced economies generally spend between 2 and 3% of GDP on R&D, and China has now joined that club. In both China and the U.S., about one-fifth of R&D is financed by the government, with the rest primarily coming from industry. This reveals that it is difficult for the government to have much direct effect on R&D. Subsidies, usually in the form of tax breaks, play some role. But, in general, R&D is based on corporate decisions which are influenced by availability of technical labor and other aspects of the policy environment.

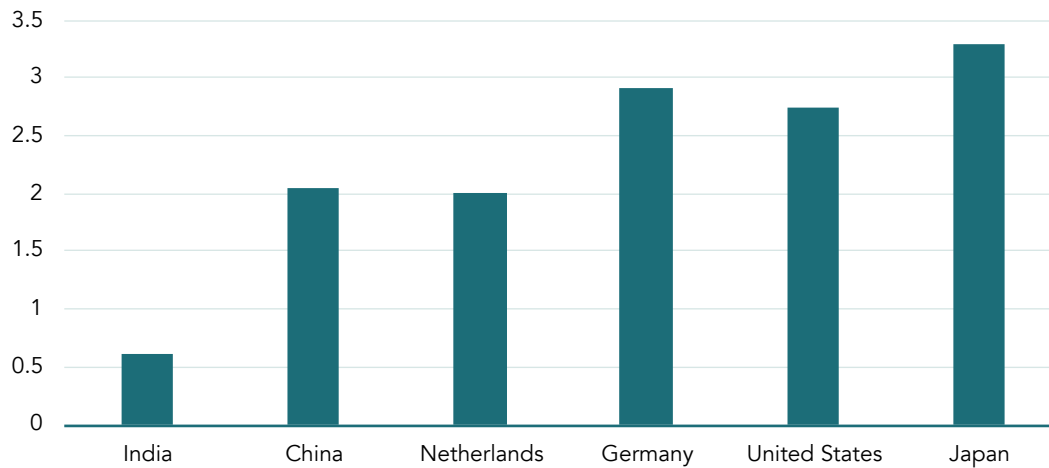
One of the most important aspects of the policy environment for R&D is intellectual property rights protection. Since the vast majority of R&D funding comes from industry, it is aimed at developing commercial innovations – new technologies for providing goods and services. The logic of IPR protection is to provide a *temporary* monopoly for the innovator. This is necessary to create a financial incentive to innovate. If innovations could be instantly copied, then there would be no incentive for R&D. On the other hand, once innovations exist it is socially optimal for them to diffuse, and for that reason IPR protection tends to be temporary and imperfect, allowing reasonable offshoots to develop quickly. One of the striking

differences between the advanced economies and emerging markets is in the quality of IPR protection. All of the top innovative economies score very highly on an index of IPR protection from the Intellectual Property Rights Alliance (Figure 7.11). Emerging markets such as Argentina, Brazil, China, India, Indonesia, and South Africa lag well behind. For countries like China that have made progress with the *inputs* of innovation, such as STEM graduates and R&D spending, improving IPR protection should be a key priority in order to get the greatest innovation output from the effort.

The most technologically advanced countries have seen their DVARs decline in recent years as they make proportionally more use of imported inputs. These economies also tend to have large shares of services in their exported value added. This rising service share reflects two factors: first, there is growing service content embodied in manufactured products, such as software in automobiles and appliances; second, as value chains become more fragmented, services such as finance, telecom, and transport are increasingly important in managing value chains. Given these trends, it is not surprising that the most technologically advanced countries tend to be very open to trade and investment in services. In these sectors trade and investment tend to go together because it is hard to trade most services without an investment presence.

The OECD calculates a direct investment restrictiveness index for whole economies and for particular sectors. The advanced economies that make up the OECD are open in virtually all sectors. Emerging markets, on the other hand, tend to be fairly open in manufacturing but still somewhat closed in services such

FIGURE 7.10 R&D as a share of GDP (2015)

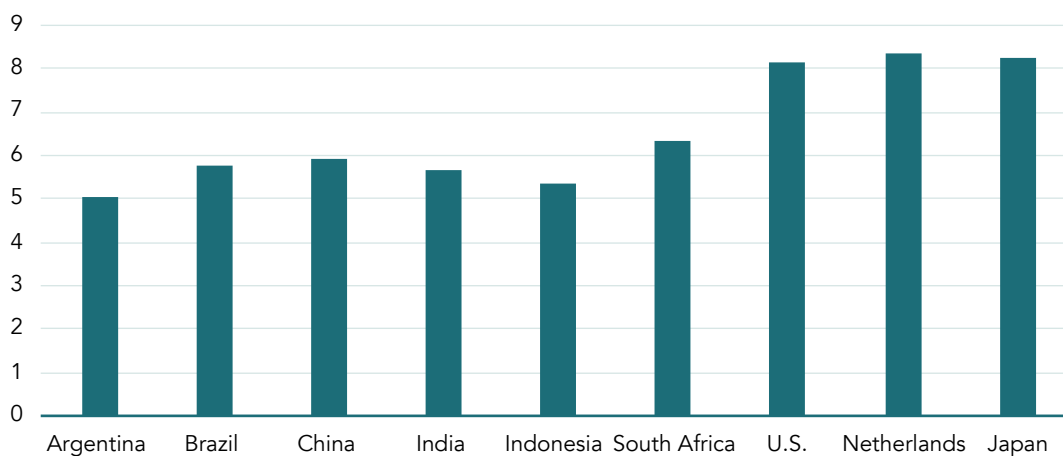


Source: World Bank (2018).

as telecom and finance (Figure 7.12). This is particularly true for China, which overall is the most closed among major emerging markets. Countries such as India and Indonesia are not as closed as China, but far from OECD levels. Argentina, Brazil, and South Africa all tend to be more open. In the case of China, there is

firm-level evidence that the closed service sectors have low productivity levels and growth rates. Hence, the protected strategy consigns China to poor-quality services that then make it more difficult for other sectors, including manufacturing, to reach international quality.

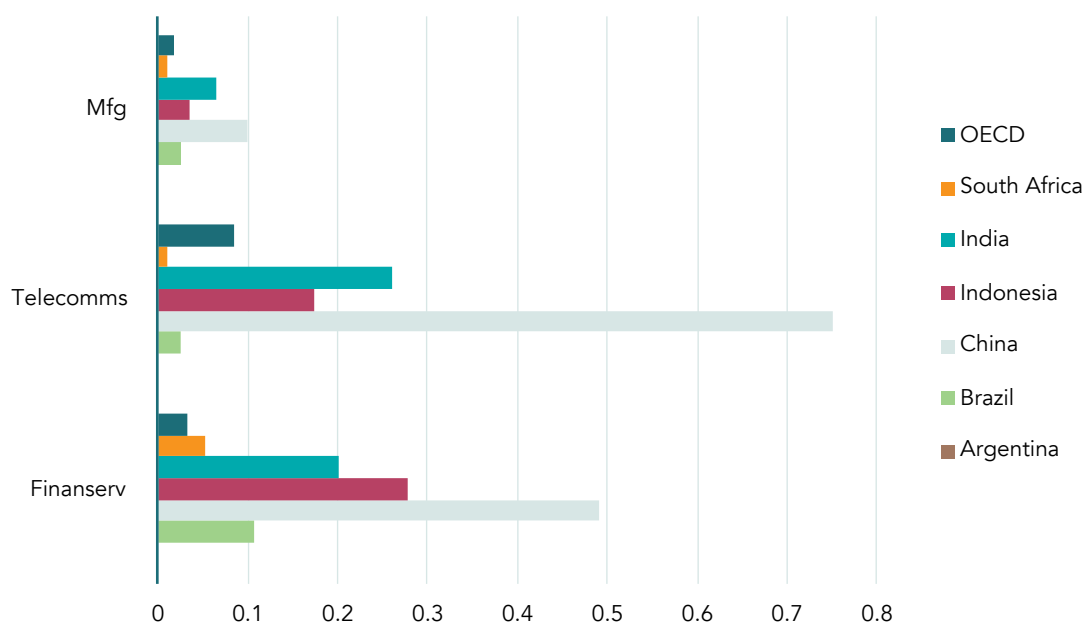
FIGURE 7.11 IPR protection index (2018)



Source: <https://www.internationalpropertyrightsindex.org/>

FIGURE 7.12 FDI restrictiveness index for manufacturing, telecom, and financial services (2018)

(0= open, 1= closed)

Source: <https://stats.oecd.org/Index.aspx?datasetcode=FDIINDEX#>

Concerns that China is not as open as other major economies have been compounded by the *Made in China 2025* program. This plan, from the Ministry of Industry and Information Technology (MIIT), aims to transform China into a hi-tech powerhouse and focuses on ten industries:

- Artificial intelligence and quantum computing
- Automated machine tools and robotics
- Aerospace
- Maritime equipment
- Modern rail transport equipment
- Self-driving and new energy vehicles
- Power equipment
- Agricultural equipment
- New materials
- Biopharma and advanced medicine

MIIT's plans call for rising domestic content for these sectors. Other Chinese officials emphasize that these are indicative, not mandatory targets. Mandatory domestic content requirements would be a WTO violation. The IMF discussed these issues with Chinese authorities during the 2018 Article IV consultation: "The authorities stressed that their plan to develop strategic sectors would be market-based.... The authorities clarified that the government did not set mandatory targets for domestic content.... They emphasized that domestic and foreign companies would be treated equally in China's effort to update its industrial sector, noting that industrial policies needed to be market-oriented." (p. 22)

Still the *Made in China 2025* program, along with China's ongoing investment restrictions, have created some confusion about the direction of policy. China is likely to get the most out of its impressive investment in STEM students and R&D if it opens the remaining sectors of the economy and continues to improve IPR protection. If, alternatively, it tries to artificially pump up the domestic content of favored sectors, that is likely to be a recipe for slow technological advance and ongoing trade conflicts.

Every economy in the world has an opportunity to join GVCs irrespective of the type of human and physical capital available in the economy. If the domestic economy has relatively higher skilled workers like Singapore or Hong Kong, China, they will join the GVCs at higher value-added segment like designing or high-end services (like marketing, financial etc.). On the contrary, if the economy has relatively more unskilled workers, it would join the GVCs in lower value added segments like assembly and packaging. Even if the economy joins at the lower value-added segment, it still helps the economy to generate more and better job opportunities for the unskilled workers. Every country needs to assess how skilled (or unskilled) the workforce is, which region it is located in and what comparative advantage it can exploit to join the GVCs in a specific sector. Once it is integrated, to enhance the value-addition (or move up the value-chain), following the Chinese example, the domestic economy needs to invest in upskilling workers, R&D and technology adoption by firms, as well as supporting ICT and physical infrastructure by converting comparative advantage into competitive advantage. If the

economy tries to increase the DVA in exports by artificially supporting the inputs/intermediates by using tariffs and non-tariff measures, it will increase the cost of production and make the product less competitive in the international market, resulting

in reduced demand for the product as well as workers in the exporting sector and will also affect the productivity and quality of the domestic firms as well, adversely affecting the welfare in the society.

Notes

1. It is common practice to present the aggregate trend for domestic content in exports, and then for manufacturing as most trade take place in this sector. Following Johnson and Noguera (2016), the total economy is grouped into four categories, Agriculture, Forestry, and Fishing, Non-Manufacturing Industrial Production, Manufacturing, and Services.
2. Though, this difference in policy is not the only reason for poor exporting performance by Pakistan but one of the primary reasons. During the same period, Pakistan experienced many security issues and crippling power outages.
3. We are using 2014 as it is the latest year in GTAP (version 10) database, recording the data for these two economies
4. The aggregate DVA for Bangladesh (67.6%) is also lower as compared to Pakistan (82.6%) despite having higher total exports as well.

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Improving the accounting frameworks for analyses of global value chains

Nadim Ahmad (OECD)

ABSTRACT

The use of global input-output tables, and the creation of Trade in Value-Added (TiVA) statistics, has greatly improved our understanding of the fragmentation of global production through value chains. However, their application requires a number of assumptions that, in practice, typically understate the degree of interconnectedness. TiVA estimates implicitly assume identical production functions across firms within an industry, when in reality production functions differ considerably. Typically, larger (and foreign-owned) firms tend to be more trade oriented than smaller (and domestically-owned) firms. As a result, TiVA statistics underestimate the import

content of exports for the economy as a whole, a key indicator characterizing global production. Moreover, TiVA analyses are based on basic price concepts, which provide an appropriate view of production through value chains, but are less well equipped to analyse consumption, particularly as they exclude significant distribution margins (in particular retail and wholesale activities, often including marketing activities and brands), which add value at the end of the chain. This can distort analyses using “smile curves”, which show the distance from final demand of different sectors within value chains, and in turn understate the scale of jobs supported by trade.

- Trade in Value-Added (TiVA) statistics have greatly improved our understanding of GVCs, but they use assumptions that generate typically downward biases in measures of GVC integration, and they give little information regarding the investment strand of GVCs.
- Efforts to mainstream key characteristics of different types of firms in the production of tomorrow’s TiVA models, through extended supply-use tables, should be prioritized, to improve not only their relevance, but also their quality.
- Efforts to complement TiVA estimates currently based on basic prices with estimates based on market prices should also be initiated, not only to ease interpretability, but also to highlight the significant role played by distributors and to better understand the role played by intellectual property. Market-based approaches, for example, reveal that 9 million jobs are sustained in the United States through sales of imports.

1. Introduction

The proliferation and development of global input-output tables in recent years has significantly transformed our ability to interpret global production. But important though such initiatives have been, it is important to recall that they are analytical tools, requiring implicit and explicit assumptions on the detailed interactions of consumers and producers, and indeed, in their current form are silent on many drivers of globalization, such as the role of multinationals, and on impacts, for example with respect to “inclusive globalization”.

Trade in Value-Added (TiVA) estimates, derived through the construction of a global input-output table, implicitly assume that all firms within a given sector have the same production function (input-output technical coefficients), import intensity and export intensity.

This of course has never been true. We know for example that larger firms will typically have different production functions to smaller firms, because of economies of scale, and also higher labor productivity. And these firms will also typically be more export- and, indeed, import-orientated than their smaller counterparts (reflecting in part the disproportionate costs of trade faced by smaller firms compared to larger firms). The same generalizations hold true for foreign-owned enterprises, or enterprises with affiliates abroad, compared to purely domestic firms; for example, the foreign content of exports by foreign-owned firms in the other transport equipment sector in the United States is twice that of domestically-owned firms.

That is not, of course, to say that the underlying conceptual basis for TiVA is incorrect. If, for example, global input-output tables were compiled at the firm level, with appropriate breakdowns to reflect the specific products and the (often differential) prices paid by consumers (as well as differences in transportation costs), then the corresponding results would accurately reflect the underlying reality they seek to measure. But, for many practical reasons¹, this is some way off what happens in practice. Further, the inability to capture this heterogeneity in current TiVA measures is increasingly compounded by additional complexities, notably the increased scope for multi-nationals (MNEs) to maximize global profits by recording intra-firm transactions in knowledge-based services in a way that is most advantageous to the firm. In practice this means that these types of intrafirm transactions can be recorded explicitly as cross-border trade or (and so outside of the TiVA system) as primary income flows.

But this is not the only area where there are challenges with the use of current TiVA statistics. Because inter-country input-output tables value transactions at *basic*, and not *market*, prices, many of the related TiVA analyses reveal only part of the story. For example the US domestic value-added content of its exports of textiles and clothing, in free-on-board (F.O.B.) prices, was around 20% in 2016 using market prices, compared to 3% using the pure basic prices approach. The basic price approach also limits the scope to reveal additional dependencies related to globalization, for example jobs sustained in retailers through sales of imports.

This chapter highlights the importance of developing extensions to current TiVA frameworks (Section 2) that are better able to capture firm heterogeneity, and, in turn, better highlight the importance of multinational enterprises (MNEs) within GVCs. It also explores the development of a complementary accounting framework in “market” prices and tries to illustrate the insights that can be gained through such an approach (Section 3). In the United States the sale of imports generated an additional 840 billion USD of US value-added in 2016, supporting 9.0 million jobs.

2. Accounting frameworks for global value chains: extended supply-use tables

2.1 Overview

The increasing international fragmentation of production that has occurred in recent decades driven by technological progress, reductions in trade costs, improved access to resources and markets, trade policy reforms, and indeed cost factors in emerging economies, has challenged our conventional wisdom on how we look at and interpret globalization. For example, traditional measures of trade record gross flows of goods and services each and every time they cross borders, leading to what many describe as a “multiple” counting of trade, which may lead to misguided policy measures in a wide range of policy areas. In response to this, the international statistics community has begun to develop new measures of trade on a value added basis, for example the OECD-WTO TiVA database, WIOD, APEC-TiVA and the European FIGARO initiative.

But important though such initiatives are, they are only able to respond to one aspect of the globalization debate. Significant attention, for example, is focused on the role of multinationals in this new landscape, and, on this, with the exception of recent exploratory initiatives², current available, and in particular official, statistics that follow the TiVA approach are silent. Of particular relevance in this context is the ability of multinationals to shift intellectual property products, such as software and R&D, from one economic territory to another, raising broader questions on the ability of GDP to accurately describe “meaningful” economic activity, with concomitant impacts on other macro-economic statistics, including TiVA. For example, TiVA measures purport to show how (in which industries) and where (in which territories) value is generated in the production of a good or service. The simple relocation of an intellectual property product from one economic territory to another³ can radically alter that view.

In addition, the policy debate in recent years has increasingly focused on what has become referred to as “inclusive globalization”, i.e. the growing realization that the benefits of globalization may not have accrued to all members of society equally, even if only as a process of transition. The challenges of inclusive globalization require that the impacts on people (in other words, workers) are also captured in our statistics. This requires information on skills, occupations, and compensation paid to these categories of workers.

2.2 Improved accounting frameworks for GVC analyses

More fundamentally, there is a growing appreciation that the statistical compilation tools and accounting frameworks designed and developed over the last 60 years in various manifestations of the System of National Accounts (SNA), despite their significant advances, may reflect a world that no longer exists.

In the early days of the SNA, the rest of the world was recorded as a separate institutional sector to and from which goods were sold and bought; and such a view was largely sufficient. But over the years as global production chains and interconnectedness grew, there was a growing realization that additional information was needed to properly navigate around the economic landscape, which resulted in the development of new areas of statistics, such as foreign direct investment measures and data collections focusing on inward and outward activities of foreign affiliates statistics (FATS). More recently new data collections, or rather compilations, have focused on linking trade and business registers to provide insights on which firms in which sectors engage in imports and exports (referred to as Trade by Enterprise Characteristics).

These more recent innovations have significantly improved our collective understanding of trade, and indeed investment, but they are still to a large extent only a partial solution to the statistical challenges presented by globalization.

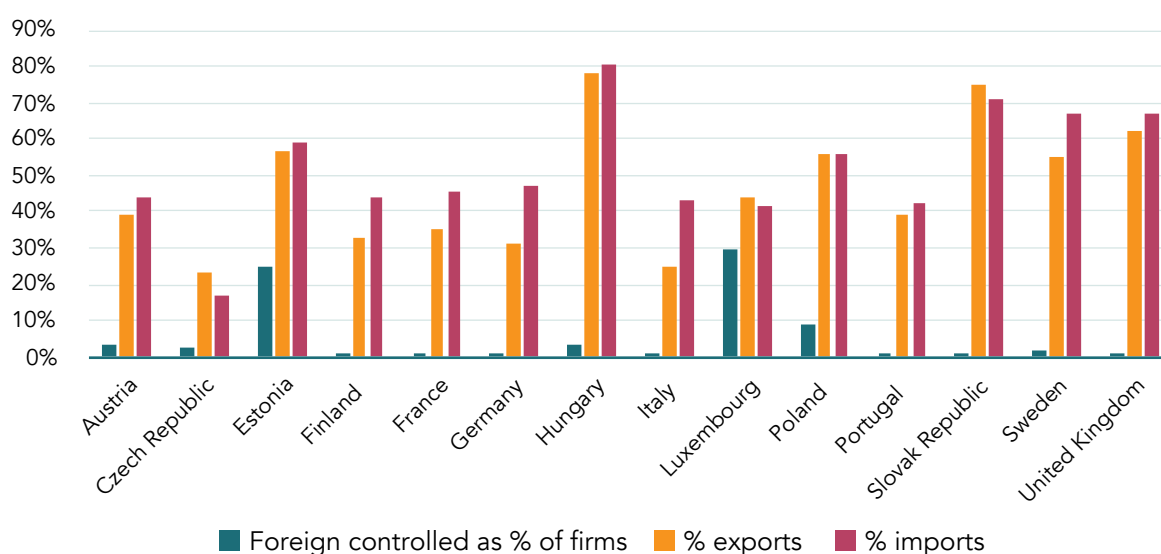
The development of TiVA type statistics is certainly a step forward in this area, but these too suffer from the stove-pipe approach. TiVA estimates, derived through the construction of a global input-output table, implicitly assume that all firms within a given sector have the same production function (input-output technical coefficients), import intensity and export intensity.

This of course has never been true. We know for example that larger firms will typically have different production functions than smaller firms (because of economies of scale) as well as higher labor productivity. And these firms will also typically be more export- and, indeed, import-orientated than their smaller counterparts (reflecting in part the disproportionate costs of trade faced by smaller firms compared to larger firms).

The same generalizations hold true for foreign-owned enterprises, or enterprises with affiliates abroad, compared to purely domestic firms; indeed in many countries MNEs account for the lion's share of overall trade (Figure 8.1). But TiVA estimates, relying as they do on national Supply-Use and Input-Output tables, cannot reflect these heterogeneities; meaning that key measures, such as the import content of exports are typically downward biased.

Moreover, the very process of globalization has increased the scale of these heterogeneities, driving coach and horses through the assumption of homogeneity within sectors. As firms within sectors increasingly specialize in specific tasks in the production process, they also suck in greater imports from the upstream part of the value chain and have greater export orientation. In addition globalization has itself led to an increased prevalence of (once rare) categories of firms such as *Factoryless Producers* and *Processors*, where recent changes in the accounting system further weaken the case for assumptions of homogeneity in technical coefficients. For example, all other things being equal, a processing firm in one sector will have significantly less (recorded) imports than a non-processing firm producing the same final product. Similarly, a *Factoryless Producer* will be allocated to the distribution sector (with limited intermediate consumption of

FIGURE 8.1 Foreign-owned firms across economies (2011)



Note: Foreign-owned firms are defined according to FATS/AMNE 50% thresholds.

Source: OECD Trade by Enterprise Characteristics.

goods) but the same firm that chooses to buy the material goods used by the processing firms will be allocated to the manufacturing sector (with significant intermediate consumption of goods).

The ability of national (and international) Supply-Use and Input-Output tables, based on industrial groupings alone, to describe how demand and supply relationships are related has therefore become more difficult. Typically, in confronting the problem of heterogeneity, the conventional approach has been to provide more detail by aggregating firms at lower levels of the industrial classification system, for example 3 or 4 digit groupings as opposed to two digit groupings, subject to confidentiality restrictions being preserved. But this approach may not be optimal, neither in terms of reducing heterogeneity within aggregations (and in a way that best responds to the policy drivers) nor necessarily in terms of processing burdens.

That is not to say that industrial classification systems are completely obsolete. It would serve little purpose for example to devise an optimal system that did not retain some means of classifying firms on the basis of their activity, (e.g. manufacturing versus services) if only because these remain the key prisms that users look through when analyzing production. But it does serve to highlight that other approaches to tackling heterogeneity can, and should, be considered.

Arguably a more radical approach is needed. Such an approach requires that the role of foreign affiliates in the economic territory, which is significant in many economies, Figure 8.2, and affiliates abroad are captured explicitly (and visibly) in the core accounts and in the development of GVC-related (i.e. TiVA) indicators. It also requires improved information on the trade relationships of categories of firms (for example exporter and non-exporter). Equally important is the need to fully articulate income flows in

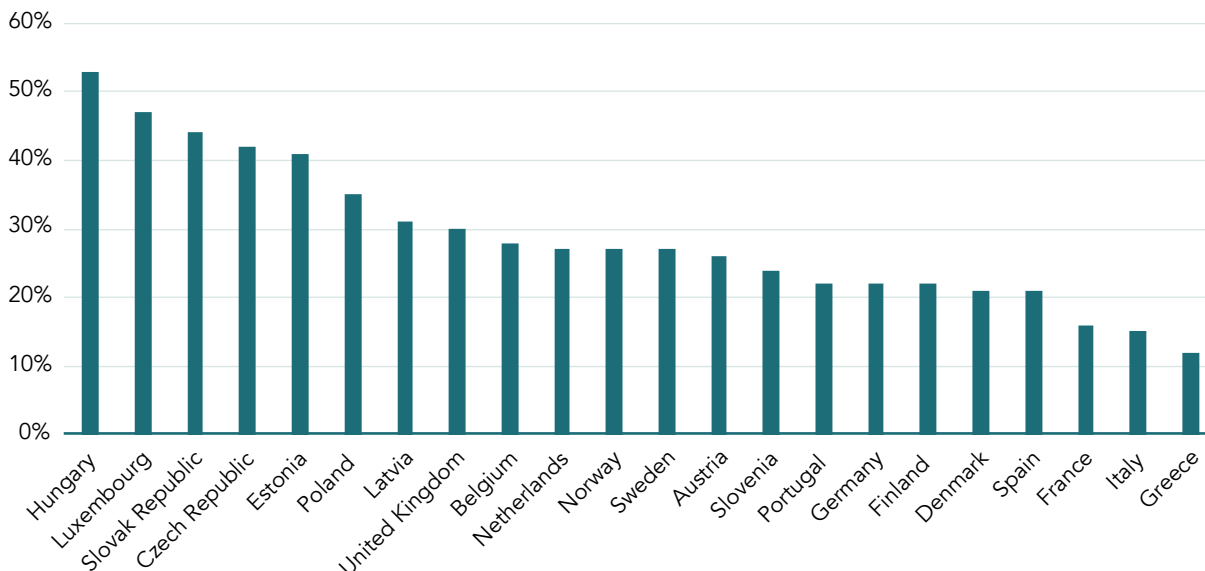
and out of the economy and, in particular, from which category of firms (e.g. industrial sector) these arise.

In this sense it is important to note that value added essentially reflects two main components⁴ – (i) operating surplus (including mixed income), or compensation for capital, and (ii) compensation for employment. While the latter component largely reflects the direct benefits that accrue and “stick” within the economy through production⁵ the case is not so clear for the former, where foreign affiliates are concerned.

In perfect markets the operating surplus generated by foreign affiliates is equivalent to the return on produced “tangible” and “intangible” capital and also non-produced assets used in production⁶. While the National Accounts of countries attribute the ownership of this capital to the affiliated enterprise, the ultimate beneficiary of the operating surplus is not necessarily the affiliate but its parent. This has raised questions – often in emerging economies but also in developed economies – about the actual benefits of foreign MNEs to the host economy. Indeed, more recently it has begun to raise questions about the meaningfulness of GDP itself as a tool for macro-economic policy making.

Particularly important in this regard are transactions in intangible assets: those recognised as produced in the SNA (such as research and development, software, etc.), non-produced (such as brands) and also other knowledge-based capital (such as organizational capital, e.g. management competencies). Often, in international trade in services statistics, payments for the use of these produced and non-produced assets are recorded as purchases (intermediate consumption) by one affiliated enterprise from another. But often they are not, and instead they are implicitly recorded under primary income payments (such as investment income, or reinvested earnings in the Balance of

FIGURE 8.2 Value Added at Factor Cost of Foreign Affiliates – share of national total, 2014 (ISIC B-N, ex K)



Source: OECD AMNE database.

Payments). In the former case, the value added of the affiliate using the assets is lower, as the value added generated through ownership of the asset appears on the accounts of the affiliate that owns it. In the latter case, however, the value added of the affiliate using the asset is higher (as there is no intermediate consumption) with the “ultimate” beneficiary (the owning affiliate) recording no value added but instead receiving primary income from the using affiliate. In both cases, however, the ultimate “income” generated by the asset ends up on the books of the owner (at least in theory, as even the very notion of the ultimate owner is a complex issue).

Furthermore, the distinction between the two scenarios above is often clouded by (a) the ability of the statistical information system to record the flows and (b) transfer pricing and tax incentives of MNEs. Indeed, in some countries where foreign affiliates generate significant value added and repatriate significant profits back to parent companies the policy focus has switched from GDP to GNI, and indeed in some countries, such as Ireland, to new accounting concepts⁷.

This is not however an issue singularly related to knowledge-based assets. Transfer pricing is also prevalent in transactions related to goods. Moreover, notwithstanding these issues, significant income flows generated by an affiliate can be repatriated to parents via other means, for example as interest payments.

The tool advocated in the SNA for ensuring coherence across various data sources to assure alignment of GDP estimates created by the income, expenditure and production approach is supply-use tables, the same underlying core statistical input required for TiVA estimates. As shown in this chapter, through (in principle) simple extensions to conventional supply-use tables, *Extended Supply-Use Tables* (ESUT) provide the ideal basis for bringing together these various domains into a single, integrated economic accounting framework that puts the measurement of the “global” at the heart of the “national”.

2.3 National examples of extended supply-use tables

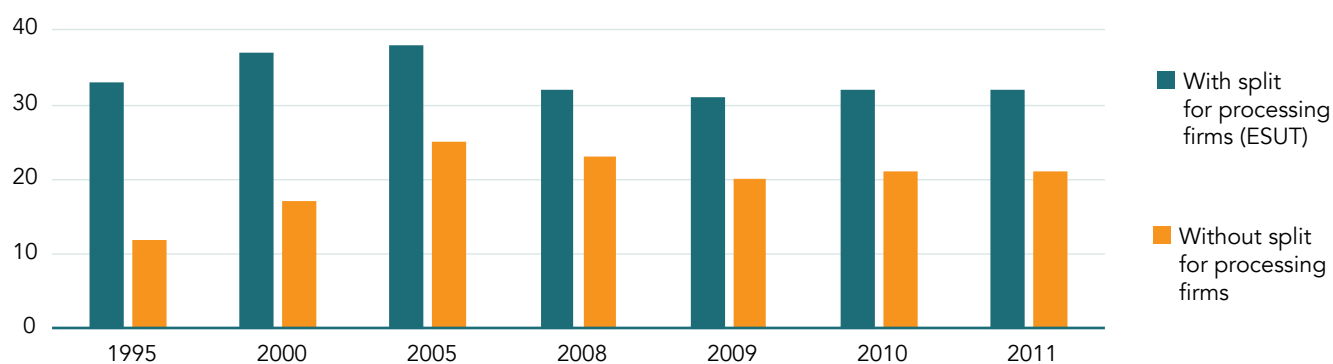
It is important to stress that the recognition that greater heterogeneity (disaggregation of firms) within national supply-use and input-output tables is not of course new. It stands to reason that more detailed tables will produce better results. Indeed Chapter 14 of the 2008 SNA provides a presentation of Supply-Use tables that differentiate production on the basis of market output, non-market output and production for own-final use. Historically and certainly prior to the explosion in GVCs, capturing heterogeneity was typically achieved through more detailed splits of industries. What has changed in recent years is the greater appreciation that a focus on the industries of firms is not necessarily best nor indeed optimal. Indeed, in 2011, even before the OECD-WTO released their first TiVA database in January 2013, it had become clear that a new approach to heterogeneity was needed, in particular one that focused on the role of MNEs.⁸

These earlier discussions, and indeed the first release of TiVA, highlighted the importance of looking anew at national statistics compilation systems, with the OECD moving, in 2014, to create a new expert group of countries that would begin to develop what have become known as ESUTs; in other words accounting tools for a coherent view of trade, investment, income and production (for a detailed exposition of the accounting framework of ESUTs see Ahmad 2018). What follows below are national examples⁹ illustrating the potential (and indeed actual for China and Mexico, whose extended tables are already integrated into the OECD-WTO TiVA database) impact of improved heterogeneity on TiVA estimates.

Results for China

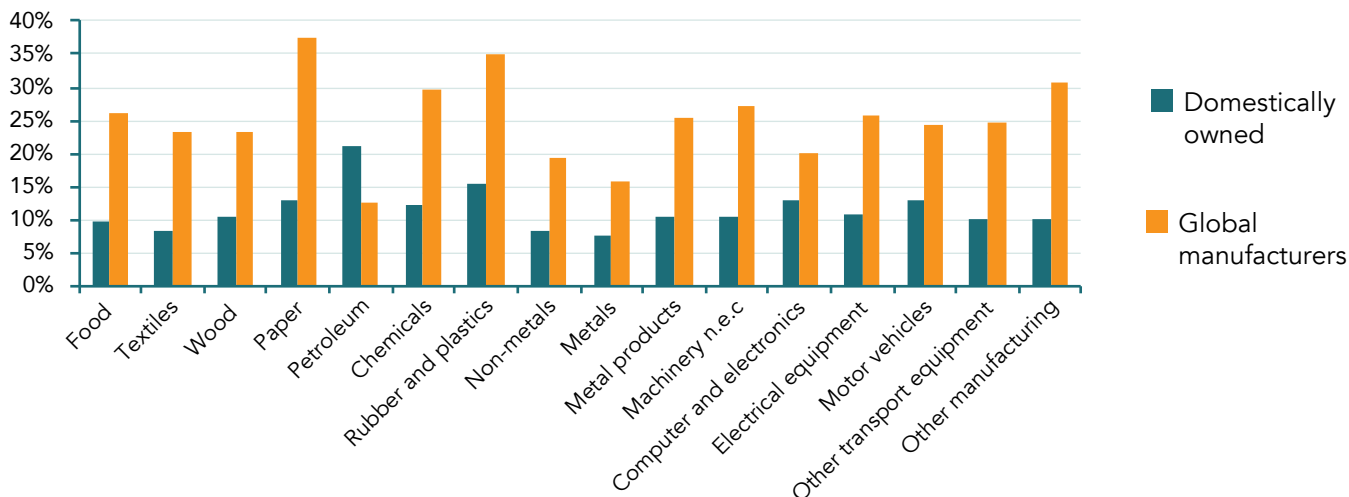
China has worked to develop extended supply-use tables that differentiate between three categories of firms – exporters operating within the Customs Processing regime, other exporters, and non-exporters. Figure 8.3 below reveals significantly different movements in the trend of the foreign content of China’s

FIGURE 8.3 Foreign value-added content of China’s exports



Source: OECD-WTO TiVA (May 2013 version).

FIGURE 8.4 US value added content of Mexico’s exports % (2011)



Source: Based on Mexico’s Extended SUT.

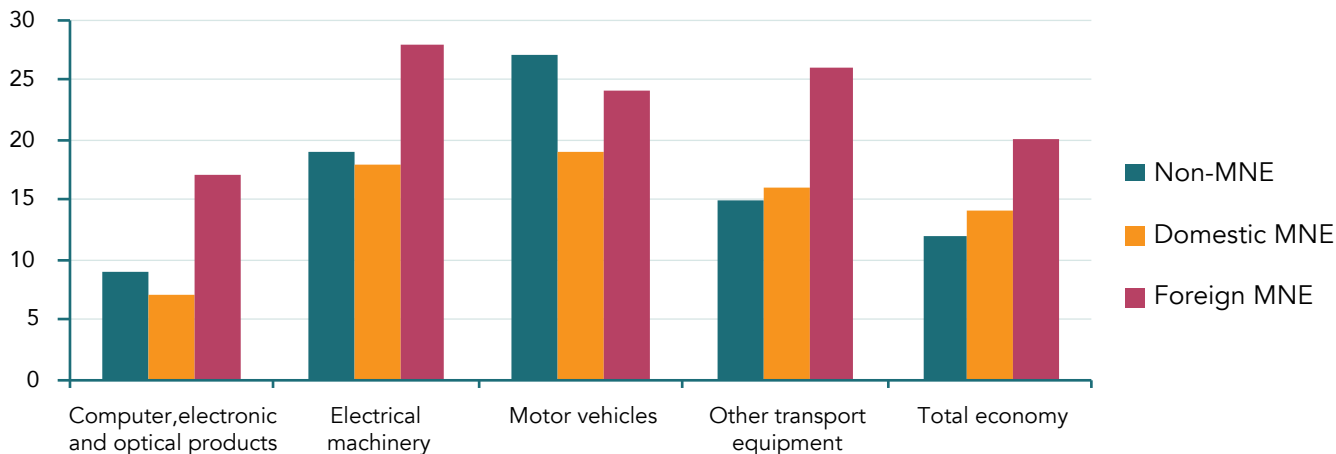
exports over the last two decades when comparing estimates based on extended SUTs (referred to as ICIO) and pure national tables without a breakdown (referred to as national).

Results for Mexico

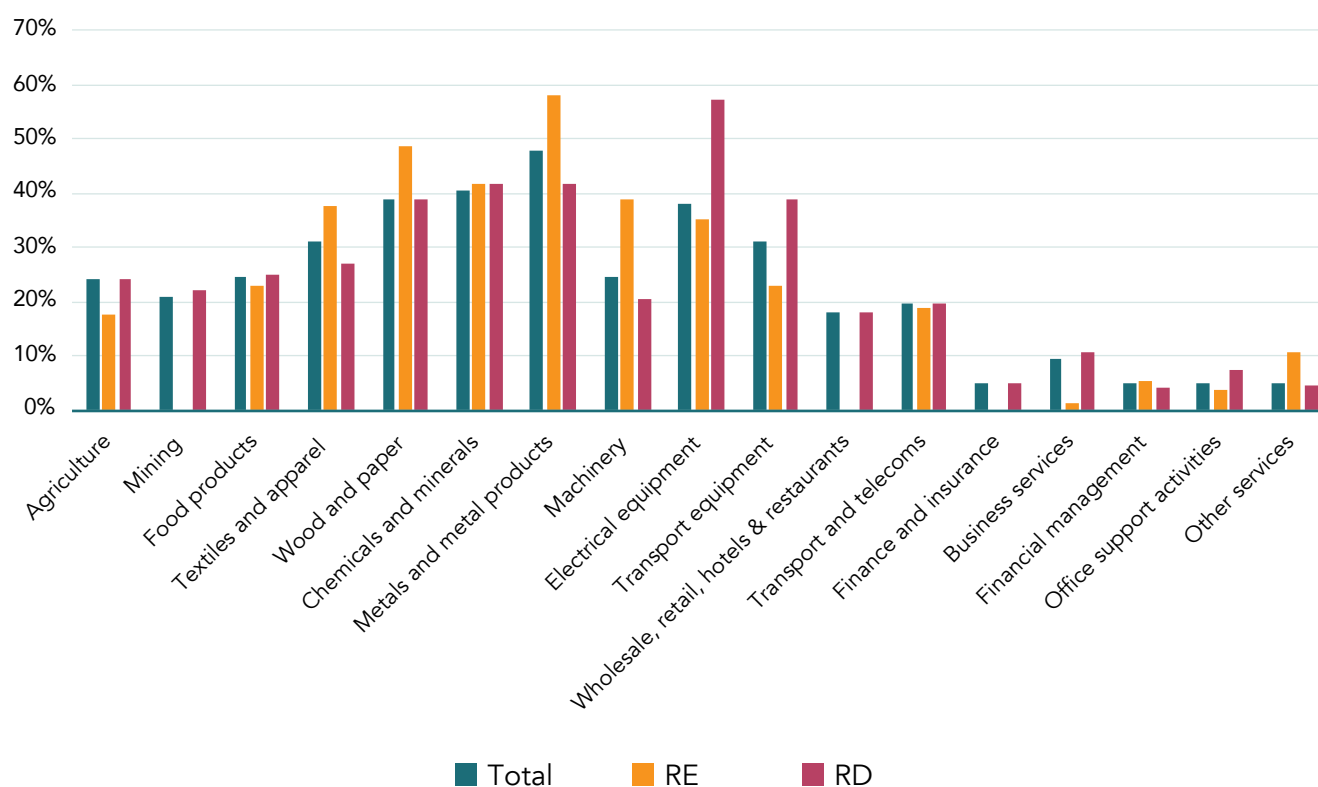
Mexico (Instituto Nacional de Estadística y Geografía – INEGI) have produced a categorization of firms referred to as global manufacturers¹⁰ that: a) import the majority of their purchases (imports account for at least 2/3 of their export value); b) produce only for exports; and c) are controlled by a foreign owner. These global firms were responsible for 55% of total

imported intermediate consumption and for 71% of gross exports of the Mexican manufacturing sector in 2008. Almost by definition the import content of Mexico’s global manufacturing (GM) firms is significantly higher than comparable firms in the same sector. This can have a significant difference on highly policy relevant indicators, for example, on measures of the US content of Mexico’s exports (Figure 8.4), where one-quarter of the exports by GM firms in the motor vehicle sector reflect upstream US contributions, compared to around half that amount for non-GM firms; this relationship is seen across most activities.

FIGURE 8.5 Foreign content of US exports, % (2011) (selected industries)



Source: Based on the US Extended SUT.

FIGURE 8.6 Foreign content of Costa Rica's exports, % (2012)

Source: Based on Mexico's Extended SUT.

Results for the United States

The United States (Bureau of Economic Analysis) has developed Extended SUTs with a three-way classification of firms reflecting ownership structures, that differentiate between foreign-owned affiliates operating in the US, domestically-owned MNEs, and domestically-owned firms with no affiliates abroad.¹¹ Results for the United States also reveal significant differences between the foreign content of exports across categories of firms defined by ownership structure. At the whole economy level the foreign content of US exports by foreign-owned firms is almost twice that of domestically-owned non-MNEs. This partly reflects compositional effects, but the foreign content is higher across nearly all activities (Figure 8.5)

Results for Costa Rica

A similar picture of strong heterogeneity emerges for Costa Rica, whose ESUT differentiates between firms operating from free trade zones (referred to as RE in Figure 8.6) and firms operating outside of foreign trade zones (FTZs) (referred to as RD). The results show that RE firms have a higher import content of exports than RD firms across a range of important export activities.

Results for Canada

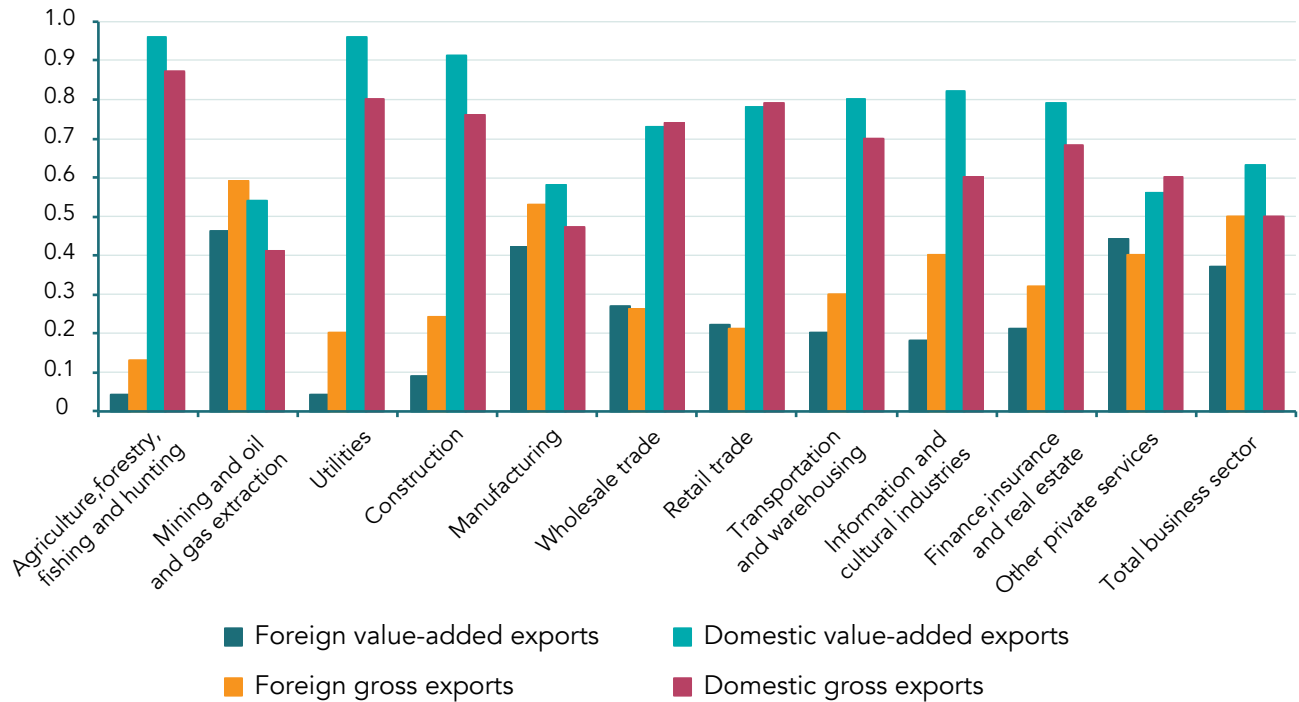
Results from a recent collaboration between the OECD and Statistics Canada reveal that the impact of compiling ESUT estimates for the business sector, accounting for either ownership or trading status, was an increase in the overall foreign value added content of Canada's exports of 4 percentage points. Figure 8.7, which shows that foreign-owned firms are responsible for a lower share of exports in value-added terms than in gross terms, highlights this higher propensity to import by foreign-owned firms, and, of course, the importance of capturing improved firm heterogeneity in national SUTs.

Results for Nordic countries

In a recent collaboration between 5 Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) and the OECD, the OECD developed extended SUTs with three variants of firm breakdown:

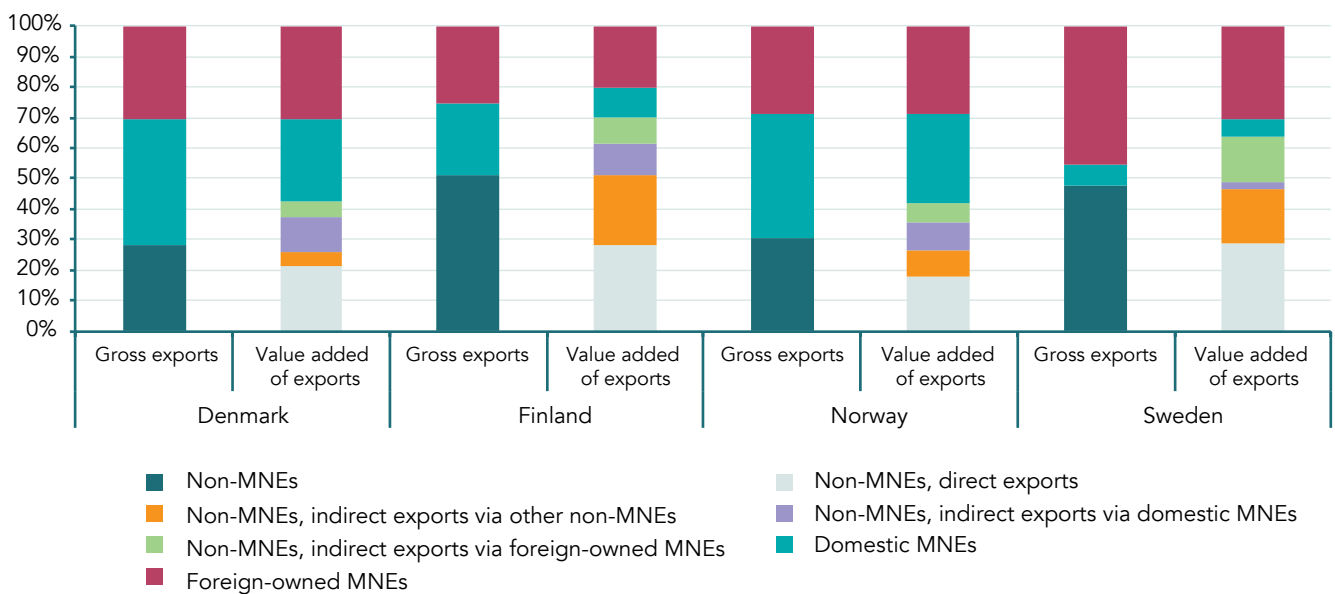
- By size class: micro, small, medium and large, further broken down by whether the micro, small and medium firms were independent or part of a larger enterprise group.
- By trading status: non-traders, two-way traders, importers and exporters

FIGURE 8.7 Share of gross and value-added exports by ownership status, % (2010), Canada



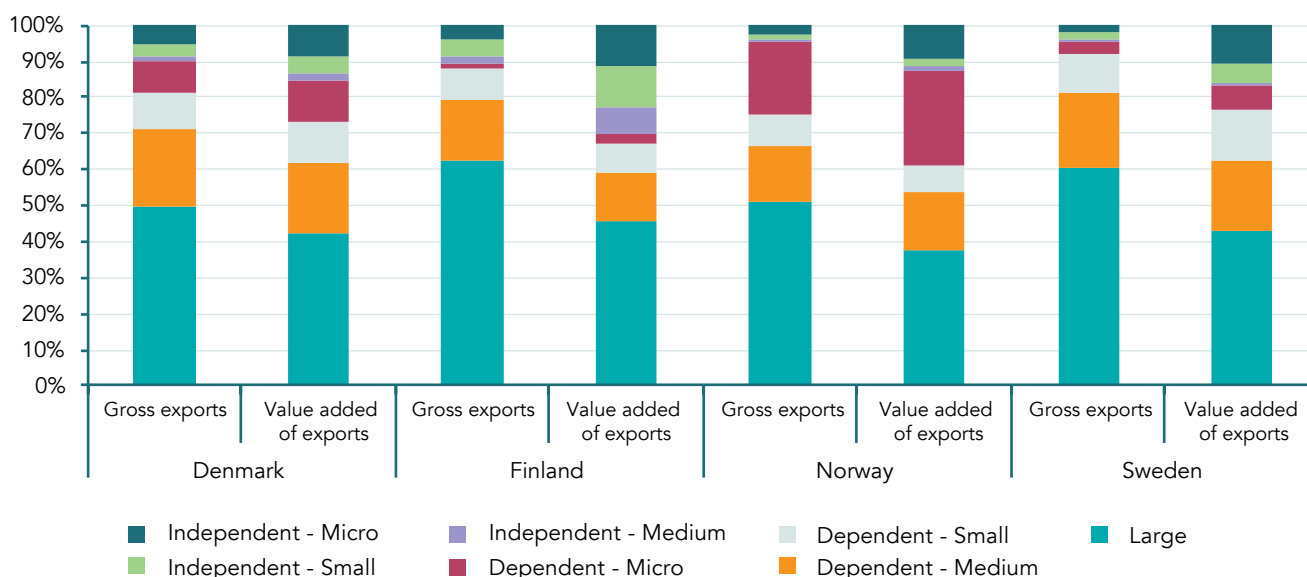
Source: OECD/Statistics Canada.

FIGURE 8.8 Exports in gross and value-added terms, % (2013), by ownership structure



Source: Nordic Countries in global value chains, 2017.

FIGURE 8.9 Exports in gross and value-added terms, % (2013), by size class



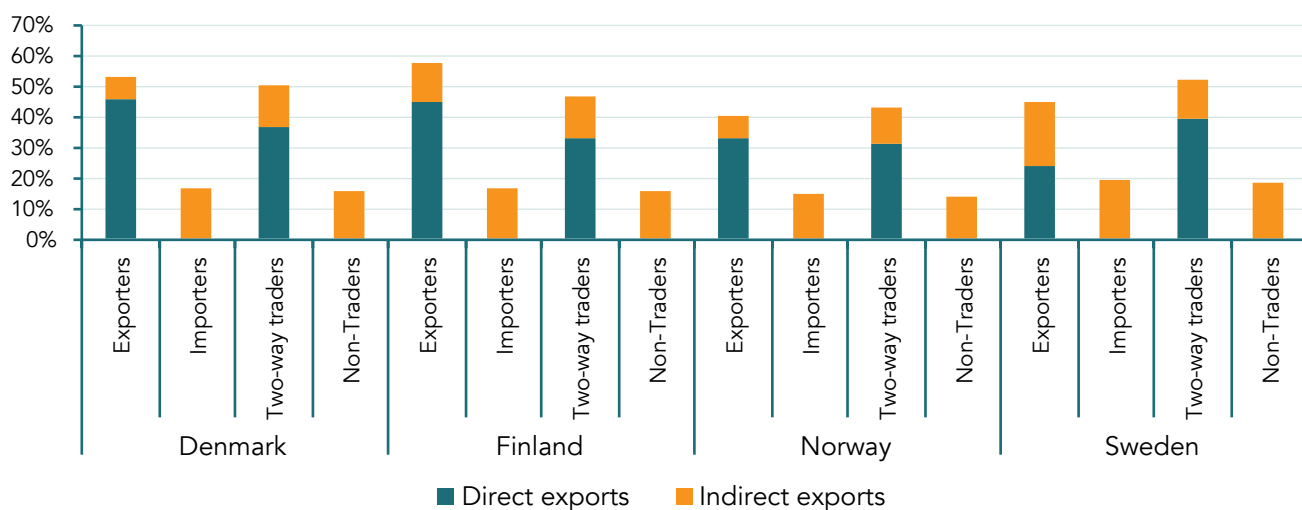
Source: Nordic Countries in global value chains, 2017.

- By ownership status: non-MNEs, domestic MNEs and foreign MNEs.

Highlights from this collaboration are presented below as Figures 8.8-10. Figure 8.8 reveals the significant upstream integration of non-MNEs across all countries, compared to integration seen looking purely at gross trade relationships. Of particular note is the fact that in all countries bar Sweden this integration is primarily channeled via domestic MNEs; in Sweden the main link is through

foreign-owned MNEs, in large part reflecting scale. Figure 8.9 presents a similar picture showing the higher integration of smaller firms in GVCs when seen in value-added terms, through their upstream integration as suppliers to larger exporting firms. Figure 8.10 presents information on jobs sustained through integration in GVCs. A significant insight from this presentation is the fact that even within firms that have no direct exports, around one in six of all jobs in these firms are dependent on foreign markets.

FIGURE 8.10 Jobs embodied in exports, % of total (2013), by trading status



Source: Nordic Countries in global value chains, 2017.

2.4 Concluding comments

The statistical challenges of globalization are profound, and it has become increasingly clear in recent years that conventional approaches used to understand how economies work can no longer rely solely on national statistics. Increasingly, in order to understand how economies work and how to target and create industrial policies focusing on competitiveness, it is necessary to see the whole. National statistics build pictures based on interrelationships between producers and consumers and the rest of the world. But these relationships, particularly those with the rest of the world, have become increasingly more complex, and, as such, there is an increasing need to consider global production within a global accounting framework. This implies a departure from the traditional role of international organizations as compilers of internationally comparable national statistics, such as national input-output or supply-use tables. Instead, it requires that they bring together these national tables to create a global table.

Although TiVA estimates have been able to shed important light on our understanding of international trade and its relation to activity and competitiveness, in particular the importance of recognizing the importance of imports to exports, and, so, the hitherto hidden costs of protectionism as well as the benefits of trade liberalization, particularly in services, they do not reveal the full picture. With significant shares of exports being driven by foreign affiliates, TiVA estimates have also revealed the importance of going beyond just value added towards income, in order to capture flows outside of conventional international trade statistics, such as the repatriation of profits related to the use of non-produced knowledge-based assets (e.g. brands) and, indeed, the repatriation of profits related to the use of produced knowledge-based assets (e.g. software) that are (often incorrectly) not recorded as receipts from exports of services.

The emergence of global value chains therefore also raises arguably profound questions about the way national statistics are currently compiled. In the same way that international organizations increasingly need to think “national” in the way they present and compile their statistics, where “national” reflects the single economic territory comprising the “world” or large parts of it, national statistics institutions need to think global.

In other words, in the construction of national statistics greater emphasis is needed on the role of the rest of the world, both as a source of demand and supplier of demand but also with regards to the role of multinationals. This requires a rethink of the way that firms are currently aggregated within statistical information systems, to move beyond the classic aggregation based almost exclusively on industrial classification systems towards more meaningful aggregations that better reflect today’s “global factory”.

Such considerations are also essential not only to better understand the way that global production is today organized but also to better understand how investment drives global value chains, and in particular how that very same investment can lead to difficulties in interpreting trade flows as well as GDP.

Extended Supply-Use tables provide an effective tool to respond to these developments and growing needs. Increasing globalization of production raises challenging questions for national statistics. And fundamental and long-standing axioms regarding the nature of production and the way that statistics are necessarily compiled warrant a rethink. Certainly the evidence suggests that long-standing assumptions concerning homogeneity of firms within industry classifications should be reviewed. The evidence also suggests, particularly for those countries with FATS and TEC data, that an optimal level of aggregation may be achievable without any significant increase in compilation or reporting burden. But, of course, such reconsiderations need also take into account constraints such as burdens and confidentiality.

Supply-Use tables have become the conventional route with which coherent estimates of the national accounts, trade and production are now systematically compiled in many countries and lend themselves as being the ideal way in which to resolve these issues. Extended Supply-Use tables can play a similar role in responding to questions on globalization.

Three final comments, providing a broader perspective, are worth making in this respect. The first concerns the quality of national supply-use tables. In many (most) countries, such tables are derived using a series of assumptions at least in some years, reflecting in part the often different periodic nature of the large number of datasets needed to construct SUTs. Many of these assumptions are based on some underlying view of stability and homogeneity in production functions. As shown, globalization is increasingly undermining the strength of these assumptions. Looking again how the homogeneity is likely to manifest itself across firms and creating SUTs based around these categorizations of firms can greatly help to mitigate these effects and strengthen these assumptions, which will remain necessary, perhaps indefinitely, across most countries. As such, one important benefit of extended SUTs that should not be overlooked is their ability to improve the quality of the core accounts, and indeed GDP. In the same way they are also ideally placed to be able to significantly improve the interpretability of the accounts, in particular, when the accounts are affected by phenomena related to globalization, such as relocations.

The second comment concerns the potential momentum extended SUTs could provide to the development and improvement of statistical business surveys. The evidence shows that significant heterogeneity exists across all categories of firms, and that the conventional stratification variables used in survey sampling (typically activity and size) may be sub-optimal. It may for example be necessary to include additional, but readily available, stratification variables, pertaining for example to ownership (e.g. part of a foreign MNE, domestic MNE, an enterprise group, exporter, non-exporter) in designing tomorrow’s surveys.

The third comes back to the issue of the statistical unit. The current 2008 SNA preference for the establishment should not be a barrier to developing extended SUTs. If for example these can only be developed using a different statistical unit, then countries are strongly encouraged to consider doing so. There is an increasing recognition that the arguments for the current SNA

preference for the establishment have been weakened because of the changing nature of production and indeed because of the changes made in the SNA itself regarding economic ownership. This is further recognized in the 2008 SNA Research Agenda, where explicit references are made for the need to reconsider the establishment preference, taking into account the “basic source information” and changes in the underlying accounting principles of “Input-Output” tables, whose emphasis has moved from a *physical* perspective to an *economic* perspective.

3. A new look at trade in value-added and global value chains: a view from the consumption perspective – what the accounting framework doesn’t tell you

3.1 Overview

In the SNA the recommended price basis for producers, and so, *de facto* in input-output tables, consumers, is the concept of *Basic Price*¹². In very simple terms this is equivalent to the factory gate price, and so excludes any distribution margin not subsumed in the original invoice price of the producer, and that are included in the price paid by the final consumer. Also excluded are any taxes paid or subsidies received on the product sold.

Although superficially benign, the distinction between basic and purchasers prices matters, especially for GVC analysis. Export prices are measured on a free on board (F.O.B.) basis and include any distribution services related to delivery from the factory gate to the port, and organized by the producer, but for input-output tables in basic prices (when these margins are separately invoiced by the producer to the consumer or provided by an intermediary that purchases and then exports the goods) they are removed from the F.O.B. price and are instead re-allocated as separate exports of distribution services (typically recorded as output of transportation services and/or output of the retail/wholesale sector).

On average these margins can be significant¹³, ranging at around 10 and 15% across countries, and over 30% in Greece, with significant differences by specific product, for example 140% and 216% for textiles and clothing in the United Kingdom and Sweden respectively and 310% for pharmaceuticals in Greece (Figures 8.11A and B).

Moreover, with respect to international input-output tables, a focus on the distribution margin provided in delivering a good from the factory gate to the customs frontier understates the size of the problem related to the use of the basic price concept, as global input-output tables will also reallocate (to the distribution sector/product) the distribution margin related to the transportation of the good from one frontier to another, and in turn the final distribution margin related to delivery from the frontier to the final consumer.

In effect input-output tables at basic prices treat distribution services as if they reflected the acquisition of a separate product. The rationale is that this creates an equivalence with prices paid by consumers when they independently organize the distribution

service (and which, by definition, are excluded from the F.O.B. price of the exported product, and indeed the cost, insurance and freight (C.I.F.) price of an imported product). But this convention is by no means a panacea.

Larger enterprises within affiliated supply chains for example are more likely (than independent smaller enterprises say) to include the costs of distribution in the basic price they charge (whether these are produced using in-house services or purchased from third parties), and so, in these circumstances, no adjustments will be made to arrive at a basic price estimate, which will be equivalent to the F.O.B. price. So, as can be seen, sometimes the distribution services are included in basic price measures and sometimes they are not, depending on how the original producer chose to invoice them.

But this is not the biggest issue here: the removal of the margin generates an alternative perspective of the value of what is being traded (and Figure 8.11A reveals that this can be significant) both from the exporting country’s perspective and the importing country’s (exacerbating complications raised by the fact that import prices typically also include international distribution margins).

For any given export of a good therefore, because the domestic content of distribution services is typically high, the share of domestic content of exports for a given good will be lower when measured on a basic price basis than compared to estimates on a F.O.B basis (although, in theory, for exports of *total*, whole economy, goods and services, the ratios should align) (see, for example, Figure 8.12). Similarly looking at imports of a particular good into an economy, a basic price measure will show a significantly smaller (often implausibly low) contribution from the distribution and transportation sector, compared to C.I.F measures. Basic price concepts also complicate and hamper analyses of the multiplicative impact of tariffs, as, in a basic price format the rates, which are usually applicable to a C.I.F. price, will instead be applied to a lower basic price; this underestimates the overall impact of tariffs.

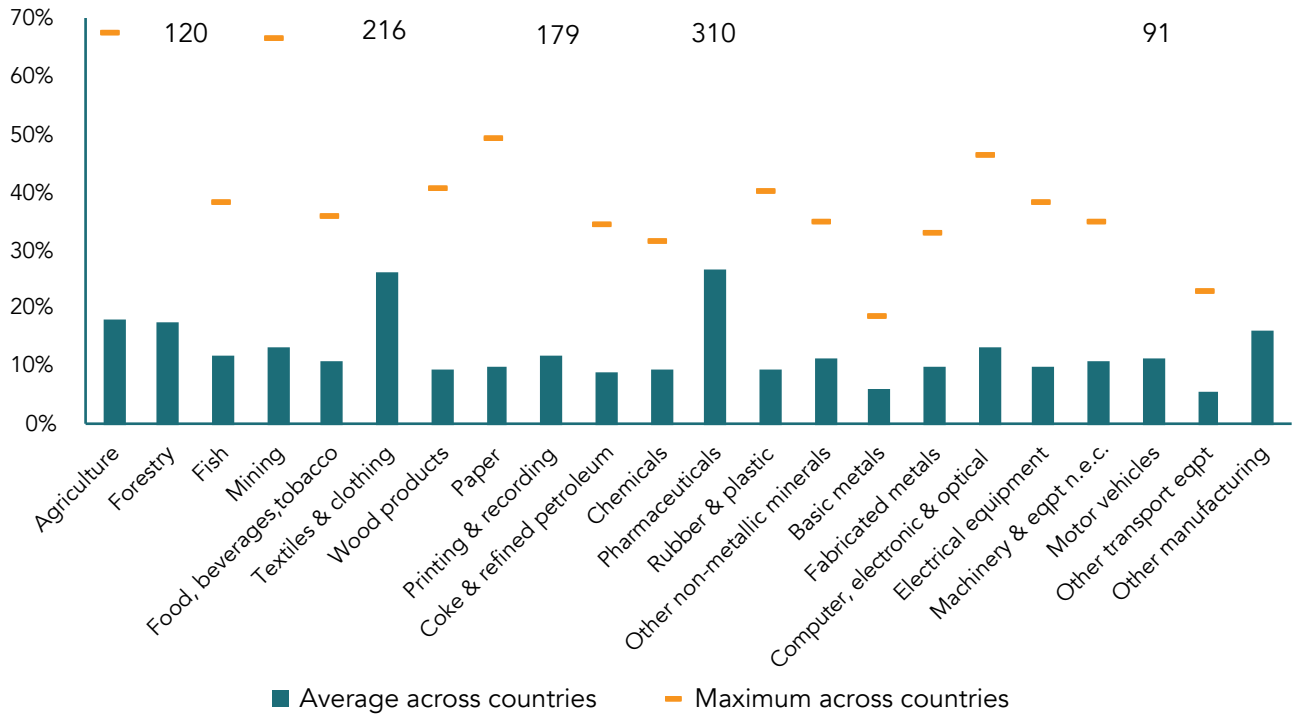
Figure 8.13¹⁴ reveals the impact that different price bases can have in interpreting the decomposition of value in GVCs by looking at the domestic services content of textiles exports. In the United Kingdom and Sweden for example the domestic services content jumps to around 70% compared to around 20% using the basic price concept. On average, across countries the domestic services content of exports increases by around 15 percentage points.

Of particular interest in this respect is the contribution made by the distribution sector (transport, retail and wholesale) in the overall production of a given product, which is noticeably lower using the basic price concept (with well over half of the increase in domestic services value-added content reflecting distribution services in most countries).

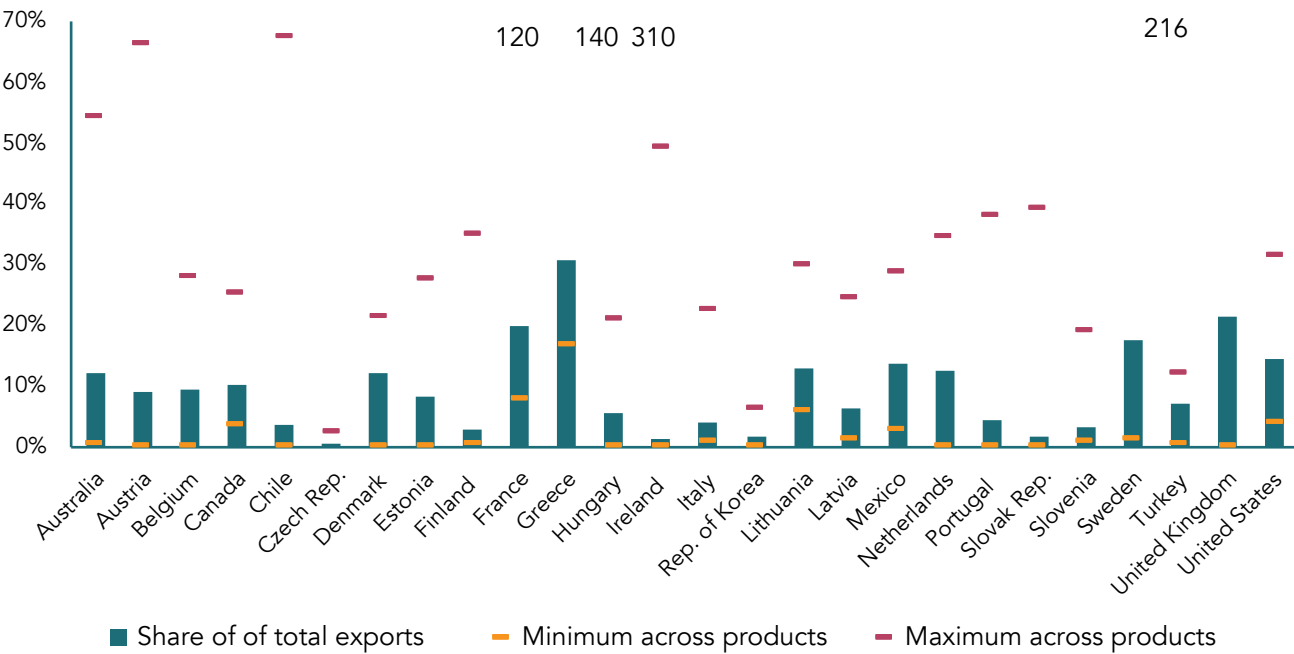
The upshot is that by decoupling the distribution costs involved in transporting a good from the factory gate to the customs frontier from the production costs of the good, the basic price concept creates an arguably *downward-biased* estimate of the overall contribution of exports of that good to the local economy. Exacerbating this downward bias is the fact that the

FIGURE 8.11 Factory gate to exporting country's customs frontier, recorded distribution margins (% of basic price of recorded exports)

A: By product

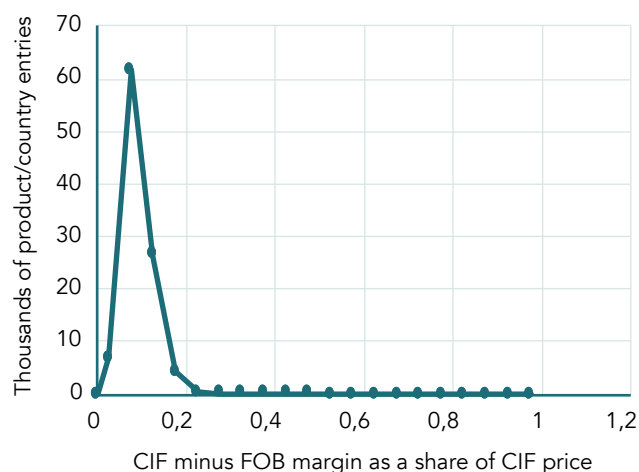


B: By country



Note: Data for Australia refers to 2014, Austria 2012, Belgium 2010, Canada 2013, Chile 2015, Czech Republic 2017, Denmark 2014, Estonia 2014, Finland 2014, France 2014, Greece 2010, Hungary 2014, Ireland 2011, Italy 2014, Republic of Korea 2010, Lithuania 2014, Latvia 2010, Mexico 2013, Netherlands 2014, Portugal 2013, Slovak Republic 2012, Slovenia 2015, Sweden 2015, Turkey 2012, United Kingdom 2010, United States 2016.

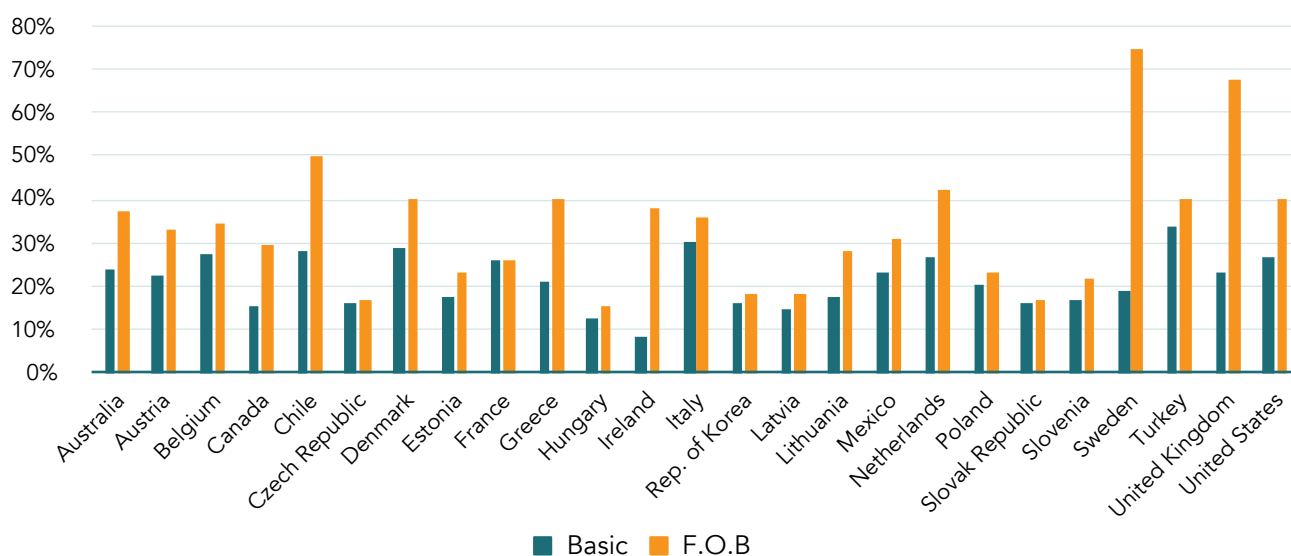
Source: OECD Supply-Use Table database.

FIGURE 8.12 International transportation margins on US imports


Source: OECD International Transport and Insurance Costs of Merchandise Trade.

basic price of the exported good will include all upstream distribution costs incurred in the production of that good, including cross-border distribution costs on intermediate imports used in production. So, in other words, distribution costs incurred in producing a good for export will be reflected in the basic price of that good when they relate to intermediate parts shipped within the country or imported into the country but, typically, not when they relate to transportation of the goods to the customs frontier.

In addition, the concept proves problematic for notions of international competitiveness, as the basic price concept de facto gives the impression that countries are engaged in significant *direct* exports of these distribution activities, as any distribution costs related to the transport of a good from the factory gate to the customs frontier will be treated as if they were direct exports of separate distribution services. For example, a country may have restrictions on the provision of these services by foreign operators, as well as high relative prices that are absorbed only through the increased international competitiveness of goods-producing sectors purchasing these distribution services. This country is more likely than not to reveal relatively higher measures of revealed comparative advantages (when measured on the conventional gross basis) in the distribution sector and relatively lower in the goods producing sector, when the complete opposite is the more likely scenario.

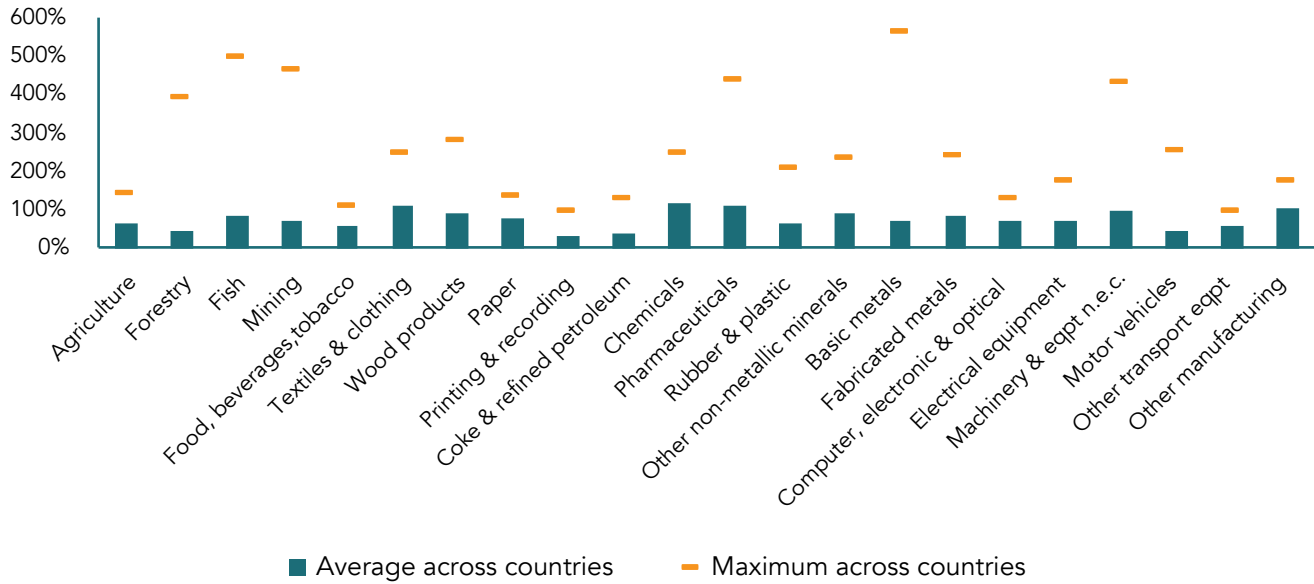
FIGURE 8.13 Domestic services value-added content of textiles exports (basic versus F.O.B. prices)


Note: Data for Australia are 2014, Austria 2012, Belgium 2010, Canada 2013, Chile 2015, Czech Republic 2017, Denmark 2014, Estonia 2014, France 2014, Greece 2010, Hungary 2014, Ireland 2011, Italy 2014, Republic of Korea 2010, Latvia 2010, Lithuania 2014, Mexico 2013, Netherlands 2014, Poland 2013, Slovak Republic 2012, Slovenia 2015, Sweden 2015, Turkey 2012, United Kingdom 2010, United States 2016.

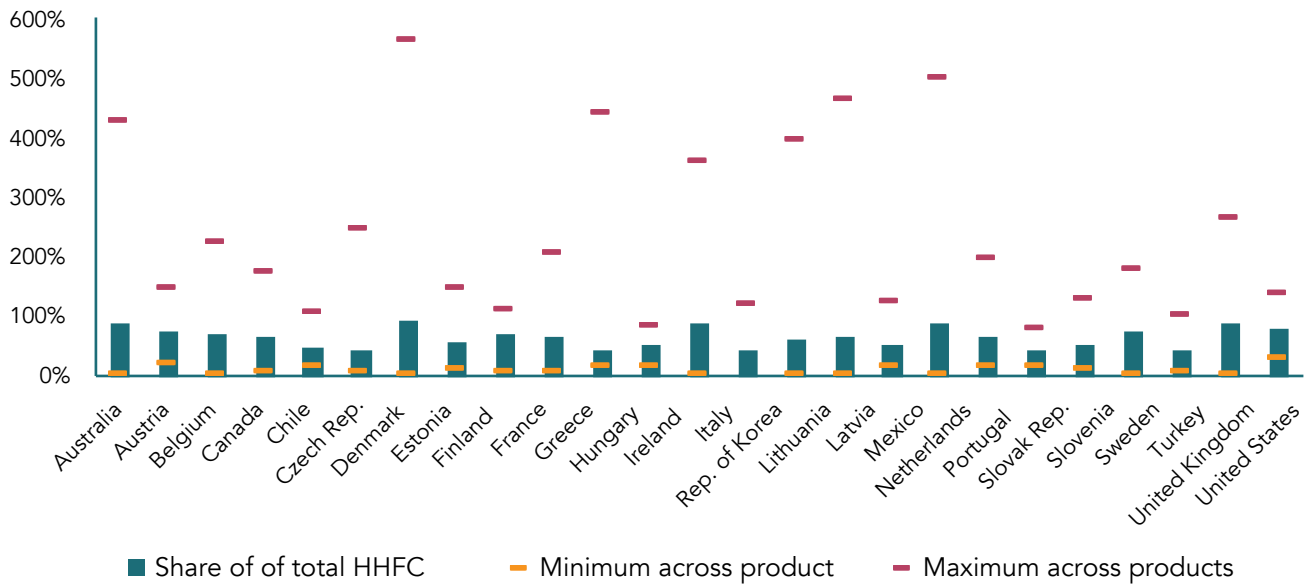
Source: OECD Supply-Use table database and OECD-WTO TiVA.

FIGURE 8.14 Margins on household final consumption, % of basic price

A: By product



B: By country



Note: Data for Australia are 2014, Austria 2012, Belgium 2010, Canada 2013, Chile 2015, Czech Republic 2017, Denmark 2014, Estonia 2014, Finland 2014, France 2014, Greece 2010, Hungary 2014, Italy 2014, Republic of Korea 2010, Lithuania 2014, Latvia 2010, Mexico 2013, Netherlands 2014, Portugal 2013, Slovak Republic 2012, Slovenia 2015, Sweden 2015, Turkey 2012, United Kingdom 2010, United States 2016.

Source: OECD Supply-Use table database and OECD-WTO TiVA.

But it is equally important to note that this is not only an issue for decompositions of exports into their sources of value added. It affects all components of demand. For estimates of intermediate consumption (or rather the coefficients of the Leontief matrix) the effects are mitigated by the fact that the distribution costs will always be captured in the costs of production of a good, whether embodied in the price of any intermediate used in production or treated as a separate cost. This reflects the fact that intermediate consumption totals are always measured at market prices even if the components are recorded in basic prices.

In other words, Leontief coefficients provide a theoretically correct view of the upstream impact of the production of a given good, but only when the application is to determine the full upstream impact of *production* as opposed to *consumption*. All current TiVA estimates align with this production view, but many of the applications are in fact looking at things from a consumption perspective. But in basic price Leontief systems, distribution margins provided by an intermediary (such as a retailer) or margins that are not part of an all-inclusive price charged directly by the producer, are stripped out of the consumption (market) price. Not surprisingly, these charges can make a significant difference to the overall price of a good (see Figure 8.14).

For products, taking an average across countries' margins adds (a low of) 31% to the basic price of printing products and (a high of) 113% for textile and chemical products (and 560% for basic metal products in Denmark). For countries, looking at total consumption of goods in basic prices, margins add a further 41% in Slovakia to 92% in Denmark.

None of that is to say that basic price approaches are without merit. Far from it, as they provide the conceptually correct view of the decomposition of costs from a production perspective. Moreover, as described below, they are also significantly easier to calculate from current national accounting systems than decompositions based on market price concepts.

But it is clear that some care is needed in interpretation. As shown above, for analyses of global value chains, taking a perspective from purchasers' prices rather than basic prices can present a significantly different picture of GVCs, for example concerning the contribution to the domestic economy of exports of a given product. But the purchaser's prices concept is perhaps also preferable in the derivation of other conventional analyses and metrics that rely on input-output based indicators. Perhaps chief in this respect concerns analyses of the now well-known Smile Curve, which is looked at in the following section.

3.2 Looking anew at the Smile Curve

Although, at least in recent years, there has been an improved understanding of the limits of GVC analyses that look at fragmentation of production through the prism of Stan Shih's Smile Curve, even with these limits it remains an important looking glass.

A greater awareness that conventional statistics concerning fragmentation of production reflect the basic price rather than the market price concept can further help improve our understanding and limitations of basic price measures.

TABLE 8.1 Derivation of Apple's gross margin on 30GB video iPod

Retail Price	\$299
Distributor Discount (10%)	(\$30)
Retailer Discount	(\$45)
Sub-total (estimated wholesale price)	\$224
Factory Cost	\$144
Estimated Apple gross profit	\$80

Source: Dedrick et al, 2008.

A simple way to illustrate shortcomings in current measures, and in particular the basic price concept, is to reconsider how they reflect single case studies, indeed case studies that have acted as motivators for much of the work, and new statistics on GVCs, that exists today.

Perhaps the most well-known of these is Dedrick et al.'s seminal 2008 work looking at the decomposition of value creation in an iPod (Table 8.1).

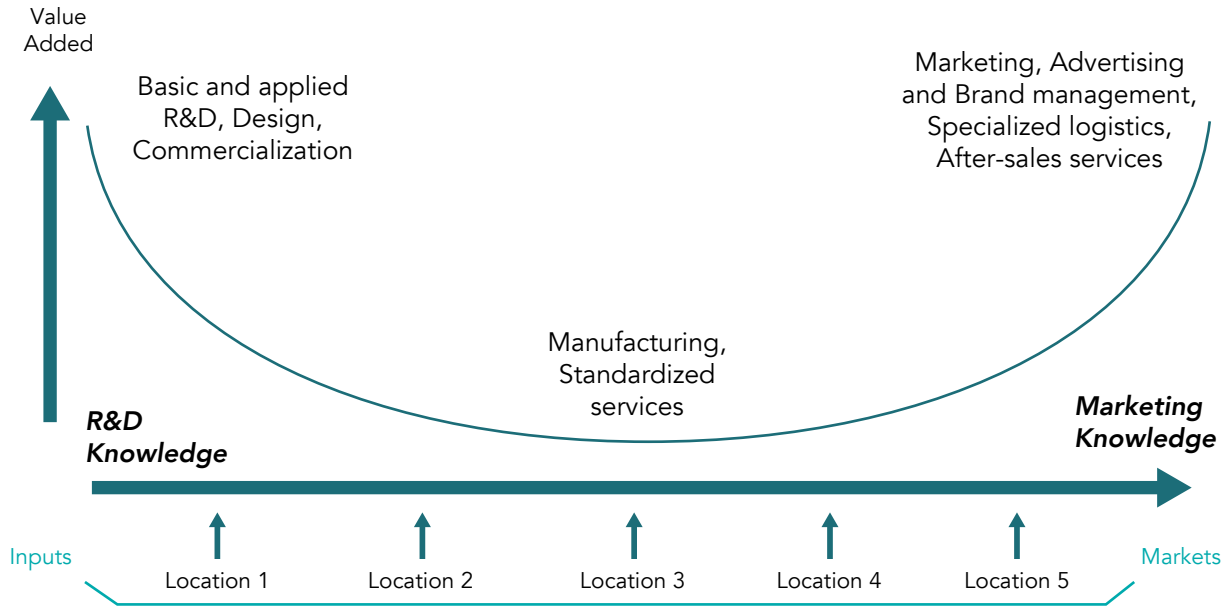
As noted in their study, the factory gate price (roughly equivalent to what would be recorded in trade statistics) was less than half the total retail price, and, indeed, Apple's contribution (measured as its gross profit), and compensation for design, marketing and research and development, is completely absent from the factory gate price.

In this sense therefore any attempt to assess the full value chain, including Apple's contribution, by decomposing only the factory gate price, will be severely compromised as the high-value activities, R&D and design (which are generally positioned at the beginning of the value chain, Figure 8.15) and marketing and distribution (at the end of the chain) are completely absent from the decomposition. This is what is de facto done in decompositions of value using input-output tables at basic prices, because, as noted above, the contribution from distribution services, and very often R&D, marketing and design are shown as separate expenditure items also in basic prices.

An underappreciation of this shortcoming in the basic price concept for GVC analyses of lengths and positions of activities in value chains is widespread in the literature. For example, Degain et al. (2017)'s otherwise excellent paper "Recent trends in global trade and global value chains" provides a decomposition of value added, showing the contribution made by various industries and countries relative to their distance from the consumer and by their relative compensation per hour.

Intuitively, all of their charts plotting relationships for various products (see below Figure 8.16, the example for China's electrical and optical equipment) show distribution activities (classified as industry 20 in the Figure) close to the consumer (with relatively high labor costs), where Degain et al. explain: "Post-fabrication service industries with higher labor compensation per hour – such as wholesale (20) and inland transportation (23) in

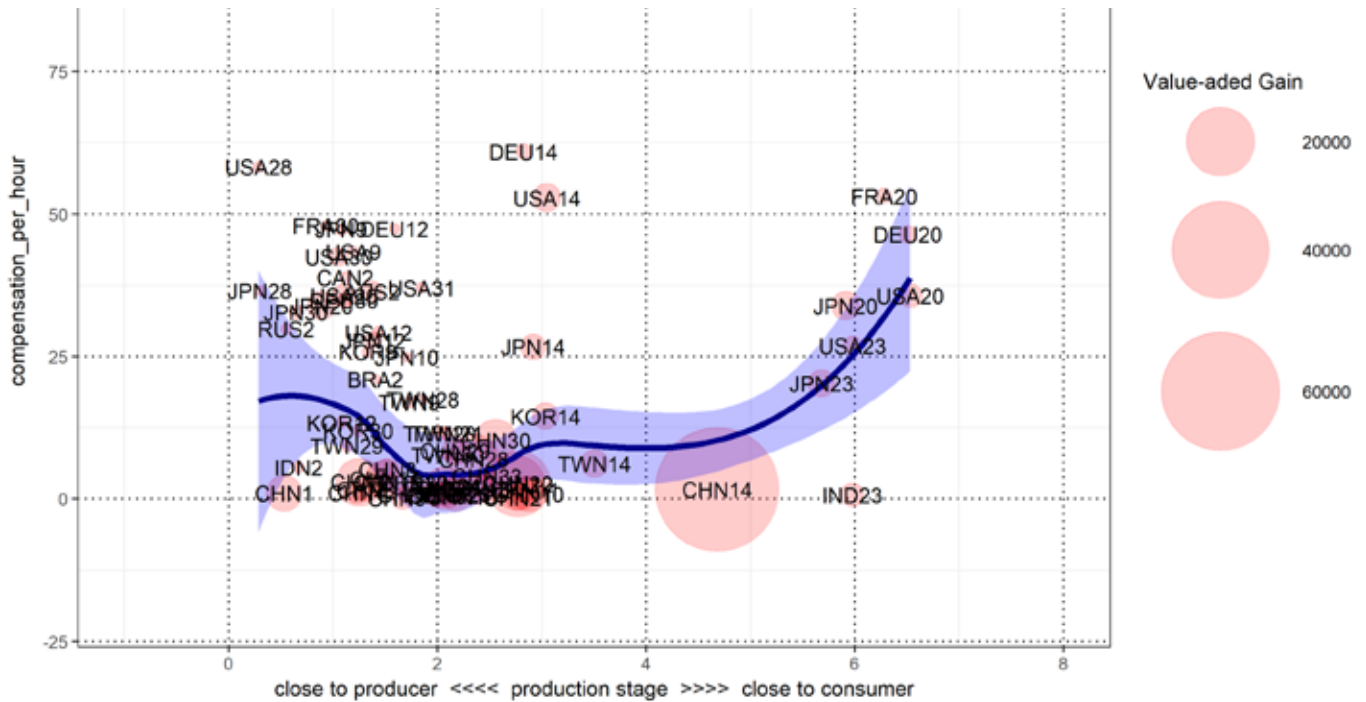
FIGURE 8.15 Conceptual framework of the Smile Curve



Source: Mudambi, 2008.¹⁷

FIGURE 8.16 Smile Curve for China's exports of electrical and optical equipment, 2009 (basic prices)

Compensation per hour (\$)



Source: Meng Ye and Wei 2017.

the United States, Japan, Germany, and France – were the main beneficiaries in the postfabrication stage of this GVC. China's ICT goods exported to the United States, Japan, and Germany had to be delivered to their domestic consumers mainly through those countries' domestic wholesale and transportation service industries."

However, therein (the bolded text) lies the misunderstanding between the basic price and market price concept. Decompositions of the value of a good purchased as final domestic demand into source industries using input-output tables in basic prices do not capture the:

- final contribution made by domestic wholesale and transportation service providers delivering an import to final domestic consumers;
- international distribution costs involved in shipping the good into the country; nor indeed the
- shipping costs from the factory to the customs frontier of the exporting country.

This is why Degain *et al.* estimate the contribution of the distribution activities at generally no greater than 20%, while this chapter finds significantly higher estimates (around 40% when the decomposition is for an export, as in Figure 8.13, and significantly higher when the decomposition relates to the price paid by the final consumer, as in Figure 8.14).

To re-emphasize, what decompositions in basic prices do capture (at least in theory) is the contribution of distribution activities related to transactions in intermediates, before the very last transaction recorded in input-output tables at basic prices. So, for example, they include any distribution activities related to the intermediate consumption of any firm (whether those intermediates were imported, in which case decompositions would include any related international distribution margin, or produced domestically). This is because the production function (input-output coefficients) of any given industry will always show total intermediate consumption at market prices, even if all the separate components are broken down into basic price components. However, these decompositions will not capture any distribution margins related to final demand transactions (whether household final consumption, general government final consumption – although in practice this is not generally an issue as in most countries general government final consumption only records transactions in services – capital formation or, indeed, exports, including exports of intermediates).

This reveals another potential problem with analyses that present the position of these distribution activities within global value chains. In all of these studies distribution activities find themselves positioned very close to the final consumer. This is, of course, an accurate reflection of their overall positions when seen as a whole (i.e. in market prices), as an overall view would include the distribution services provided to final domestic demand (household and government consumption, consumption of non-profit institutions serving households, and capital formation). However, this is not an accurate reflection of the position of these activities when they refer to the provision of distribution services used to service intermediate flows – in other words

it is not an accurate representation of the position of distribution services when decomposing basic prices. Indeed it stands to reason that for very fragmented chains, distribution services would be needed throughout the production process and, so, would be further away from the consumer than retail distribution services (which are almost entirely related to the provision of services to final demand consumers). It is only because, in practice, estimates of the position of distribution services (i.e. distance to consumer) are calculated for the sector as a *whole* that results in distribution services appearing close to consumers. This reflects the fact that distribution services provided to final consumers make up the majority of overall distribution services, and, so, swamp results for the overall position of the sector. This somewhat intuitive result appears to have led many to conclude that the distribution service component in decompositions of basic prices reflects the final distribution service at the end of the chain – *but this is not the case.*

3.3 Marketing, design and R&D services

Thus, an aggregated view of the position of the distribution sector in global value chains is unlikely to accurately reflect the position of intermediate services in a given production process when input-output tables used decompositions in basic prices. But, because the remuneration for marketing, design and R&D services is also often bundled within the final distribution margin, our understanding of the contribution of other underlying activities – recorded as distribution activities – may be similarly affected, i.e. their position in global value chains, estimated using input-output tables, may not necessarily align with where they appear in the physical production process.¹⁸

This is particularly relevant for the position of high-value tasks such as research and development and design. These should of course appear at the beginning of the production process, but where they appear in input-output based estimates depends greatly on a number of factors. Chiefly these relate to whether these activities are conducted by separate production entities or whether they are conducted within the firm. Further complicating matters is the industrial classification of the firm itself, discussed in more detail below.

If the R&D and design activities are conducted by separate units classified to these specific activities in input-output tables, then input-output based approaches will be able to capture their appropriate position and indeed value contribution within GVCs. However, often these activities are conducted in-house for which there is no observable transaction, and in these cases their contribution is included within the value added of the main activity of the firm. For example, a retailer may outsource production of clothing, but the value generated through brand, design, and R&D may instead (and often) appear as distribution margin. Input-output based measures will therefore record (but not separately) the positions of the underlying R&D and design activities in the same position as the firm's main activity (distribution), which will not typically be at the beginning of the value chain.¹⁹ This of course is not an issue unique to these types of tasks; any in-house activity not separately identifiable in input-output

tables is treated in this way (as are secondary activities that are separately identifiable when input-output tables are constructed on an industry by industry as opposed to product by product basis).

But whilst this is a more generic problem with input-output tables, it is perhaps most pertinent when it comes to R&D, design and marketing activities, where in-house production remains significant (certainly when considering the very high distribution margins on exports seen in Figures 8.11A and B). Further exacerbating this is the increasing importance within global value chains of factory-less producers, who outsource physical production whether at home or abroad, but control the overall production process (focusing control on activities such as specification, design, R&D, marketing), which to some extent is a reflection of the upgrading process underpinning GVCs.

Current international standards for the classification of firms (ISIC Rev 4) classify factory-less firms that own no material intermediate inputs in the production process to the distribution sector. As such the value added by these factory-less firms will materialize in input-output tables as distribution margins, and, so, are allocated to a separate activity to the good being produced when input-output tables are recorded in basic prices. In other words the value of the goods (whose production and sales are controlled by these firms) will reflect the (contractor's) factory-gate price but these prices will not include the intellectual property, design, brand etc. owned by the factory-less firm. These will instead materialize in the wholesale prices the firm charges to other intermediaries or indeed the final retail price if the factory-less firm sells the products through its own chain of retailers.

Further complicating matters, factory-less firms that own some material intermediate inputs (even if they have no actual role in the physical transformation of those inputs) are classified to the activity of the good being produced. In these circumstances input-output tables should record transactions between the factory-less firm and its contractors following the recommendations for the treatment of goods for processing transactions in the System of National Accounts. But in practice this may not be the case, especially if the value of the material intermediate inputs purchased by the principal is marginal, in which case national accountants may instead choose to record the output of the principal as if it were a distribution service, (i.e. excludes the factory gate price of the good) even if the industry of the principal remains classified to manufacturing.

Following the example of the iPod above therefore, input-output tables that decompose the basic price value of the iPod will not record the contribution from Apple's R&D, design, brand etc. to the good itself if Apple is classified as a distributor (e.g. as a factory-less firm, in which case the contribution will be shown separately under consumption of distribution margins) and may not do so in practice even if Apple is classified as a manufacturer. Whatever the classification, any retail margins incurred by final demand consumers, whether charged by independent retailers or Apple stores, will never be included in the decomposition of the basic price. In other

words, decompositions of goods in basic prices (and in particular hi-tech goods) may, in practice, typically significantly underestimate the contribution of R&D, marketing, design etc. to the production process (as they will instead be recorded as a separate transaction of "direct" purchases of distribution services).

3.4 A new perspective on the role of imports

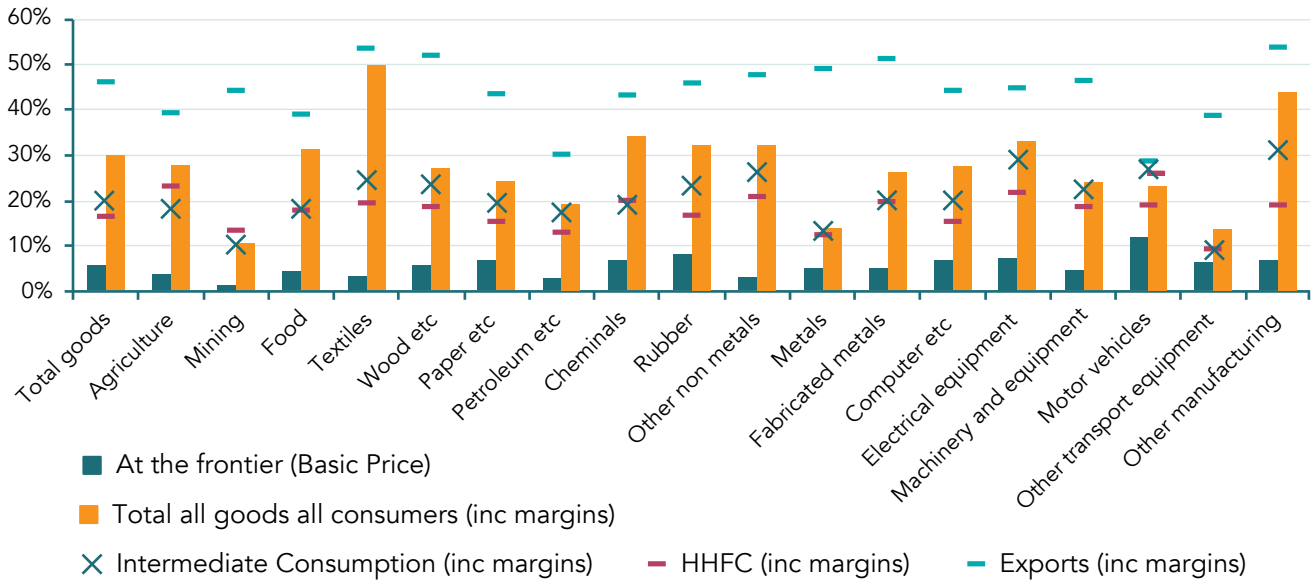
Another area, among many, where a purchaser's price perspective can provide an important complementary view to a basic price concept concerns the role of imports. One highly sensitive indicator produced in TiVA-type analysis is the domestic content of a country's imports, typically used to highlight the potentially counter-productive impact of tariffs as they may affect upstream domestic exporters. In the United States, the US content of its total goods imports amounts to, on average, 6% in recent years (Figure 8.17). But bringing the imports into the country, in turn, generates distribution services, whether the imports are for intermediate consumption, final domestic consumption, or indeed for direct re-exports.²⁰

Conventional input-output approaches, using the basic price concept, de facto decouple and break the link between these costs and the imported good. But a purchasers' price approach treats the distribution services as integral, revealing, in turn, much higher US "dependencies" (or US "content") of its imports. Indeed changing the price basis, and decomposing the purchasers price value of an imported good reveals that the US content of its total goods imports (or rather the US value-added generated by consumption of imports) amounted to 30%²¹ of the overall price of those imports (excluding any consumption taxes). For imports of textiles, the US content was as high as 50% for consumption by US households and 20% for exports, compared to the 3% shown in TiVA.

Indeed, the total value of distribution margins provided by US domestic operators in taking imports from the customs frontier to their next destination (to industries, final consumers, or as re-exports) amounted to close to 900 billion USD dollars in 2016, equivalent to 5% of GDP. In value-added terms, as the distribution sector also requires imports for production, distribution activities added 840 USD billion to US GDP in 2016 on account of transportation and sales of imports, supporting 9 million jobs, including 6.3 million in the wholesale and retail sector, and 1.0 million in the transportation sector, with significant contributions from upstream industries (0.2 million in manufacturing, and 1.6 million in all other activities) (Figure 8.18).

In many other countries the contribution of distribution services (as recorded in official supply-use statistics) to the domestic economy through sales of imports is significantly higher (Figure 8.19). Unsurprisingly, the contribution is larger, the smaller the economy (and the higher the dependency on imports). In Lithuania for example, where gross imports were equivalent to 78% of GDP in 2014, and the value added of the distribution and transportation sectors accounted for 28% of GDP, the domestic value added generated through sales of imports in the economy accounted for 22% of GDP. Of particular interest is the contribution to GDP made via distribution

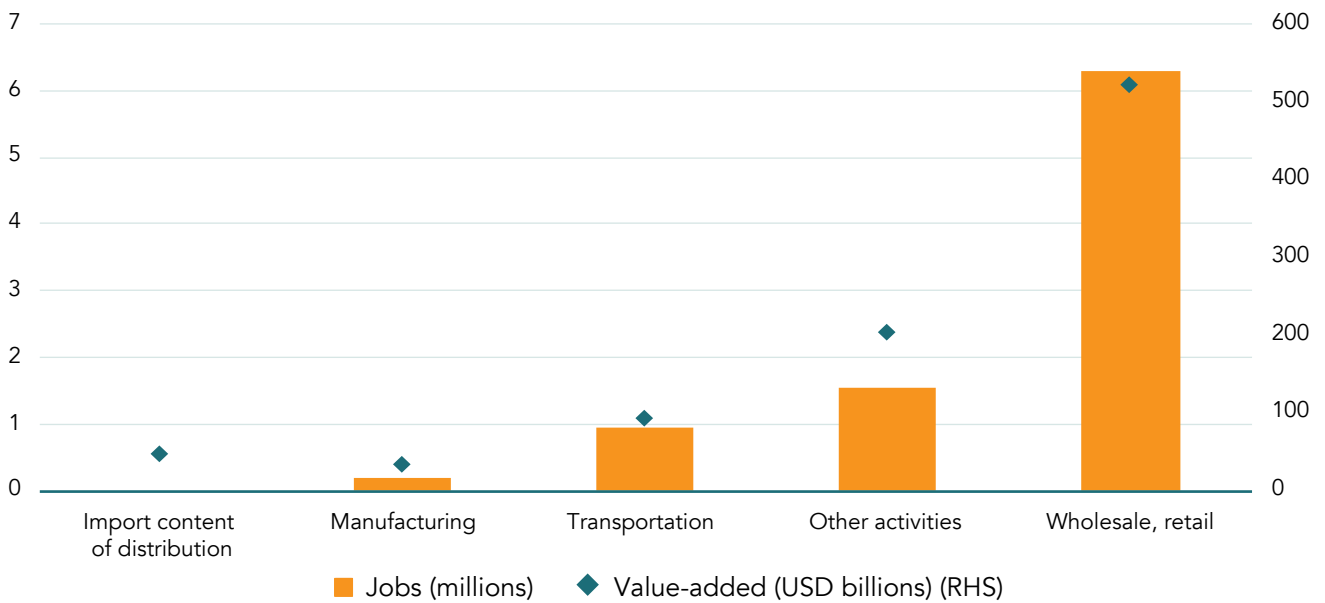
FIGURE 8.17 US value-added content of imports at the frontier (% of basic price) and as percent of consumer's price (excluding taxes) (2016)



Note: MHHFC, Household final consumption.

Source: Calculations based on OECD-WTO TiVA and OECD Supply-Use Table database.

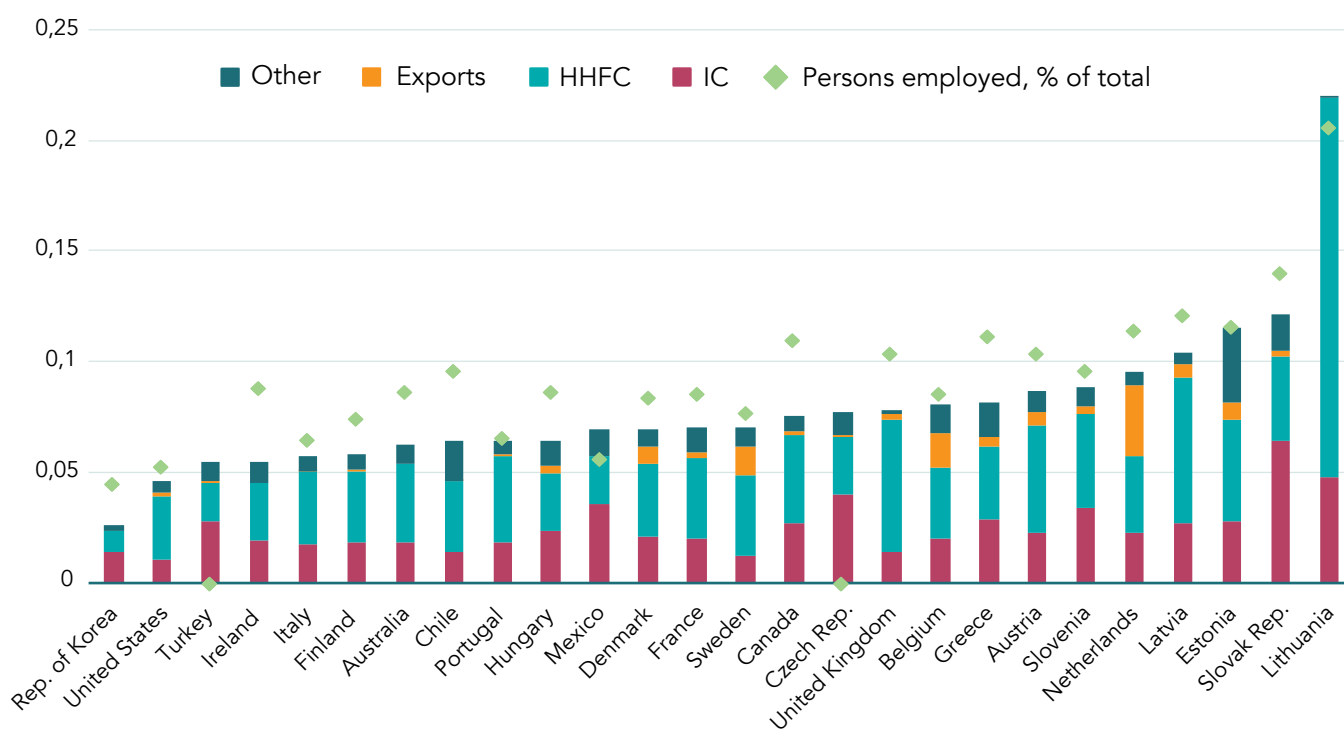
FIGURE 8.18 Jobs supported and value added via sales and export of imports in the US, by source (2016)



Source: Calculations based on OECD-WTO TiVA, OECD Supply-Use Table database and OECD National Accounts.

FIGURE 8.19 Domestic value added generated and persons employed through sales of imports, by source of demand

% of GDP and persons employed



Note: Data for Australia are 2014, Austria 2012, Belgium 2010, Canada 2013, Chile 2015, Czech Republic 2017, Denmark 2014, Estonia 2014, Finland 2014, France 2014, Greece 2010, Hungary 2014, Ireland 2011. Italy 2014, Republic of Korea 2010, Lithuania 2014, Latvia 2010, Mexico 2013, Netherlands 2014, Portugal 2013, Slovak Republic 2012, Slovenia 2015, Sweden 2015, Turkey 2012, United Kingdom 2010, United States 2016.

Source: OECD Supply-Use table database and OECD-WTO TiVA and OECD National Accounts. HHFC: household final consumption. IC: Intermediate consumption.

services related to re-exports, accounting, for example, for over 3% of GDP in the Netherlands. Total persons employed²² (providing distribution and upstream services) are generally higher than shares of GDP, reflecting the lower labor productivity²³ seen in the distribution sector compared to other activities in the economy.

None of the above is to say of course that higher import prices, or lower imports, will necessarily reduce the domestic value (direct and upstream) generated by distribution activities nor the jobs supported, as consumers will be able to substitute production with domestically produced equivalents (where these exist). But if the higher import prices occur through, for example, tariff measures, this may reduce the overall purchasing power of consumers (in addition to the potential reduction in competitiveness of producers, including exporters) which is likely to have a volume effect. This would, in turn, reduce value added generated and jobs sustained through distribution activities related to the sale of imports.

3.5 Developing market-price input-output frameworks

Despite all the commentary above, it's important to reiterate that decompositions of basic price transactions into the origins of their value contribution are not wrong, nor are they without meaning. However, care is needed in their interpretation.

There are a number of areas where care is needed, but key is the fact that they do not provide a view from the purchaser's perspective. In this respect therefore, they cannot provide a whole view of the value chain (in particular the distribution, marketing, retail channel at the end of the chain), nor are they necessarily well-equipped to provide insights on the contribution of design, marketing and R&D (for example because they are bundled with distribution services or because they are performed in-house by manufacturers) nor on the actual positions of various activities within value chains.

In addition, basic price decompositions can also introduce asymmetric results for chains that are to all extent and purposes, identical. For example, if a Korean producer used a Japanese

shipping company to ship parts to be assembled in China before being shipped and sold to US households, the decomposition of the import price recorded in input-output tables at basic prices in the United States would include all costs incurred up to the point that the goods left the factory gate in China – in other words they would exclude the costs incurred in shipping the goods across the Pacific, which would be treated as a separate import of distribution services by US households from Japan. Typically, the distribution costs involved in shipping the good from the Chinese factory gate to the Chinese frontier (which would also be recorded as a direct import of distribution services by the US) would also be excluded. However, if the same goods were assembled in Mexico, the basic price for the imports into the US would include shipping costs across the Pacific and the distribution costs incurred in China (as, theoretically, these would be included in the intermediate consumption costs of the Mexican assembler²⁴). As such, even if the assembly costs in Mexico and China were identical and the shipping route (i.e. Republic of Korea-China-Mexico-US) and costs were also identical, the Japanese content of the US imports would be higher for goods assembled in Mexico compared to the same goods assembled in China.

Perhaps the main shortcoming with the basic price concept, however, is that it breaks the link between the good being sold and the final distribution services that are reliant on it. That is, any upstream domestic distribution services involved in shipping a good across borders before it is eventually consumed back in that same country for final consumption will be (at least in theory) recorded in the home-country's content of its imports. However, the same distribution services used to ship the product to the country's frontier before it is finally consumed will not be recorded in the home-country's content of imports (the difference between the C.I.F. and the basic price), nor (generally) will any domestic distribution services engaged in shipping the good from its frontier to its final domestic consumer (the difference between the purchasers price and the CIF price, ignoring taxes and subsidies). As such, there is a clear case to be made (as in Figure 8.17) for complementary insights based on the purchasers' price.

The perspective necessarily needs to be complementary to, and not as a replacement for, the basic price concept, as a purchaser's price perspective cannot meet all needs. For example, in looking at, say, the multiplicative impact of tariffs on imports, one still needs to have a view of the actual price of the imports and not the actual price paid by the ultimate consumer after distribution margins are included. Even here, however, while the basic price concept is better it is also imperfect, as tariffs are typically imposed on the CIF price and not the basic price, and when they are not CIF prices they are typically the FOB price, and the difference as shown in Figure 8.11 above can be significant.

The idea for a complementary view in this respect is a means of supporting a broader narrative, whether that be on the full upstream impact of exports, the domestic spillover from imports or the positions (and interpretation of positions) of industries within GVCs. Import-export wholesalers, for example, depend

exclusively on their ability to trade internationally but you would not be able to identify this in a standard input-output table at basic prices (which would show they had no imports).

Developing such a complementary view in practice is, however, far from trivial (see Ahmad 2019, forthcoming). It would, in effect, require a very different presentation of the role of distributors in the accounting framework. They would be shown either as providers of intermediate services, resulting in changing the value of output of industries from basic prices to purchasers' prices (excluding taxes on products), or they would be shown as purchasers of the goods they sold. Thus, the accounts would need to record the value of their output inclusive of the value of the goods that they sell, and not just their margins. Both cases are complex, posing, in turn, difficulties for analyses and indeed in compilation.

4. Conclusions

Basic price approaches to the development of global input-output tables provide important insights on the nature of global value chains and have helped transform our understanding on international trade today. However they can be prone to significant misinterpretation, as shown in many of the studies that use them to infer positions of activities in global value chains. But, as shown above, this is not the only area where misinterpretation can occur; for example through their removal of the distribution margin on goods transported from the factory gate to the customs frontier, they provide a view of trade in goods that is significantly different to that seen by analysts of trade, which often hampers their take-up, and indeed can impact on analyses (for example in calculations of the impact of tariffs, whose price is typically C.I.F. or F.O.B.).

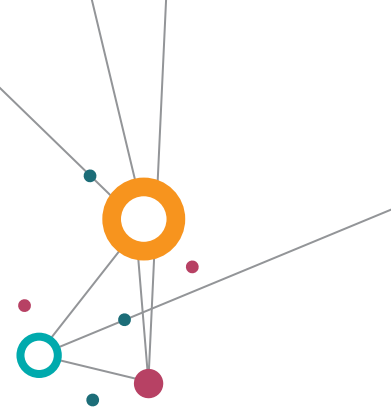
Perhaps chief in this respect is the application of basic price models to questions that require a consumption perspective (which is, to some extent, at the heart of many of the applications of standard Leontief analyses, which often look at the impact of an increase in final demand on production). But a significant part of the actual consumption price (be that a market price or a CIF price) on which taxes and tariffs are applied includes significant distribution margins, and pure basic price models that treat distributors as providing direct services to customers, break these links.

Notes

1. This chiefly relates to the fact that no statistical information system in the world actually has this information for all firms (by product produced and consumer) but even if this were the case, the need to preserve confidentiality of respondents to statistical business surveys, would make it impossible to release such firm-level data for public consumption.
2. <http://www.oecd.org/daf/inv/investment-policy/trade-investment-gvc.htm>
3. Albeit a relocation that satisfies the accounting rules regarding economic, as opposed to legal, ownership. See the 2008 System of National Accounts.
4. It also includes taxes and subsidies on production.
5. Not all labor compensation will necessarily stick in the economy, for example for cross-border workers.
6. Such as land and other intangible assets not recognised as Intellectual Property Products in the SNA.
7. <http://www.cso.ie/en/csolatestnews/pressreleases/2017pressreleases/pressstatementmacroeconomicreleasesyear2016andquarter12017/>
8. See Ahmad and Araujo 2011 "Measuring Trade in Value-Added and Income using Firm-Level data". Available at: http://sitere-sources.worldbank.org/INTRANETTRADE/Resources/Internal-Training/287823-1256848879189/6526508-1283456658475/7370147-1308070299728/7997263-1308070314933/PAPER_8_Ahmad_Araujo.pdf
9. Where results have been generated using national tables only – in other words the domestic content of imports is recorded as zero.
10. <http://www3.inegi.org.mx/sistemas/tabuladosbasicos/LeerArchivo.aspx?ct=44462&c=33654&s=est&f=4>
11. http://scholar.harvard.edu/files/jorgenson/files/4a.1_paper.pdf
12. See the 2008 System of National Accounts
13. Note that some care is needed in interpreting the margin values presented here. The varying degree, across countries, of implementation of the 2008 SNA guidance on merchanting transactions may affect cross-country comparability and may also explain the very high estimates of margins in some countries. For example in countries with significant merchanting activities (typically recorded as a distribution margin) there will be a positive entry for the margin (merchanting service) exported, including under goods transactions, but there will not be a corresponding value of the exports of the goods being merchanting (unless the periods when the merchant acquires and sells the goods differ, in which case margin ratios in the period when the goods are acquired will be biased upwards as the acquired goods will appear as a negative export).
14. Note that in industry by industry output tables distribution margins provided directly by the exporting industry are included in the output and the value added of the industry. Figure 8.13 assumes that the additional margins are provided only by the domestic distribution industry and so will present marginally upward biased estimates of the additional contribution made by the sector; typically the contribution made by the distribution sector represents nearly all of the domestically-produced distribution activity. For example, in the United States the wholesale and retail sector provided 96% of all output in 2016 in the corresponding product.
15. However at the same time because of the decoupling, in practice, at least with current estimates of TiVA, there is an impact on the source of the distribution services, as, typically, the allocation (before balancing in a global input-output) to partner country sources of the imports is based on the partner shares observed for actual direct imports (and also, often, as part of the balancing process, exports) of these same services.
16. Dedrick, Kraemer, Linden (2008): "Who Profits from Innovation in Global Value Chains? A Study of the iPod and notebook PCs".
17. Mudambi, R. (2008). "Location, Control and Innovation in Knowledge-Intensive Industries". *Journal of Economic Geography*, 8(5), 699-725.
18. For example if an Apple store pays explicit cross-border royalties for the use of intellectual property (such as design, software) to an Apple subsidiary abroad every time an iPhone is sold, the position of the intellectual property will appear close to the end of the value chain using standard input-output estimation methods, despite the fact that the design and software are fundamentally at the beginning of the value chain.
19. See also Chen, Los and Timmer (2018), *Factor Incomes in Global Value Chains: The Role of Intangibles*, NBER Working Paper, 25242, which attempts to estimate the underlying contribution made by intangibles.
20. Of interest with respect to the treatment of re-exports is the considerable margin associated with the distribution services (e.g. handling, transportation etc.) for re-exports. In the United States, around 200 billion USD of its total 2.3 trillion of imports in 2016 in C.I.F. prices, reflected re-exports. The handling (transportation etc.) of these imports for re-export generated 33 billion USD of distribution margins. In basic price input-output systems that exclude re-exports and allocate bilateral flows on the basis of their final destination, it is not possible to separately differentiate this activity from other distribution services, masking the role of re-exports. Allocations of bilateral flows on the basis of country of consignment, with a separate distinction for re-exports, even if only in basic prices may be a better approach for the construction of global input-output tables.
21. Indeed, this may be an underestimate as the calculations for percentages of "basic prices plus margins" shown here do not account for international transport margins (which can also be provided by US transporters). TiVA estimates exclude these costs in the basic price of the imported good, but the US Supply-Use tables used to generate the "market" price equivalent estimates use imports at C.I.F. prices.
22. Note that persons employed rather than jobs (as in Figure 8.18) are shown here as fewer countries provide estimates of jobs by activity
23. Labor productivity measures should preferably be calculated on an "hours worked" basis. But for the purposes of this paper, persons employed and jobs are used to better reveal the number of individuals dependent on sales of imports.
24. This would be the case whether the Mexican firm actually purchased the goods from the Korean producer or was merely a contractor, and so is unaffected by the changes in the 2008 SNA concerning goods sent abroad for processing.

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APPENDIX 1

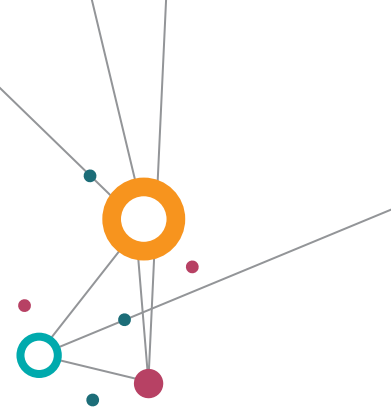
Chapter Authors' conference

Final Programme

8 October 2018, WTO
154 rue de Lausanne, Geneva, Switzerland

9:00 - 9:15	Registration
9:15 - 9:45	Welcome & opening remarks David Dollar (Brookings Institution) Emmanuelle Ganne (WTO)
9:45 - 10:30	Presentation of Chapter 1 – Update on trends in GVCs Presenter Zhi Wang (UIBE) Discussant Nadim Ahmad (OECD)
10:30 - 11:15	Presentation of Chapter 2 – Labor market effects of GVCs in developed countries Presenter Victor Stolzenburg (WTO) Discussant Michael Ferrantino (WBG)
11:15 - 11:30	Coffee break
11:30 - 12:15	Presentation of Chapter 3 – Labor market effects of GVCs in developing countries Presenter Claire Hollweg (WBG) Discussant Stela Rubinova (WTO)
12:15 - 13:00	Presentation of Chapter 4 – The future of manufacturing, automation, and developing countries Presenter Daria Taglioni (WBG) & Satoshi Inomata (IDE-JETRO) Discussant Yuqing Xing (National Graduate Institute for Policy Studies, Tokyo)
13:00 - 14:00	Lunch break
14:00 - 14:45	Presentation of Chapter 5 – GVCs and digital technologies Presenter Michael Ferrantino & Emine Elcin Koten (WBG) Discussant Satoshi Inomata (IDE-JETRO)

14:45 - 15:30	Presentation of Chapter 6 – The digital economy, SMEs, and GVCs
Presenter	Emmanuelle Ganne & Kathryn Lundquist (WTO)
Discussant	Abdul Abiad (ADB)
15:30 - 16:15	Presentation of Chapter 7 – Should high domestic value added in exports be an objective of policy?
Presenter	David Dollar (Brookings Institution)
Discussant	Gaaitzen de Vries (Groningen Growth and Development Centre)
16:15 - 16:30	Coffee break
16:30 - 17:15	Presentation of Chapter 8 – Issues in GVC measurement
Presenter	Nadim Ahmad (OECD)
Discussant	Christophe Degain (WTO)
17:18 - 18:15	Review of the Executive Summary
Presenter	David Dollar (Brookings Institution)
17:18 - 18:15	Wrap-Up
	Zhi Wang (UIBE)



APPENDIX 2

Technological Innovation, Supply Chain Trade, and Workers in a Globalized World

Global Value Chain Development Report 2019 Background Paper Conference

GuoBin Hotel, Beijing, March 22-23, 2018
Pre-conference of China Development Forum

Organized by RCGVC_UIBE and China Development Research Foundation.
 Co-sponsored by China National Science Foundation
 and Bill & Melinda Gates Foundation

March 22, Guobin Hotel

8:30 - 9:00	Opening Remark
9:15 - 9:45	Welcome & opening remarks
Speakers	Dr. Chen Deming, Former Minister of MOFCOM Dr. Robert Koopman, Chief Economist, The WTO Professor Zhao Zhongxiu, Vice President, UIBE Mr. Lu Mai, General Secretary, CDRF
9:00 - 10:00	The Multilateral Nature of Bilateral Trade in the Age of Global Value Chains
Speaker	Wang Fei, Wang Zhi, UIBE, Wei Shang-jin, Columbia University, and Zhu Kunfu, UIBE
Discussant	Satoshi Inomata, IDE-JETRO
10:00 - 11:00	Did global value chains contribute to rising labor market polarization?
Speaker	Cosimo Beverelli, Victor Stolzenburg and Stela Rubinova, WTO
Discussant	Ma Hong, Tsinghua University
11:00 - 11:15	Tea break
Participant	All
11:15 - 12:15	Global Value Chain Participation and Labor Market Outcomes at the Macro and Micro Level
Speaker	Claire Hollweg, Jose Guilherme Reis and Deborah Winkler, World Bank Group
Discussant	Jiyoung KIM, IDE-JETRO

12:15 - 13:30	Lunch
Participant	All
13:30 - 14:30	Accounting for Globalization: Frameworks for Integrated International Economic Accounts
Speakers	Nadim Ahmad, OECD
Discussant	David Dollars, Brookings institution
14:30 - 15:30	Re-examining the Impact of the China Trade Shock on Local US Labor Markets: A Supply Chain Perspective
Speakers	Zhi Wang, Shang-jin Wei, Xinding Yu and Kunfu Zhu, RCGVC
Discussant	Cosimo Beverelli, WTO
15:30 - 15:45	Tea break
Participant	All
15:45 - 16:45	From China with Love
Speakers	Mauro Boffa, Gianluca Santoni, and Daria Taglioni, World Bank Group
Discussant	Gaaitzen de Vries, University of Groningen, the Netherlands
16:45 - 17:45	The Changing Structure of the Global Value Chains and Domestic Firms' Productivity: Evidence from Japanese and Chinese Firm-Level Data
Speakers	Yoshihiro Hashiguchi Keiko Ito, Chiara Criscuolo, Jonathan Timmis, IDE-JETRO
Discussant	Nick Hope, Stanford Center for International Development
17:45 - 18:45	The Future of Supply – How Might Industry 4.0 Impact Global Value Chains ?
Speakers	Michael Ferrantino, World Bank Group
Discussant	Emmanuelle Ganne, WTO

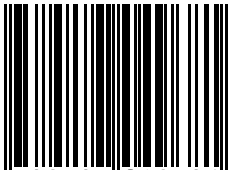
March 23, Guobin Hotel

8:00 - 9:00	Are the Geese Still Flying? Evidence from Manufacturing FDI Mary Hallward-Drimeier and Gaurav Nayyar, World Bank Group
Speakers	Mary Hallward-Drimeier and Gaurav Nayyar, World Bank Group
Discussant	Jiandong Ju, Tsinghua University
9:00 - 10:00	Regional divergence in China: the Perspective of Value Chain
Speakers	Shan-tong Li, He Jianwu (DRC)
Discussant	Deborah Winkler, World Bank Group
10:00 - 10:15	Tea break
Participant	All
10:15 - 11:15	Hollowing Out and Slowing Growth: A Perspective from Heterogeneous Technological Change
Speakers	Wenbo Zhu, RCGVC
Discussants	Heiwai Tang, John Hopkins University
11:15 - 12:15	Value added in China's mobile phone handset industry
Speakers	Tim Sturgeon, MIT, Eric Thun, OXFORD, Daria Taglioni, World Bank Group
Discussants	Yuqing Xing, National Graduate Institute for Policy Studies, Japan
12:15 - 13:15	Lunch
Participant	All
13:15 - 14:15	Formerly Assembled, But Now Designed in China? An Exploration of Chinese Activities in Global Value Chains
Speakers	Quanrun Chen, Yuning Gao, Jiansuo Pei, Gaaitzen de Vries, Fei Wang
Discussants	Bo Meng, IDE-JETRO

14:15 - 15:15	The effect of production fragmentation on Skill reallocation: Is it felt equally across levels of development?
Speakers	David Dollar, Matthew Kidder and Bilal M. Khan, RCGVC
Discussants	Liping Zhang, Research Center at The State Council
15:15 - 15:30	Tea break
Participant	All
15:30 - 16:30	How can the digital economy help small and medium-sized traders in developing countries to integrate into the global economy?
Speakers	Rainer Lanz, Kathryn Lundquist, Andreas Maurer and Robert Teh, WTO
Discussants	Xin Cheng, Alibaba Research Institute
16:30 - 17:30	Corruption, Import Liberalization, and Productivity in China: A Firm-Level Analysis
Speakers	Jiankun LU, Bo MENG, Hongsheng ZHANG, Shang-Jin WEI
Discussants	Miaojie Yu, CCER
17:30 - 18:30	Keynote Speech: The impact of new technology on future Jobs
Speakers	Michael Spence, Nobel Prize Laureate in Economics
18:30 - 18:45	Closing remarks
Speakers	Dr. Robert Koopman, Chief Economist, WTO Dr. David Dollar, Senior Fellow, Brookings Institution Wang Zhi, Professor and Director, RCGVC

This report takes stock of the evolution of global value chains (GVCs) in light of technological developments, such as robotics, big data and the Internet of Things. It discusses how these technologies are reshaping GVCs and examines the effect of these changes on labor markets in developed and developing economies and on supply chain management. The report discusses how technological developments are creating new opportunities for the participation of small and medium-sized enterprises in global value chains and reviews issues related to GVC measurement. The report is a follow-up to the first Global Value Chain Development Report, which revealed the changing nature of international trade when analyzed in terms of value chains and value-added trade.

ISBN: 978-92-870-4968-1



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