

# From domestic to regional to global: Factory Africa and Factory Latin America?

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**G**lobal value chains (GVCs) have been drivers of growth in developed and emerging economies for many years, perhaps best characterized by China's experience. Export-driven growth is about generating higher overall value added, employment, and income through more efficient (and, ideally, higher productivity) production. The process of generating higher value added is typically referred to as upgrading. But the scale of integration within GVCs has varied, with many low-income countries, particularly in Sub-Saharan Africa, integrating only at the primary (commodity) part of the value chain, with little diversification or upgrading to higher value-added activities. And unlike most other regions—particularly Europe, North America, and Southeast Asia—Sub-Saharan Africa and, to a lesser extent, South America show little intraregional integration. In part, that reflects thick borders that add to trade costs, especially in landlocked African economies, but it also reflects a “spaghetti bowl” of regional trade agreements.<sup>1</sup> Better trade facilitation measures—such as establishing a single window for customs clearance, reducing tariffs, improving transport and logistics—are policy levers that governments can pull to deepen regional and global connectivity within value chains and to facilitate upgrading within firms.

The development of the Organisation for Economic Co-operation and Development–World Trade Organization (OECD–WTO) Trade in Value-Added database, and similar initiatives such as the World Input-Output Database, have transformed the ability to understand integration and assess the benefits of integration into GVCs. But while the literature on GVCs has generated a rich new vocabulary that describes the various forms of upgrading, the terms can in turn be misunderstood. At least

on the surface, the various forms of upgrading have also presented a conundrum to policymakers. The evidence reveals the importance of having access to cheap and efficient imports for exports. In most countries and industries around the world, the foreign content of exports has risen considerably over the past two decades. But upgrading can also involve the development of strong domestic upstream supply chains to exporting firms. In simple terms, therefore, the policy conundrum is whether to emphasize increasing the foreign content or the domestic content of exports.

This chapter provides a brief overview of upgrading and GVC terminologies, providing insights on interpretability pitfalls. It offers evidence of the complementarities between strong domestic supply chains and imports and then demonstrates the importance of strong regional value chains for integration at a global level. And to illustrate the complementarities, it ends with examples of broad and targeted policies that countries are implementing for the motor vehicle value chain.

## What is upgrading?

The concept of upgrading has its origins in international trade theory, where it indicates a shift toward the production of higher value goods. But with the increasing international fragmentation of production, the definition has incorporated the notion that goods are produced through a combination of specific tasks within a value chain, each generating a proportion of the good's overall value. This has given rise to the term “moving up the value chain,” whereby firms upgrade by engaging in a task within

the value chain that extracts a higher share of the overall value of the good (higher value added), typically referred to as functional upgrading.

### Functional upgrading

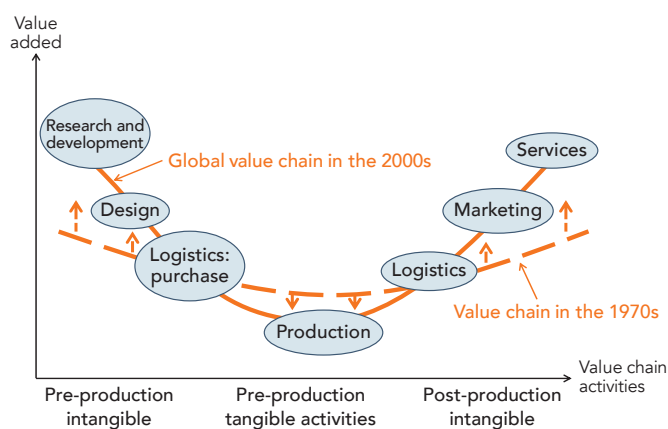
Functional upgrading is usually associated with higher labor productivity, since the move to a higher value part of the chain typically (but not always) requires higher skills. Notwithstanding the high correlation between productivity growth and profit growth, profit remains the primary driver for where firms position themselves in the value chain. From the perspective of the firm, upgrading may involve a move to a part of the value chain where relative labor productivity is lower but profits are higher. Indeed, a firm may take a lower overall part of the value of the final good at the end of the chain (even if overall sales of the final good remain unchanged). That is one reason why care is needed when deriving messages on upgrading using data on the domestic value-added content of output.

Upgrading also has implications for social cohesion and overall economic growth. Thus the country perspective on upgrading may differ from the firm perspective, a point often overlooked. Upgrading can result in higher profits and higher employment creation for the firm but lower overall productivity and lower overall GDP. For a country, however, the driver for functional upgrading is to increase GDP, as well as labor productivity and employment. Government intervention to ensure that upgrading occurs in a way that incentivizes the firm to upgrade to a higher skilled (higher labor productivity) part of the value chain can thus affect outcomes. For example, high tariffs on imports of capital goods could push firms to activities with low capital intensity (typically low labor productivity) and thus with lower domestic value added in order to maximize profits.

Partly for these reasons, care is needed in interpreting the “smile curve” developed by Acer’s CEO Stan Shih to illustrate the position of Chinese Taipei in the electronics value chain. The smile curve accurately describes the decomposition of value of a given product into the underlying stages (tasks) of production (at least for typical manufactured products; figure 3.1). But it does not follow that firms will necessarily seek to position themselves in tasks at the extreme ends of the curve, typically those that extract a higher share of the overall value.

The same holds for the national perspective. Countries clearly would like firms to position themselves at the higher value ends of the curve, since these are typically the tasks associated with higher labor productivity, but other considerations are also in play. Countries with a focus on higher social inclusion and lower inequality, for example, may want firms to position themselves in the higher employment part of the curve, particularly if that is where they have a comparative advantage and if doing so results in high volumes of output—recall that where to position along the value chain is as much a volume game (sales) as a ratios game (share of overall value). In addition, a low share of the overall value of a product does not necessarily equate with low productivity. There are examples of specialized and capital-intensive niche activities with high labor productivity in the manufacturing

**FIGURE 3.1** The smile curve of the global value chain, 1970s and 2000s



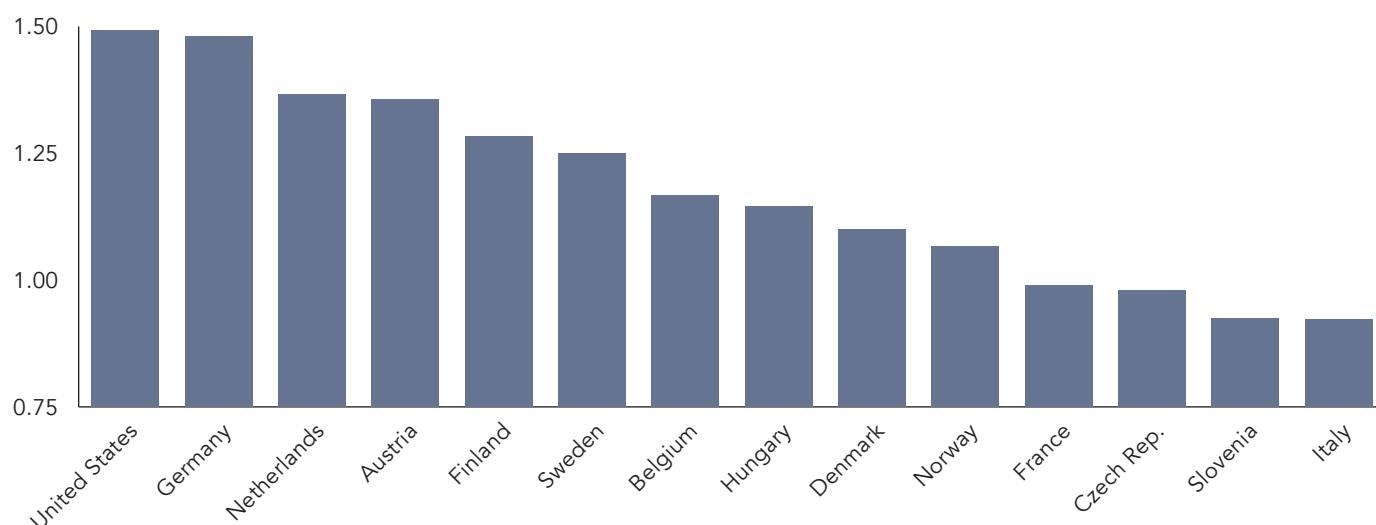
Source: Author’s analysis based on Shih 1996 and Gereffi, Humphrey, and Sturgeon 2005.

part of the value chain. Indeed, in many OECD economies, labor productivity is typically higher in manufacturing (often the low value part of the smile curve) than in business services (typically at the extreme ends; figure 3.2).

Functional upgrading goes beyond existing firms moving to different parts of the value chain. In a national context, it can also occur as new firms enter the market, often through new supply chains driven by lead firms (generally foreign affiliates) that provide (easier) indirect access to international markets for these new (upstream) entrants. Additional value is thus created through upstream domestic supply chains. Lead firms can also encourage incumbents to upgrade through process and product upgrading facilitated by technology and human capital spillovers from the lead firms. Typically, this process results in higher overall domestic value-added content of exports within a specific value chain as new entrants and incumbents, capitalizing on comparative advantages (such as proximity), displace less competitive foreign imports. This process highlights the one-time complementarity between importing for exports and eventually creating upstream supply chains.

The data point to this type of upgrading for textiles in China, although not unambiguously, as the data may also point to other forms of upgrading, including the more general case of functional upgrading.<sup>2</sup> For example, the foreign content of China’s textile exports fell from 43% in 1995 to 26% in 2011. Some of that content was displaced by the Chinese textiles industry, but by far the biggest contributor was the Chinese service sector, which displaced upstream foreign services providers (figure 3.3). Indeed, the Chinese textile industry’s contribution to the value of gross textile exports remained broadly steady (suggesting limited classic functional upgrading in the firm or sector), but its share of domestic value added in textile exports fell from just under 50% in 1995 to just over 40% in 2011, as Chinese firms began to occupy other parts of the GVC for textiles.

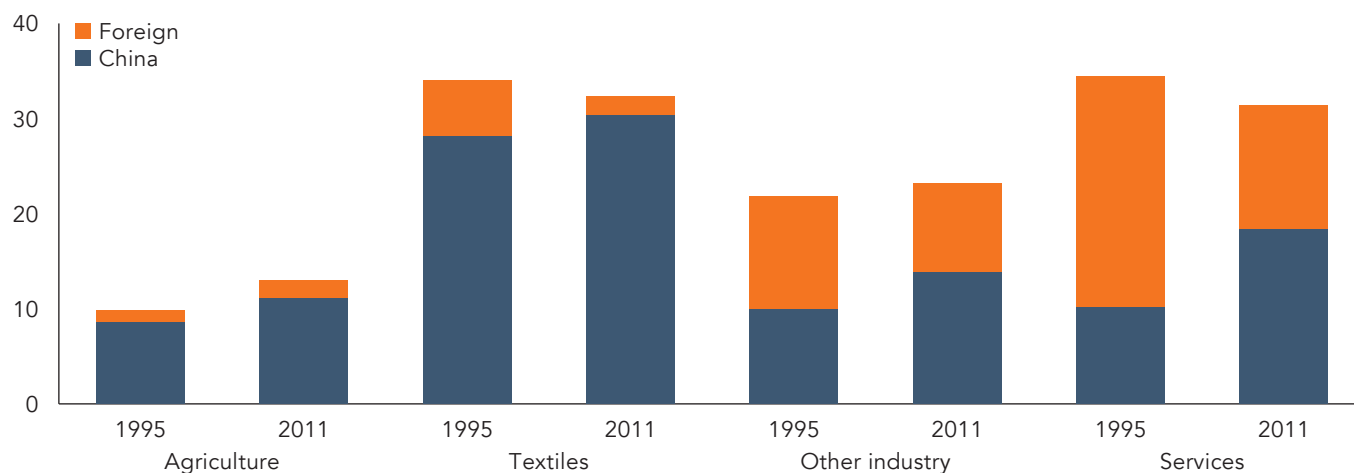
**FIGURE 3.2 Labor productivity: Manufacturing relative to business services in selected Organisation for Economic Co-operation and Development countries, 2010**



Source: Author's analysis based on Shih 1996 and Gereffi, Humphrey, and Sturgeon 2005.

**FIGURE 3.3 China's exports of textiles, by origin of value added, 1991 and 2011**

Percent



Source: Author's analysis based on Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database.

### Product upgrading

Another mechanism for upgrading is by producing higher value products (product upgrading), as the firm seeks to increase profits through sales of higher value products rather than moving to a different part of the value chain. This typically manifests itself as higher domestic value-added content through price rather than displacement (of imports) effects, as well as higher labor productivity. The aggregated Trade in Value-Added database-type measures of trade make it difficult to observe this type of upgrading. But analyses of detailed merchandise trade statistics can provide insights—for example, by looking at the (growing)

diversification of products (and relative unit value prices) within a particular product group and country.

### Process upgrading

Process upgrading typically refers to improved production methods that more efficiently transform intermediate inputs into final products, particularly through innovations in the production process or new technologies (see, for example, Humphrey and Schmitz, 2000, 2002, 2004). In theory, this type of upgrading should also generate higher domestic value content of production and higher labor productivity, since fewer intermediate

inputs are needed, especially if the innovations are related to knowledge-based capital that allows for higher rent extraction. Again, this can manifest itself as upgrading in upstream domestic suppliers that respond to competition from foreign producers.

### **Intersectoral upgrading**

Another common form of upgrading is intersectoral, extracting higher value by entering new product value chains. For example, Chinese Taipei used its competence in producing televisions to make monitors and eventually (through functional upgrading) to make computers (Humphrey and Schmitz 2002).

## **Integration for growth: Imports for exports**

The ability of firms to organize production processes into discrete tasks has transformed the nature of trade and the scope for firms (and countries) to participate in global production networks. This reorganization of global production has opened opportunities not only for multinational companies and leading exporting firms in advanced economies, but also for firms in emerging and developing economies. Firms in advanced economies are able to outsource to more cost-competitive countries, while emerging and developing economies can enter GVCs by taking advantage of a new tradable commodity in which they have comparative advantages—namely labor.

This is intuitive for firms that are able to source cheaper inputs, but concerns remain that the reallocation of resources induced by such changes may work imperfectly. Although debate continues on the benefits of trade for economic growth, the growing body of evidence points to a positive relationship between increases in imported intermediates and increases in competitiveness and indeed in exports at a broader level. This positive association has been demonstrated to occur through two channels: through the use of a greater variety of intermediates (also more competitively priced) and through technology transfers embodied in the imported products, which is also seen in the greater boost to productivity through imports from developed economies (Bas and Strauss-Kahn 2014). Similarly, a positive relationship has been found between imports and GDP, though with gains distributed unevenly across sectors (Kummritz 2014).

Further evidence of a positive relationship comes from a study using OECD–WTO Trade in Value-Added database data on foreign and domestic value added embodied in exports that relates changes in domestic value added in exports to structural and policy factors (Kowalski and Lopez-Gonzalez 2016; see annex 3.1 for a full description of the variables and data sources).<sup>3</sup> The study controls for structural determinants using the ratio of capital to labor, the intensity of skill, and the country's relative productivity. The policy determinants are the quality of domestic institutions, revealed investment openness, and trade policy stance. To identify the role of foreign inputs, the study takes foreign value added (by sector) to produce exports but with a temporal lag to avoid mechanical associations or reverse causality with the dependent variable.<sup>4</sup> The study also includes a

measure of geographic spillovers from neighboring countries (the distance-weighted domestic value added in final demand of partner countries) and a measure of domestic demand linkages, which help control for the size of the economy (captured indirectly through the domestic value added used for final domestic consumption).<sup>5</sup>

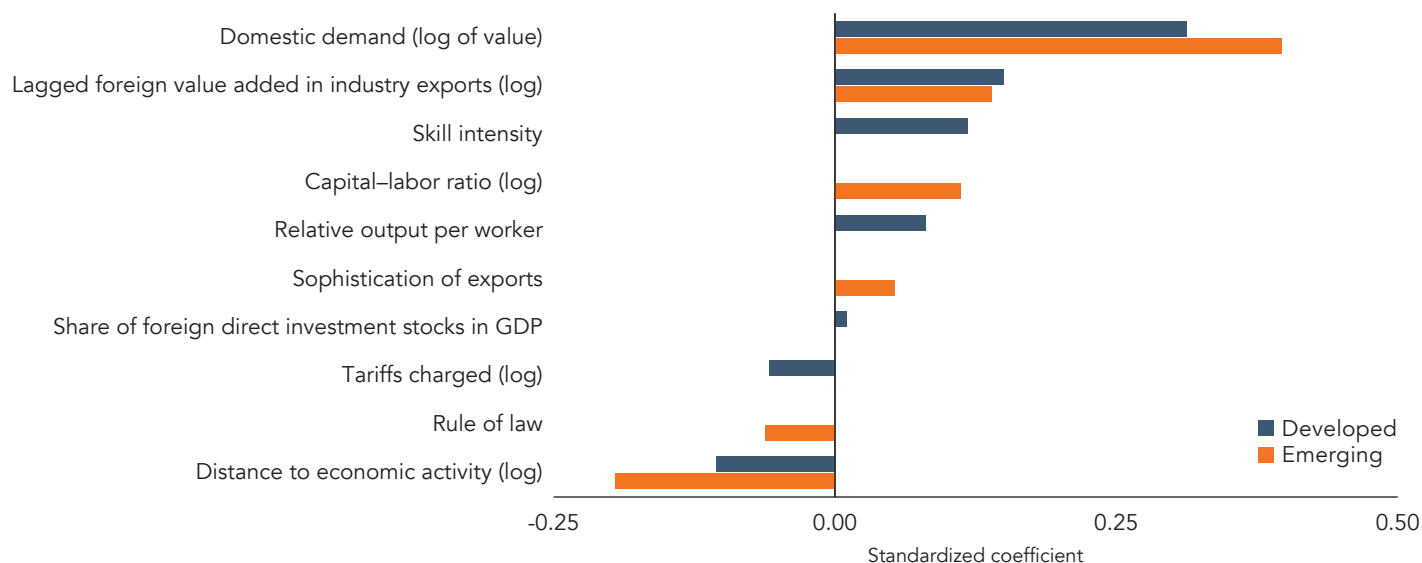
### **Strong domestic supply chains and strong international supply chains drive export growth**

Demand linkages with the domestic economy, proxied through the domestic value added of a sector in domestic demand, is the most significant determinant of growing domestic value added in exports for both developed and emerging economies (figure 3.4). But foreign value added used in the production of exports is the second most significant component in developed economies and the third most significant in emerging economies, clearly illustrating the complementary nature of imports for export growth. For example, in emerging economies a 1 percentage point increase in the import content of exports translates into roughly a 0.1 percentage point increase in the value of exported domestic value added. Distance to economic activity (measured as the distance-weighted domestic value added in the final demand of partner countries) is also an important determinant of value added in exports. But it is almost twice as important in emerging economies as in developed economies, possibly capturing the constraints imposed from less developed transportation networks. Tariffs, even if low, also have an impact in developed economies and marginally (albeit not statistically significant) in emerging economies (see table A3.1.1 in annex 3.1).

### **Not all drivers affect emerging and developed economies equally**

There are also some differences in significant factors between emerging and developed economies.<sup>6</sup> For example, the production of more sophisticated products (even though this may capture only insertion in processing parts of the value chain) is associated with growing domestic value added in exports in emerging economies only, while skill intensities are significant in developed economies only, likely reflecting the differing nature of integration between the two types of economies (see figure 3.4). Increases in capital–labor ratios are also an important determinant in emerging economies but not in developed economies. On the surface, this may point to low wages as an important determinant of integration in emerging economies, but the result is more nuanced.

Capital–labor ratios can also be loosely proxied by the inverse of unit labor costs, which in turn reflect the ratio of average compensation costs divided by average productivity.<sup>7</sup> The covariance with productivity may partly explain why productivity on its own was not a significant determinant for emerging economies. But the key point is that it is not average wages alone that determine integration in emerging economies but the combination of wages and productivity. And the higher the unit labor costs (the lower the capital–labor ratio), the lower the degree of

**FIGURE 3.4 Significant determinants of a change in domestic value added in exports for developed and emerging economies**

Source: Kowalski and Lopez-Gonzalez 2016.

Note: The figure shows the standardized coefficients of the determinants of changes in domestic value added in exports across agriculture, manufacturing, and services. The regression results are in table A3.1.1 in annex 3.1. No significance was found for depth of free trade agreements, share of exports covered by free trade agreements, or concentration of exports.

export-driven growth (and in turn integration). This result may in part explain why economies with an abundance of unskilled cheap labor still struggle to integrate in GVCs, despite rising wages in other parts of the world. For example, despite a four-fold increase in average wages in China between 2000 and 2010, its unit labor costs (at the economy level) were little changed and remained significantly below those in most economies in Africa (table 3.1). And Sub-Saharan African economies that generally saw little change in average wages between 2000 and 2010 still had high unit labor costs relative to other countries (figure 3.5).

### **Nor do the drivers affect all sectors equally**

A similar pattern emerges at the sectoral level, but the importance of foreign inputs for manufacturing exports is more stark (figure 3.6), while domestic (demand) linkages are most important for the services sector (reflecting the importance of integration by services as upstream suppliers to manufacturers).<sup>8</sup> Perhaps not surprising, given the limited role of foreign intermediates in services, foreign inputs are less important for services. Structural factors such as relative output per worker are also important, but skill intensity does not appear to be significant for services, though it is difficult to discount the possibility that this may to some extent reflect an aggregation effect that cannot differentiate between underlying high-skilled workers (such as software developers) and low-skilled workers (such as cleaners) within the industry grouping, as well as the different nature of the underlying integration process.

Promoting the creation of more sophisticated products has a positive effect only on manufacturing activities (not services),

and surprisingly this is also the case for share of foreign direct investment (FDI) stocks in GDP, though that may reflect differences in the outward orientation of inward FDI (FDI in manufacturing to serve export markets as opposed to FDI in services to serve domestic markets, including final demand). As for emerging and developing economies, tariffs on imports also act as a drag on domestic value added in exports at the sectoral level, including the services sector, reflecting that in most economies upstream services content accounts for around a third of the value added of manufactured exports. Puzzlingly, increasing the share of exports covered by free trade agreements does not appear to lead to increased exports of value added.

### **Domestic supply chains are an important stepping stone for improving participation in global value chains**

An important result of Kowalski and Lopez-Gonzalez's (2016) study relating changes in domestic value added in exports to structural and policy factors is the co-incidence of domestic demand (a proxy for internal domestic supply chains) and foreign inputs in export-driven growth, highlighting the complementarity of the two for export growth. Further evidence of this complementarity is provided by Beverelli and others' (2016) study of the relationship between upstream domestic supply chains and the foreign value added of exports (as a measure of GVC participation). They found a robust relationship between domestic value chains and future participation in GVCs. The study estimated that a 1 percentage point increase in domestic integration raises GVC backward integration by 0.5% over the short run.

**TABLE 3.1** Average wages and unit labor costs in manufacturing in selected developing and emerging economies, 2000 and 2010

Region and country	2000		2010	
	Average wages (U.S. dollars)	Unit labor cost (ratio of average wages to GDP per capita)	Average wages (U.S. dollars)	Unit labor cost (ratio of average wages to GDP per capita)
<i>Sub-Saharan Africa</i>				
Burundi	—	—	3,261	14.9
Cameroon	3,088	5.3	—	—
Ethiopia	771	6.3	807	2.4
Ghana	1,832	4.9	—	—
Kenya	2,118	5.2	2,854	3.6
Malawi	436	2.8	2,045	5.7
Mauritius	3,254	0.8	6,285	0.8
Senegal	3,680	7.8	6,450	6.5
South Africa	7,981	2.6	12,331	1.7
Tanzania	2,296	7.5	1,581	3.0
<i>North Africa</i>				
Egypt	2,028	1.3	3,453	1.2
Morocco	4,123	3.2	6,654	2.4
Tunisia	4,066	1.8	5,455	1.3
<i>Latin America</i>				
Brazil	5,822	1.6	10,918	1.0
Colombia	4,096	1.6	4,680	0.8
Mexico	8,048	1.2	7,310	0.8
<i>Asia</i>				
Bangladesh	—	—	680	1.6
China	1,016	1.1	4,770	1.1
India	1,356	3.0	2,619	1.8
Indonesia	929	1.2	1,897	0.6
Malaysia	4,405	1.1	6,548	0.7
Viet Nam	—	—	1,727	1.3
<i>Eastern Europe</i>				
Czech Republic	3,964	0.7	12,673	0.7
Latvia	3,689	1.1	9,191	0.8
Poland	5,829	1.1	10,162	0.8

Source: Ceglowski and others 2015.

Note: — is not available.

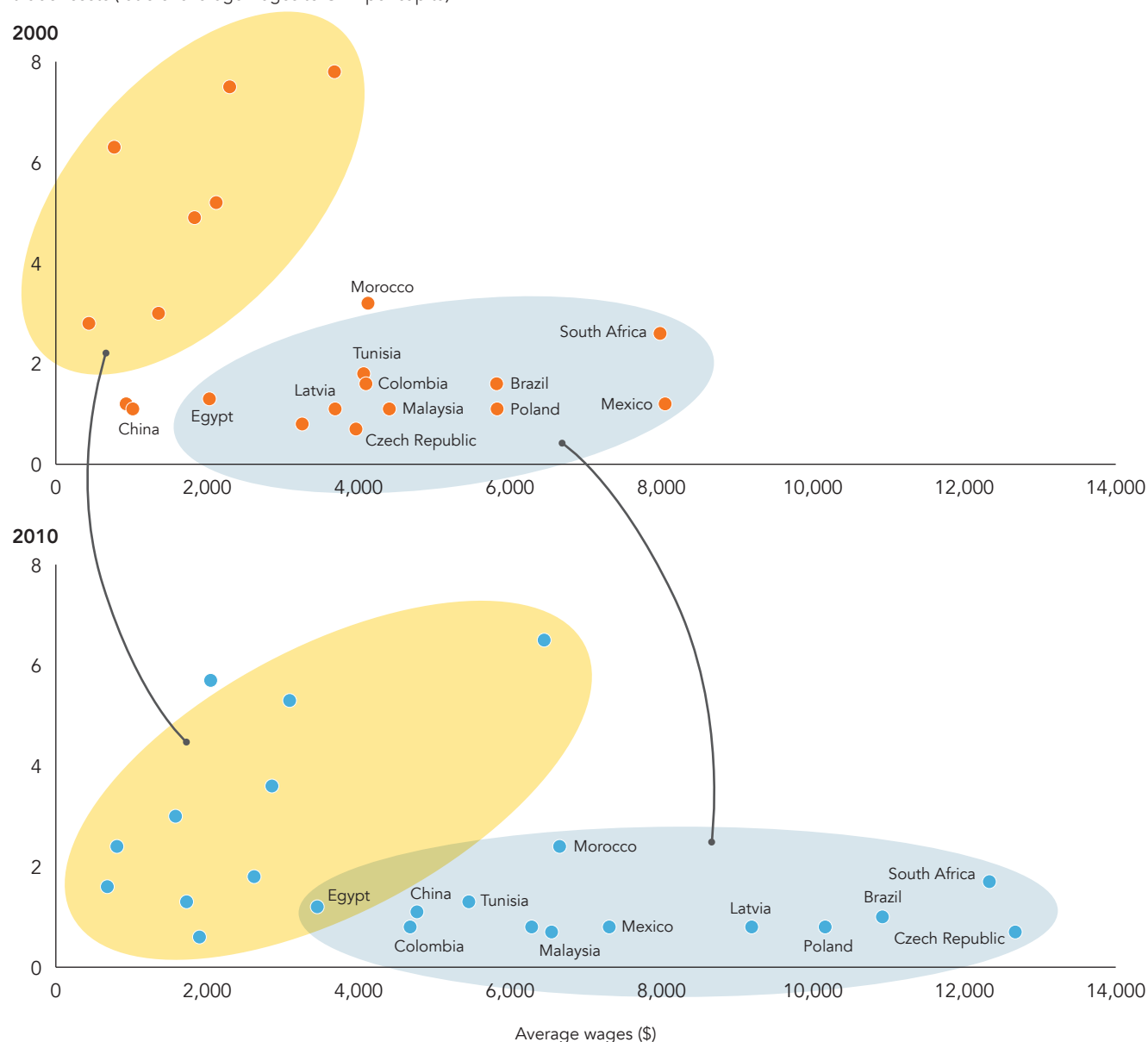
## Regional value chains as enablers of integration into global supply chains

The analysis so far offers two takeaway messages for countries looking to drive growth through integration in global value chains. The first is that imports can be an important driver of export growth. The second is that strong domestic supply chains provide an important launching pad for integration at a more

global level. But another important takeaway message, often overlooked in the debate on GVCs, is that it matters where a country is located: it matters who its trading partners are, especially how integrated the partners are into regional and global value chains, and how far the country is from poles of economic activity (including markets). The composition of firms within an economy also matters. In most economies, particularly emerging economies, the majority of firms are small or medium size. The

**FIGURE 3.5 Evolution of unit labor costs and average wages, 2000 to 2010**

Unit labor costs (ratio of average wages to GDP per capita)



Source: Ceglowski and others 2015.

Note: Unit labor costs are the ratio of average wages to per capita GDP.

evidence points strongly to a lower likelihood of direct engagement in trade the smaller the firm, reflecting additional barriers—lower probability of financing, lower economies of scale, higher relative fixed costs in dealing with regulation, and so on.

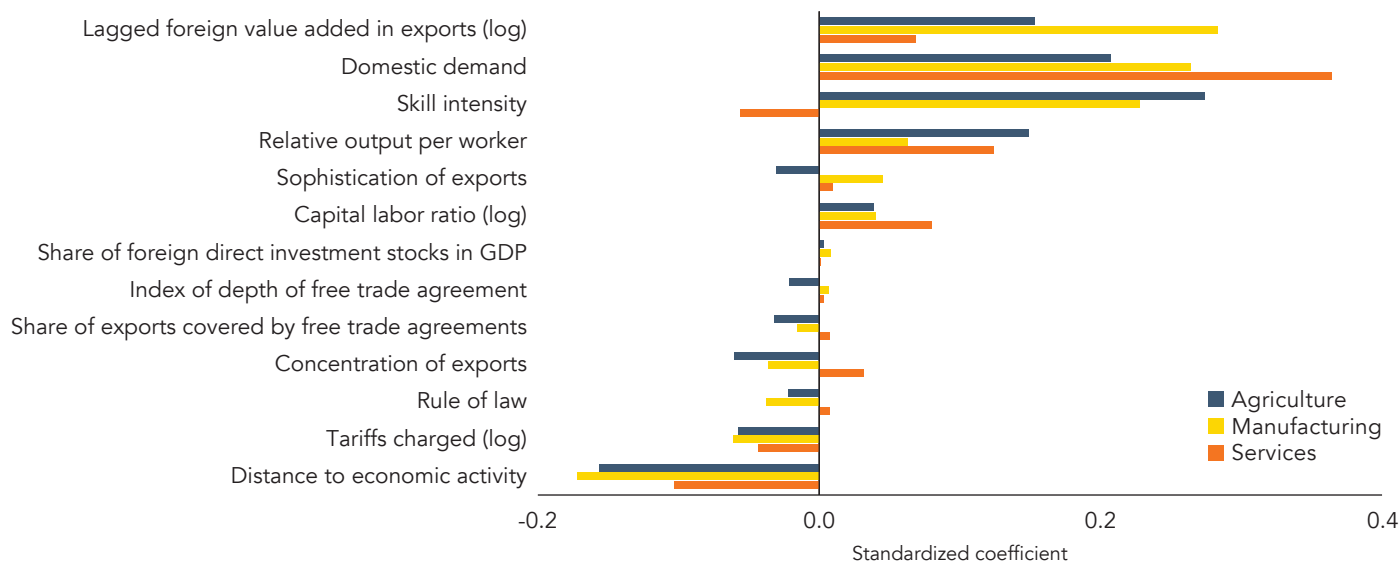
The fact that geography matters, coupled with the fact that strong domestic supply chains are important enablers of integration into global supply chains, leads the debate toward regional value chains as enablers. Currently the best statistical tool used to measure GVC integration comprehensively is the OECD–WTO Trade in Value-Added database, which has data on 63 countries. It

provides strong evidence of increased integration in GVCs in most economies based on foreign value added in exports, backward linkages, forward linkages, domestic value added in other countries' exports, and standard GVC participation indices (figure 3.7).

### ***Intraregional integration is unequal—and poor in Africa and Latin America***

Although the coverage of countries in the OECD–WTO Trade in Value-Added database reflects a significant proportion of world output and world trade, it remains patchy in many regions,

**FIGURE 3.6** Determinants of change in domestic value added in exports, by sector

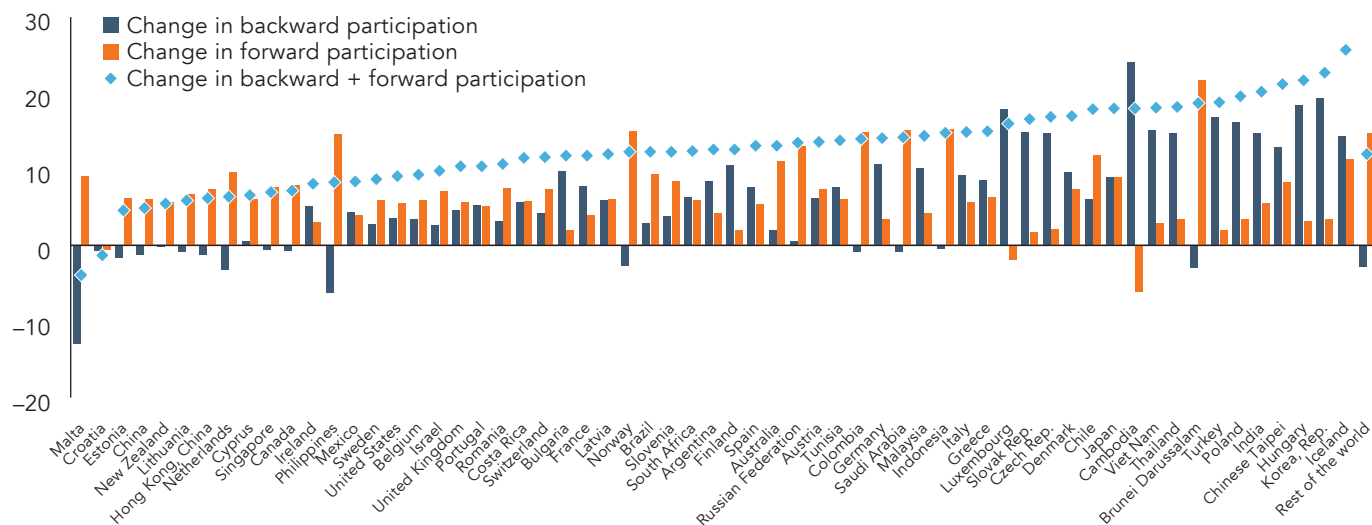


Source: Kowalski and Lopez-Gonzalez 2016.

Note: The figure shows the standardized coefficients of the determinants of changes in the domestic value added in exports across agriculture, manufacturing, and services. The regression results are in table A3.1.1 in annex 3.1.

**FIGURE 3.7** Changes in measures of integration into global value chains between 1995 and 2011 for the 63 economies in the Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database

Change (percentage points)



Source: Author's analysis based on Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database.



notably Africa and Latin America. That limits its ability to provide insights on the nature of regional value chains. And where evidence does exist, it points strongly to very weak regional participation (intraregional trade) outside Asia, Europe, and North America relative to extraregional trade (figure 3.8).

For regions not covered, notably for Africa, conventional (gross trade) statistics provide similar messages of weak regional integration (figure 3.9).

Moreover, where integration does occur, it is very much at the low-value end of GVCs for low-income countries, with exports of natural resources a significant form of integration and imports of intermediate parts generally satisfying domestic demand (figure 3.10).

### Poor integration is stifling convergence

Many countries that have integrated into GVCs have found themselves “captive participants,” experiencing difficulties in scaling up as a result of being locked into low-value tasks or as providers of commodities at the beginning of the value chain. With seemingly limited ability to upgrade or diversify, they are often hostage to price competition that keeps wages low or to the vagaries of commodity prices (the resource curse). And this low-value form of integration appears to have, at least in part, inhibited greater improvement in economic convergence and stymied the upgrading process (figure 3.11). Most African economies, for example, have experienced only a 0–2 percentage point increase in GDP per capita in the last two decades relative to U.S. levels (although in some cases this amounts to doubling relative GDP per capita and sometimes even more, as in Angola’s case).

The stylized fact that a limited ability to integrate has gone hand in hand with limited income convergence can also be seen in measures of economic complexity, which provide a broad indication of a country’s upgrading (relative to other countries; Hausmann and others 2011).<sup>9</sup> Most African economies show little change in ranking on these measures over the last two decades (where 1 indicates the highest complexity and 124 the lowest). Notable exceptions are North African economies, reflecting, at least in part, their geography—their proximity to European markets and value chains (figure 3.12).

The pattern is similar in Latin America and the Caribbean, with gains generally observed only in economies that improved their integration into North American value chains, such as Costa Rica (figure 3.13).

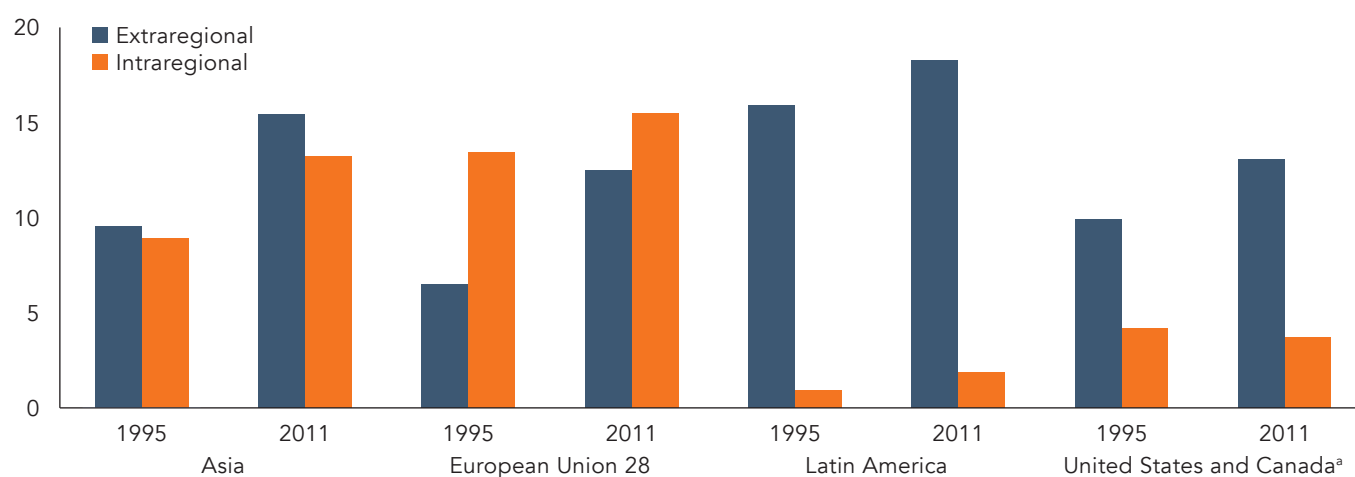
This contrasts starkly with countries in Asia and former transition economies in Eastern Europe (figure 3.14).

There is a positive correlation between change in economic complexity ranking over the last two decades (where a negative entry reflects greater economic complexity) and change in the foreign content of exports for countries with a more than 5 percentage point change in the foreign content of exports (figure 3.15).<sup>10</sup> But for countries with a smaller change in foreign content, the data point to a negative correlation.

Important here is the relative performance of countries in regions not well covered in the Trade in Value-Added database and how representative they may be for their regions as a whole: Argentina, Brazil, Chile, Colombia, and Costa Rica for Latin America and Saudi Arabia, South Africa, and Tunisia for the

**FIGURE 3.8** Intraregional and extraregional value chains, by region, for the 63 economies in the OECD–WTO Trade in Value-Added database, 1995 and 2011

Foreign value added content of gross exports as percent of total value added in exports



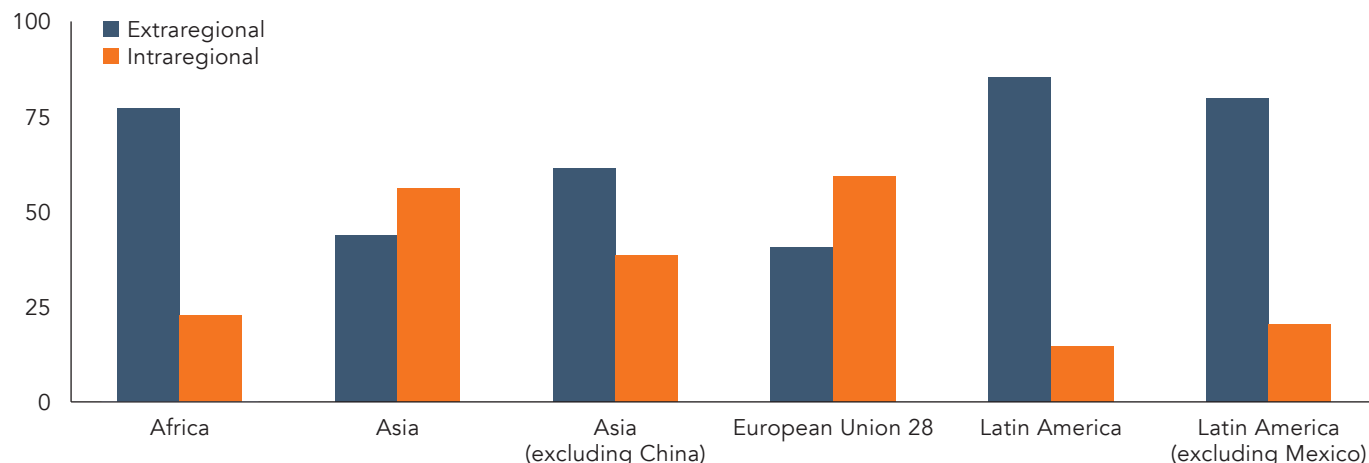
Source: Author’s analysis based on Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database.

Note: The regional classification is limited to countries in the Trade in Value-Added database. Asia includes Brunei Darussalam; Cambodia; Hong Kong, China; India; Israel; Japan; the Republic of Korea; Malaysia; the Philippines; Saudi Arabia; Singapore; Chinese Taipei; Thailand; Turkey; and Viet Nam. Latin America includes Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico.

a. A significant share of extraregional trade reflects trade with Mexico.

**FIGURE 3.9 Extraregional and intraregional trade in intermediates, 2014**

Percent of total intermediates trade

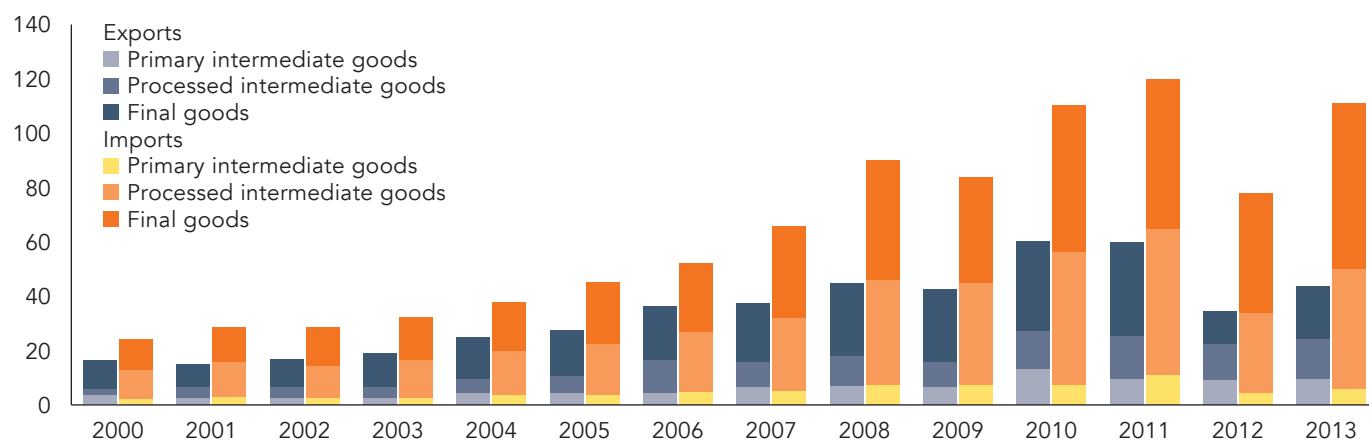


Source: Author’s analysis based on data from the UN Comtrade database for Africa and Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database for other regions.

Note: Trade in intermediates is defined as total trade (the sum of gross exports and gross imports) in the sectors classified as primary and processed food and beverages destined mainly for industry, other industrial supplies, fuels and lubricants other than processed motor spirits, and parts and accessories for capital goods and transport equipment. The composition of macro-geographic (continental) regions follows the UN methodology (<http://unstats.un.org/unsd/methods/m49/m49regin.htm>). Countries in the Trade in Value-Added database, by region, are as follows: Asia includes Brunei Darussalam; Cambodia; Hong Kong, China; India; Israel; Japan; the Republic of Korea; Malaysia; the Philippines; Saudi Arabia; Singapore; Chinese Taipei; Thailand; Turkey; and Viet Nam. Latin America includes Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico.

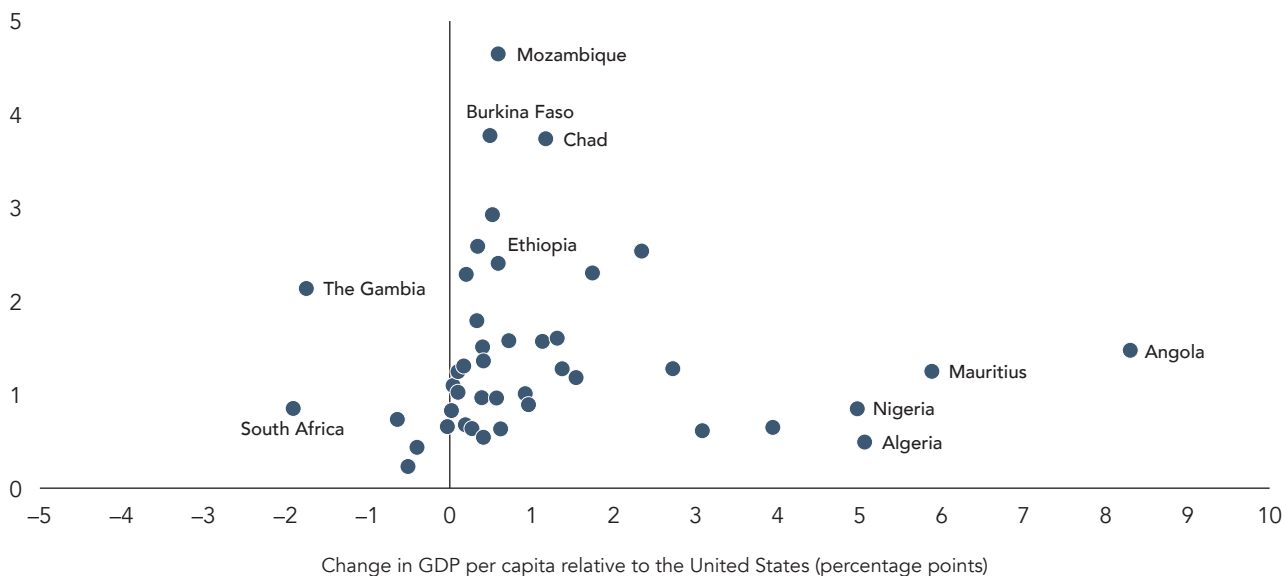
**FIGURE 3.10 Composition of trade in low-income countries by intermediate and final goods, 2000–13**

\$( billions)



Source: Author’s analysis based on UN Comtrade database.

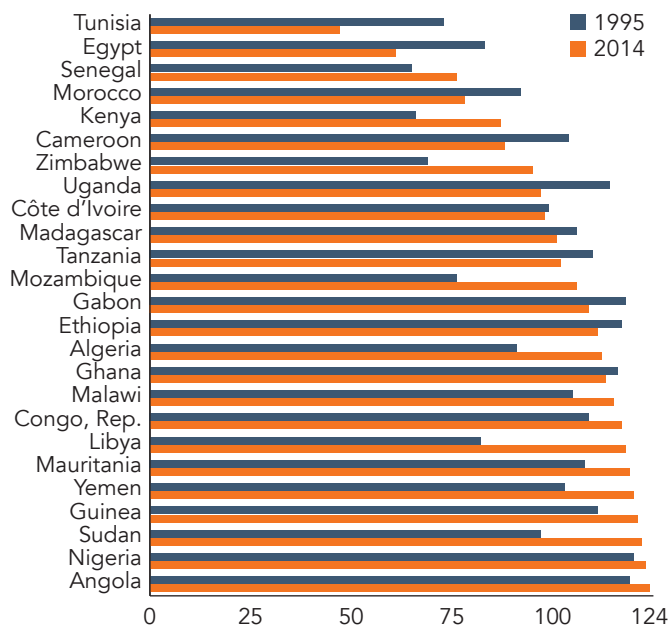
**FIGURE 3.11** Convergence in income per capita and exports in Africa relative to the United States between 1995 and 2014  
2014 export volume (index, 1995 = 1 relative to the United States)



Source: Author's analysis based on World Development Indicators database 2016.

**FIGURE 3.12** Economic complexity rankings in Africa, 1995 and 2014

Rank (1 = highest, 124 = lowest)

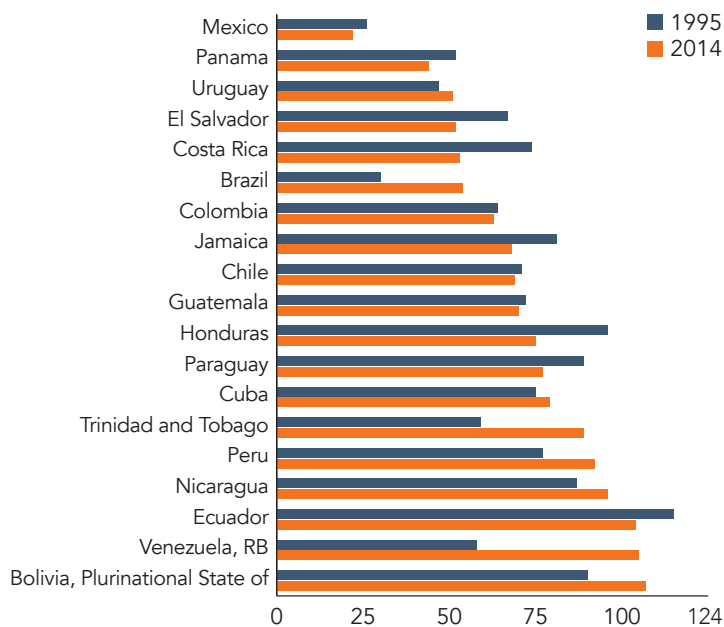


Source: Hausmann and others 2011.

Note: Rankings are among 124 economies, with a ranking of 1 reflecting the highest complexity and 124 the lowest.

**FIGURE 3.13** Economic complexity rankings in Latin America and the Caribbean, 1995 and 2014

Rank (1 = highest, 124 = lowest)

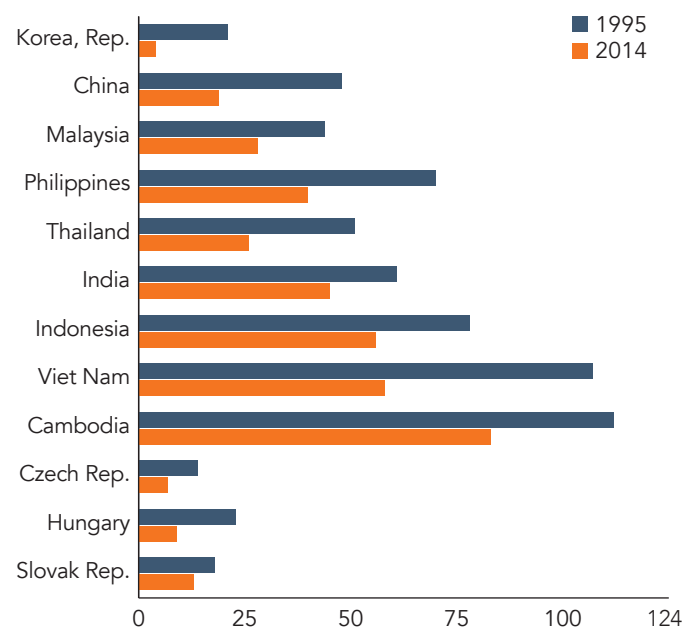


Source: Hausmann and others 2011.

Note: Rankings are among 124 economies, with a ranking of 1 reflecting the highest complexity and 124 the lowest.

**FIGURE 3.14 Economic complexity rankings in Asia and Central Europe, 1995 and 2014**

Rank (1 = highest, 124 = lowest)



Source: Hausmann and others 2011.

Note: Rankings are among 124 economies, with a ranking of 1 reflecting the highest complexity and 124 the lowest.

Middle East and Africa. Costa Rica and Tunisia, for example, have seen a marked improvement in both integration and economic complexity rankings, but this largely reflects integration through North American and European production chains and their proximity to those chains and markets. The same access for other countries in their regions may not be as straightforward.

#### **But there is scope for improved intraregional integration**

Of particular interest is the technological content of exports by region. As expected from interpreting figures 3.12 and 3.13, the technological content of exports is generally lower in Africa and Latin America than in other regions (figure 3.16), explaining in large part the poor performance in their economic complexity and, potentially, their economic convergence. But intraregional integration, where it does occur, is typically in higher value (technology) production. Intraregional trade is a small share of activity in these two regions, but it does point to the potential to improve regional integration by accelerating structural transformation and to the ability of intraregional integration to serve as a launching pad for greater global integration in higher value products.

For example, despite Africa's abundance of primary commodities, they also account for an important share (35%) of the continent's imports, indicating missed opportunities for sourcing commodities internally. Intra-Africa trade has grown only modestly, from 11.0% of total exports in 2002 to 15.7% in 2014, emphasizing its considerable unrealized potential. The potential is similar in Latin America and the Caribbean. On (unweighted)

average in 2014, countries in Latin America and the Caribbean (except for Mexico) exported 10 times more products within the region than to China, 7 times more to the European Union, and 2 times more to the United States (table 3.2).

Further differences emerge in Latin America and the Caribbean by the size of exporting firms. Small and medium-size firms (almost 15,000) export predominantly within the region (figure 3.17). Firm-level customs data show that the number of large firms that exported globally fluctuated between 500 and 1,000 in 2011 (in Bolivia, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, and Uruguay). However, although increased exports by small and medium-size firms can be an important driver of improved regional integration (and then global integration) as well as of improved inclusiveness, the contribution of their exports remains limited because of their low share in the overall value of exports (around 6% in 2011, much lower than in more developed regions such as Europe).<sup>11</sup> And given the high concentration of commodity exports, the contribution of smaller firms as upstream suppliers to larger firms integrated within existing value chains is also likely to be limited, certainly when compared with other regions (OECD and World Bank 2015).

#### **Enhancing regional trade agreements for regional trade**

A surprising result from the analysis by Kowalski and Lopez-Gonzalez (2016) was the negative relationship between the share of exports covered by free trade agreements and value added in exports. A number of factors might explain this. For example, in emerging economies most extraregional trade is in commodities, so diverging price effects could play a role. For example, higher values of commodity exports to countries with which the exporting country has no free trade agreement could create an inverse correlation. In addition, the scope and depth of regional trade agreements matter. In some regions, regional trade agreements may have only limited benefits, if they are not also part of more comprehensive liberalization and facilitation policies, including multilateral and unilateral efforts.

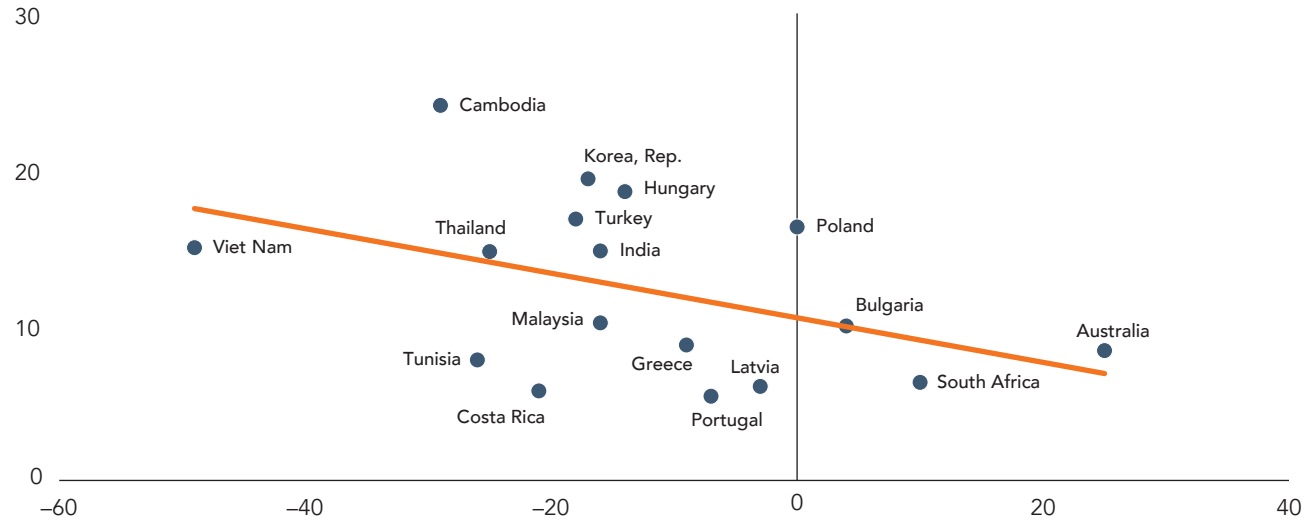
Despite a proliferation of free trade agreements and regional trade agreements, nontariff barriers to trade remain high in Africa. Trade costs within Africa are only slightly lower than trade costs with the rest of the world, at 313–337% in ad valorem equivalent (UNECA 2013). Indeed, as many as 10 African countries have higher trading costs with their intraregional partners than with the rest of the world. And in the median African country, document preparation to export or import takes 25% more time than in the rest of the world, while customs procedures are 30% more expensive (ESCAP and World Bank Trade Cost Database).

In the Asia–Pacific region, formal trade agreements may not have been a crucial driver of GVC trade at the intraregional level because economies are already connected through the regional production networks of multinational corporations. In addition, the effectiveness of regional trade agreements for exports appears to depend on the level of development of the exporting and importing economies. For example, regional trade agreements appear to have a greater impact for low-income countries when exporting to high-income countries than when exporting to another low-income country.

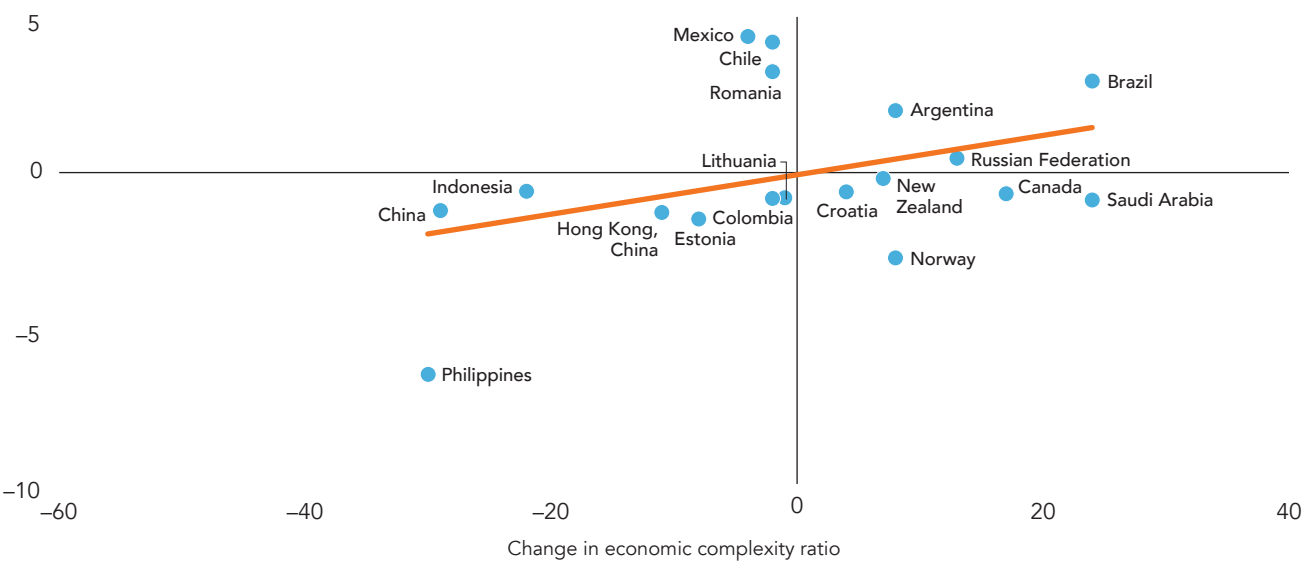
**FIGURE 3.15** Correlation of change in economic complexity rankings and change in foreign value-added content of exports between 1995 and 2014

Change in foreign value added content of exports

**With foreign value-added increase of 5 percentage points or more**



**With foreign value-added increase of less than 5 percentage points**



← Improvement in economic competitiveness ranking, 1995–2014

Source: Hausmann and others 2011.

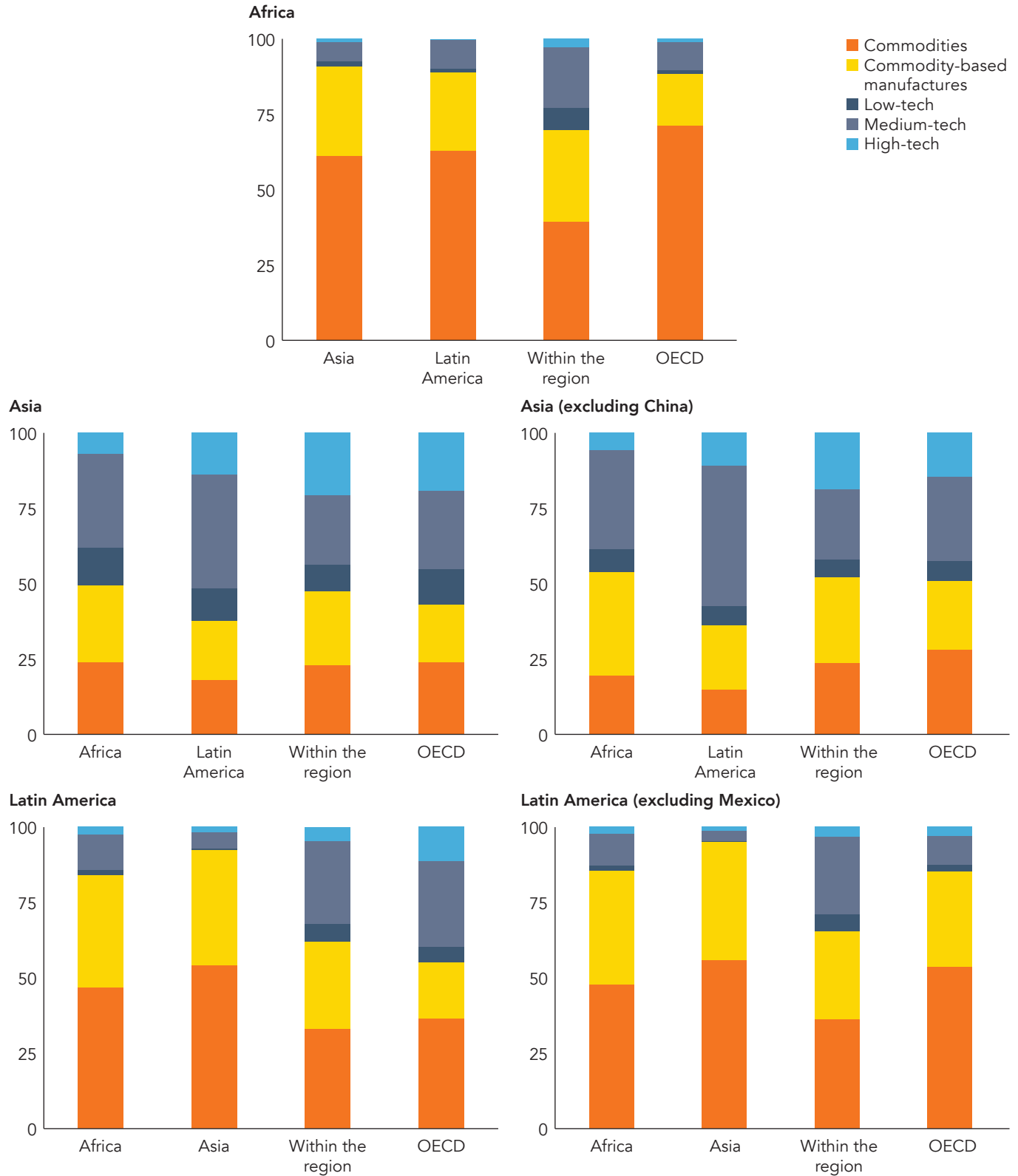
Another possibility is that the multitude of overlapping free trade agreements and regional trade agreements impede rather than promote exports by adding to the complexity of managing trade, particularly for small and medium-size firms, for which barriers to entry are already high. In general, higher intraregional trade is associated with fewer overlaps of regional trade agreements. For example, Europe, with the highest level of intraregional trade, also seems to have the simplest structure, whereas Latin America and Africa, with poor intraregional trade, have the most complex arrangements (figure 3.18).

**National experience with value chain upgrading and integration: Automotive sector**

There is no single solution to GVC policymaking. Country-specific factors shape how countries integrate into GVCs: where they are located, the size and relative income of their neighbors, their relative income, the structure of their economy, the scope and nature of trade agreements, and endowments of physical and human capital, to name but a few. So GVC policymaking requires a whole supply chain approach, which is largely country

**FIGURE 3.16** Regional exports by share of technological intensity, 2014

Percent



Source: UN Comtrade database.

Note: The figure shows the cumulative total exports for each region between 2013 and 2014. The technological classification follows Lall 2000 and Aboal and others 2015. OECD group refers to members up to the end of 1993.

**TABLE 3.2** Number of exported products by destination from countries in Latin America and the Caribbean, 2014

Source country	Destination region or country			
	Latin America and Caribbean	China	European Union	United States
Antigua and Barbuda	17	—	4	11
Argentina	3,358	359	1,488	1,333
Bahamas	17	4	8	45
Barbados	906	40	259	475
Belize	75	5	26	85
Bolivia, Plurinational State of	566	51	278	273
Brazil	3,779	1,402	2,937	2,786
Chile	2,932	327	1,472	1,291
Colombia	3,176	277	1,375	1,762
Costa Rica	2,791	273	1,033	1,690
Dominican Rep.	2,281	203	1,223	2,151
Ecuador	1,883	109	940	1,052
El Salvador	2,442	44	466	1,149
Guatemala	3,198	113	637	1,361
Guyana	471	29	94	294
Honduras	1,485	757	682	1,531
Jamaica	470	38	252	337
Mexico	3,756	1,401	2,830	4,052
Nicaragua	1,837	52	304	923
Panama	289	32	66	156
Paraguay	968	63	408	287
Peru	3,034	249	1,599	1,772
Saint Lucia	355	6	188	848
Uruguay	1,367	108	786	453
Venezuela, RB	920	16	168	618

Source: Economic Commission for Latin America and the Caribbean using data from the UN Comtrade database.

Note: A product is defined at the six-digit code level in the Harmonized System.

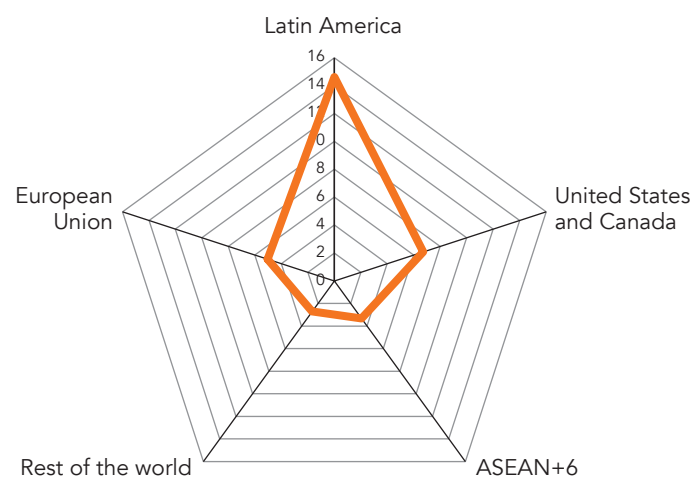
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specific. That makes it useful to draw lessons from actual country experiences. This section does that by synthesizing the results of questionnaires developed by the OECD Development Centre to target policy measures in the automotive sector.

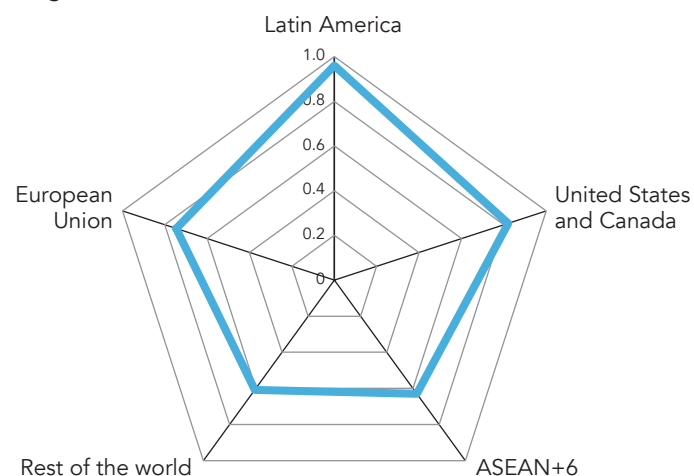
Although the automotive industry is highly concentrated, with only a few countries (companies) contributing to global production, its value chain is especially fragmented, both geographically

**FIGURE 3.17** Number of exporters in Latin America and the Caribbean by main export destination, 2011

#### Small and medium-size firms



#### Large firms



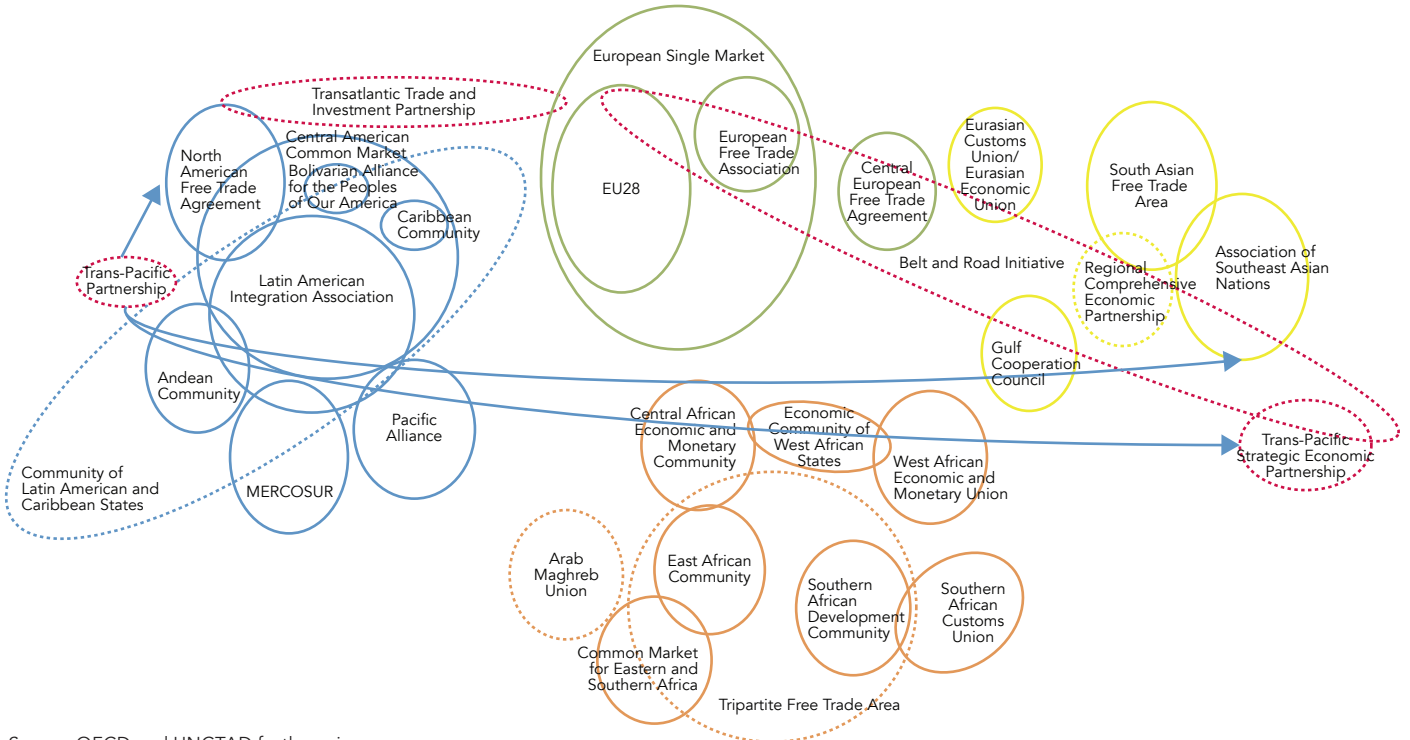
Source: Economic Commission for Latin America and the Caribbean using data from national customs offices.

Note: Data cover exports from Bolivia, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, and Uruguay.

and by tasks (research and development, design, testing, and assembly and production), with significant upstream chains. In all regions the automotive industry contributes no more than a third of overall final export value, less than services in all regions except Asia, where the automotive industry contributes marginally more (figure 3.19). In Latin America, services contribute nearly twice as much (more than 40%) as the automotive sector.

The high fragmentation in the industry has provided broad scope for integration for a variety of countries—and not just those with a significant motor vehicle industry. That, in turn, shapes the policy tools for improving the nature and space of integration. And in many countries—especially those with

**FIGURE 3.18 Selected regional and megaregional agreements, 2016**



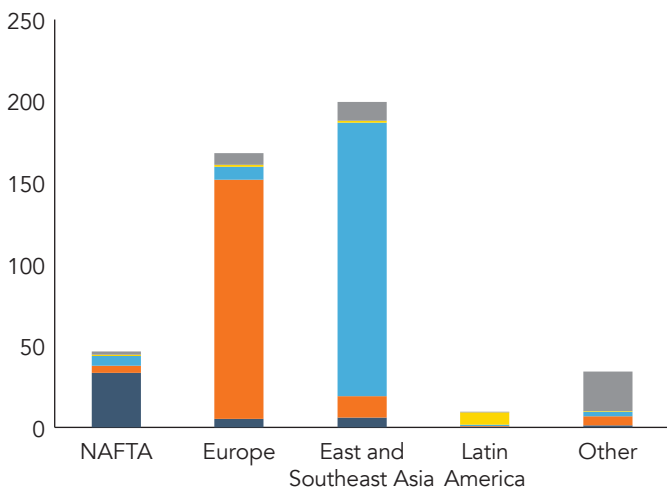
Source: OECD and UNCTAD forthcoming.

Note: The size of circles is proportional to the number of members that are parties to the agreement. Dashed lines indicate selected announced megaregional initiatives.

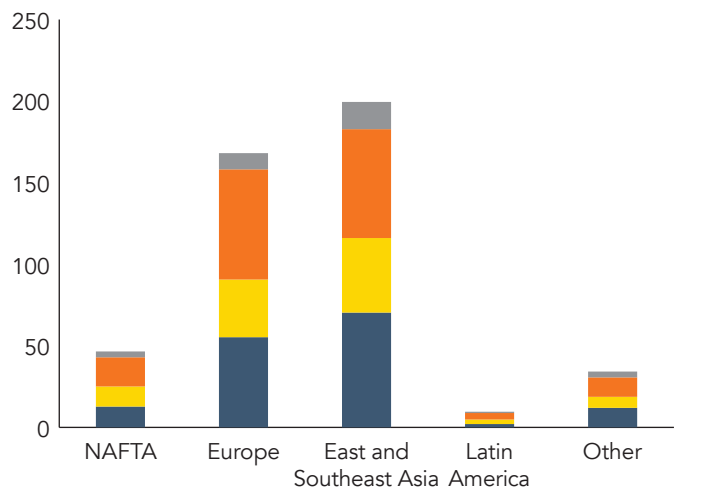
**FIGURE 3.19 Gross exports of motor vehicles and parts by region and origin of value added, 2011**

\$( billions)

**By region of origin**



**By sector of origin**



■ NAFTA ■ Europe ■ East and Southeast Asia  
■ Latin America and Caribbean ■ Other

■ Motor vehicles ■ Other manufacturing ■ Services ■ Other

Source: Author's analysis based on Organisation for Economic Co-operation and Development–World Trade Organization Trade in Value-Added database 2015.

Note: NAFTA is the North American Free Trade Area.



negligible automotive sectors, but also those with large automotive sectors—a strong policy focus is on the upstream part of the motor vehicle chain, where two-thirds to three-quarters of total value is created.

Of the 15 countries that responded to the OECD questionnaire, 5 are implementing targeted programs for the industry (Brazil, Colombia, France, Morocco, and Uruguay), four follow a horizontal approach (Costa Rica, Czech Republic, Mexico,

and Turkey), and the rest, with small automotive industries, are focusing on linkage opportunities through other activities (Chile, Dominican Republic, Ethiopia, Ireland, Peru, and Singapore).

### Targeted programs

Even in these specific categories, countries adopt different approaches to improve growth (table 3.3), often in parallel with broader multidimensional strategies (table 3.4). For example,

**TABLE 3.3 Main characteristics of targeted programs to promote the automotive industry in selected countries, 2014**

Characteristic	Brazil	Colombia	France	Morocco	Uruguay
Program name	Inovar-Auto <sup>a</sup>	Production Transformation Program	Plan Automobile	Pact for Industrial Resurgence—Automotive	Automotive Industry Export Promotion Regime
Responsible Institution	Ministry of Development, Industry and Foreign Trade	Ministry of Trade, Industry and Tourism	Ministry of Economic Regeneration and E-economy	Ministry of Industry, Trade, Investment and E-economy	Ministry of Industry, Energy, and Mining
Timeframe	2013–17	2009–32	Began in 2012, no termination date	2009–15	1992 (expired in 2015 following World Trade Organization rules)
<i>Objective</i>					
Strengthening national supply chain	Strengthen national supply chain (reaching a minimum investment of 1% of gross revenues net of taxes of qualified companies)	Achieve revenues (including exports) of at least \$3.4 billion and exports of \$1.1 billion and create at least 33,000 jobs by 2032	Strengthen linkages among local suppliers	Increase GDP by 12 billion dirhams and create 70,000 new jobs by 2015; setup second- and third-tier factories	Promote exports in certain industrial segments, mostly focused on MERCOSUR
Green targets	Increase energy efficiency of vehicles (efficiency goal of 1.82 megajoules per kilometer for all cars sold in the country by 2017)		Develop affordable green vehicles		
Innovation	Increase research and development and engineering capacities (0.5% of gross revenues from sales of goods and services, matching with grants from the National Fund for Scientific and Technological Development)	Promote innovation through the Center for Technological Development of the Automotive Industry	Increase innovation content		
Territorial dimension	National initiative	National initiative, in coordination with regional competitiveness commissions	National initiative in coordination with local authorities	National initiative, with territorial dimension (Tanger, Keintra, and Casablanca)	National initiative
Budget	—	—	1.4 billion euros	—	—
Monitoring and evaluation	Brazilian Agency for Industrial Development is in charge of developing a monitoring system for the program	National Planning Department is in charge of monitoring and evaluation	No evaluation foreseen	A monitoring committee with private and public stakeholders has been established	No evaluation carried out or foreseen
Links	<a href="http://inovarauto.mdic.gov.br/">http://inovarauto.mdic.gov.br/</a>	<a href="http://www.ptp.com.co">www.ptp.com.co</a>	<a href="http://www.redressement-productif.gouv.fr/plan-soutien-a-filiere-automobile">www.redressement-productif.gouv.fr/plan-soutien-a-filiere-automobile</a>	<a href="http://www.emergence.gov.ma/MMM/Automobile/Pages/prqMaroc.aspx">www.emergence.gov.ma/MMM/Automobile/Pages/prqMaroc.aspx</a>	

Source: Author's compilation based on country responses to the OECD questionnaire, "Targeted Programmes to Promote the Automotive Industry."

Note: — is not available.

a. In November 2016 the World Trade Organization ruled that this program's subsidies were illegal; it is currently being reformulated.

**TABLE 3.4 Multi-institution and multidimensional policy mix targeted to the automotive industry, 2014**

Type of incentive and country/responsible institution	Description/beneficiaries	Conditions	Innovation content
<b>Finance</b>			
<i>Fiscal incentives</i>			
Brazil, Ministry of Industry and Foreign Trade	Multinational and domestic companies	Minimum requirements of research and development and investments in engineering and business information technology	Development of domestic technology; adoption of foreign frontier technology
Colombia, Bancoldex	Domestic companies	No	No
France, Ministry of Research	All companies carrying out research and development	No	All innovation activities
Morocco, Ministry of Economy and Finance	Total exemption for five years for all companies located in special economic zones	Beneficiaries need to be located in special economic zones	No
Uruguay	Tax credit linked to export performance	Local content requirement (20% of national value added)	No
<i>Matching funds/grants</i>			
Colombia, Innpulsa Colciencias	Domestic companies, specific line for small and medium-size firms	Cooperation among local suppliers	Adaptation to domestic market
France, Ministry of Economy	All companies carrying out research and development on future cars	No	Future-oriented research and affordable green vehicles
Morocco	State contribution of up to 10% of total investment	Beneficiaries need to be located in special economic zones	No
<b>Skills</b>			
Brazil, Ministry of Industry and Education)	Technical, vocational, and higher education	Cooperation among private sector, local universities, and training institutes	—
Colombia, National Learning Service and Centre for Technological Development of Automotive Industry	—	—	—
Morocco	Creation of training institute for skills for the automotive sector; grants for training	Partnerships with private sector	—
<b>Business services</b>			
Brazil, Brazilian Agency for Export Promotion	Domestic and multinational companies	The company should operate in Brazil (or be willing to relocate)	—
Colombia, Bancoldex	Domestic companies	—	—
Morocco, Industrial Platforms offer a one-stop shop for business services	—	—	—
<b>Demand-side support</b>			
<i>Public procurement</i>			
Brazil, Ministry of Planning and Agrarian Development	Multinational and domestic companies	Companies capable of giving after-sale assistance over all national territory	Special incentives for adaptation to local markets
Colombia, Agency for Efficient Purchase	Domestic companies	No	Special incentives for adaptation to local markets
France	Domestic companies	25% of purchased cars are hybrid or electric	Green cars
<i>Other</i>			
France, Ministry of Environment	Taxes on high emission vehicles and fiscal incentives to buy green cars	—	Green cars
<b>Standards</b>			
Brazil, National Institute for Metrology, Quality and Technology	—	—	—

Source: Author's compilation based on country responses to the OECD questionnaire, "Targeted Programmes to Promote the Automotive Industry."

Note: — is not available.

Mexico and Turkey, with relatively large automotive industries, are developing strong assembly capacities with an emphasis on adding value through higher (quality) upstream domestic value chains. Some countries are strengthening domestic industrial capacities, such as Inovar-Auto in Brazil,<sup>12</sup> the Production Transformation Program in Colombia, and the Plan Automobile in France. Another approach is to capitalize on FDI; Morocco's target is to increase the attraction of FDI in second- and third-tier upstream operations, while Colombia is looking at developing domestic technological capabilities. Another approach is to strengthen export capacities, as in Uruguay, by upgrading through free trade agreement (MERCOSUR) chains.

The approaches also differ in time horizons. The Colombian program is part of a long-term (2032) strategy of production transformation. Brazil and Morocco follow multiyear planning, while France has no predetermined end date. Uruguay ended its regime in 2015 in line with WTO requirements.

Countries have set job targets (Colombia and Morocco), export targets (Brazil, Colombia), or investment targets (Brazil). Brazil and France have targets linked to "green" cars and sustainable development. Brazil and Colombia also target technological development and innovation. Colombia, for example, has a new Center for Technological Development of the Automotive Industry.

### Horizontal strategies

Similarly heterogeneous strategies can be observed in countries that identified the automotive industry as a priority area

within a broader horizontal strategy (Costa Rica, Czech Republic, Mexico, and Turkey) rather than as a targeted strategy. In the Czech Republic, for example, the National Incentive Scheme, which covers manufacturing, technology, and business services, sets out the conditions for attracting FDI—tax incentives, grants for job creation and training, preferential rates for land and infrastructure use, and grants for capital investment. But it also sets conditions for the investors—notably job creation targets (table 3.5).

In Mexico, a variety of horizontal programs can benefit the automotive sector (table 3.6). They include programs that support the development and uptake of information and communication technologies (PRODIAT and PROSOFT) and incentives for innovation (CONACYT), for strengthening local suppliers (NAFIN), and for attracting FDI and promoting regional development (ProMexico).

Turkey introduced an investment incentives system in 2012 with the objectives of promoting production transformation and specialization in higher value-added activities, increasing jobs, and reducing territorial disparities. The system targets both domestic and foreign companies and includes four categories of incentives by type of investment: general, regional (broken down into six regions based on socioeconomic criteria), large scale, and strategic. Each includes a different mix of incentives (table 3.7). The different schemes are applied taking into account the characteristics of the region in which the investment is made.

**TABLE 3.5 Policy mix of the National Incentive Scheme, Czech Republic, 2014**

<b>Policy mix</b>	<ul style="list-style-type: none"> <li>• Corporate income tax relief</li> <li>• Partial corporate income tax relief</li> <li>• Job creation grants</li> <li>• Training and retraining grants</li> <li>• Site support</li> <li>• Cash grant on capital investment</li> </ul>				
<b>Beneficiaries</b>	<b>Manufacturing firms</b>		<b>Technology centers</b>		<b>Business support services centers</b>
<b>Conditions</b>	<p>Regular ▼</p> <p>Minimum investment of 100 million koruna (\$5 million) within three years. This limit is reduced in regions with high unemployment.</p> <p>Investors' own equity must equal at least half the investment.</p> <p>Minimum investment in new machinery of 50 million koruna (\$2.5 million).</p>	<p>Strategic ▼</p> <p>Minimum investment of 500 million koruna (\$25 million) within three years.</p> <p>Minimum investment of 250 million koruna (\$12.5 million) in new machinery.</p> <p>The investor must create at least 500 new jobs.</p>	<p>Regular ▼</p> <p>Minimum investment of 10 million koruna (\$0.5 million) within three years.</p> <p>Investors' own equity must equal at least half of the investment.</p> <p>Minimum investment of 5 million koruna (\$0.25 million) in new machinery.</p> <p>The investor must create at least 40 new jobs.</p>	<p>Strategic ▼</p> <p>Minimum investment of 200 million koruna (\$10 million) within three years.</p> <p>Minimum investment of 100 million koruna (\$5 million) in new machinery.</p> <p>The investor must create at least 120 new jobs.</p>	<p>Regular ▼</p> <p>Creation of at least 40 new jobs at software development centers.</p> <p>Creation of at least 100 new jobs at other business support services centers (shared services centers and high-tech repair centers).</p>
<b>Eligible costs</b>	Long-term assets, when the value of machinery equals at least half the value of acquired assets.				
<b>Maximum state aid</b>	40% of total eligible costs (30% in Southwest regions and for investment in low-tech sectors)		40% of total eligible costs.		

Source: Author's compilation based on country responses to the OECD questionnaire, "Targeted Programmes to Promote the Automotive Industry."

**TABLE 3.6** Horizontal programs that can support the automotive sector in Mexico, 2014

Characteristic	Technological development		Promoting innovation CONACYT	Financing for suppliers NAFIN	Attracting foreign direct investment ProMexico
	PRODIAT	PROSOFT			
Objectives	Business services, training, certifications, and fiscal incentives to allow smaller firms to become suppliers of larger companies	Promoting use of information and communication technologies to increase productivity	Fund for technological development and innovation	Financing for working capital and fixed-asset acquisition to suppliers of any industry to promote growth and increase local content	Financial incentives to attract foreign direct investment and promote national and regional development
Year of introduction	2009	2008	2009	—	—
Time of frame	Three-year program, but with annual budget approval	—	Budget is approved annually by congress	Upon exhaustion of current budget	—
Main responsible institution	Ministry of Economy	Ministry of Economy	National Council for Science and Technology	NAFIN (development bank for small and medium-size firms)	Ministry of Economy
Territorial dimensions	Federal	Federal	Federal	Federal	Federal with matching resources from states
Budget	200 million pesos approved in 2014 (\$154 million)	700 million pesos approved in 2014 (\$54 million)	4 billion pesos approved in 2014 (\$308 million)	500 million pesos (\$385 million)	—
Links	<a href="http://www.economia.gob.mx/mexico-emprende/programas/7107-programa-para-el-desarrollo-de-las-industrias-de-alta-tecnologia-prodiat-para-el-ejercicio-fiscal-2012">www.economia.gob.mx/mexico-emprende/programas/7107-programa-para-el-desarrollo-de-las-industrias-de-alta-tecnologia-prodiat-para-el-ejercicio-fiscal-2012</a>	<a href="http://www.prosoft.economia.gob.mx/">www.prosoft.economia.gob.mx/</a>	<a href="http://www.conacyt.mx/index.php/fondos-y-apoyos/programa-de-estimulos-a-la-innovacion">www.conacyt.mx/index.php/fondos-y-apoyos/programa-de-estimulos-a-la-innovacion</a>	<a href="http://www.nafin.com/portaln/content/sobre-nafinsa/sala-de-prensa/boletin_15_14.html">www.nafin.com/portaln/content/sobre-nafinsa/sala-de-prensa/boletin_15_14.html</a>	<a href="http://www.economia.gob.mx/conoce-la-se/programas-se/informes-de-evaluaciones-externas/promexico">www.economia.gob.mx/conoce-la-se/programas-se/informes-de-evaluaciones-externas/promexico</a>

Source: Author's compilation based on country responses to the OECD questionnaire, "Targeted Programmes to Promote the Automotive Industry."

Note: — is not available.

**TABLE 3.7** Turkey's investment incentives system, 2014

Incentive	General investment incentives	Regional investment incentives	Large-scale investment incentives	Strategic investment incentives
Value-added tax exemption	✓	✓	✓	✓
Customs duty exemption	✓	✓	✓	✓
Tax reduction		✓	✓	✓
Social security premium support (employers' share)		✓	✓	✓
Income tax withholding allowance		✓	✓	✓
Social security premium support (employees' share)		✓	✓	✓
Land allocation		✓	✓	✓
Interest rate support		✓		✓
Value-added tax refund (with minimum investment of 500 million Turkish lira)				✓

Source: Author's compilation based on country responses to the OECD questionnaire, "Targeted Programmes to Promote the Automotive Industry."

### Broader policies supporting upstream integration

Even in countries with only small upstream providers to the automotive sector, such as Ireland, horizontal programs can be important. Enterprise Ireland, the agency developing Irish enterprises in world markets, provides direct support (subject to EU state aid guidelines) to foster high-potential startups by offering research and development grants and tools for expansion, internationalization, capacity development, and productivity. In addition, Ireland's global sourcing strategy develops strong domestic supplier chains to multinational enterprises in the country. In Chile and Peru, both net importers of vehicles, the focus is on developing upstream capacities in copper, rubber products (tires), design, and textiles.

### Special economic zones

Several countries also reported using special economic zones, including Morocco, Costa Rica, the Dominican Republic and Colombia. Morocco has targeted the broader automotive sector through the creation of integrated industrial platforms. Tanger Automotive City and Kenitra Automotive City are linked to Tanger and Casablanca special economic zones, which host automotive assembly multinational corporations to create local clusters of competences.

Costa Rica's FDI attraction policy has been linked to special economic zones. It also promotes local suppliers (Costa Rica Provee) and supports science and industry links to increase the innovation content of domestic companies.

A variety of upstream suppliers to the automotive industry have established manufacturing operations in special economic zones in the Dominican Republic. In addition to fiscal incentives, foreign companies are attracted to skilled human resources in disciplines related to the automotive industry, such as electrical and electronics manufacturing and injection molding. A free trade regime, managed by the National Free Zones Council, offers fiscal incentives to attract domestic and foreign companies that manufacture goods or provide export services. The council also establishes links between companies inside and outside the special economic zones, and the government has invested in promoting human capital in disciplines related to the main industries operating in the special economic zones (in partnership with the National Institute for Vocational Training). The Dominican Republic is now shifting toward technology-intensive sectors and higher value-added activities, including the automotive industry, capitalizing on preferential access to the U.S. and EU markets.

## Conclusions

There is no unique solution or approach to capitalizing on GVCs. Who or where a company is matters almost as much as the what and how, and indeed largely, determines how it integrates. Also clear, certainly from the upgrading stories in many economies, is that companies are not necessarily static, and countries can take many actions to overcome barriers to integration.

Barriers to trade, whether at the border or behind the border, can severely impede integration, but they are not the only obstacles. Countries need strong domestic supply chains coupled with unhindered access to imports. And it is no coincidence that economies making inroads in GVCs (as shown here for the automotive sector) focus policy as much on the improved functioning of these domestic chains as on improved access to foreign markets. Strong domestic chains are almost a precondition for sustainable and long-term success in GVCs. The spoils of export success accrue to different sectors, most notably to small and medium-size firms, which struggle for direct access to foreign markets, especially in emerging economies. Domestic chains also provide greater scope for functional upgrading. In many economies policy and partnerships nudge lead firms toward developing stronger competitiveness through technology transfers and training and greater scope for upstream incumbents to also upgrade through process and product upgrading.

But for many economies the road to success is not exclusively in their own hands. Where the countries are matters as much as who they are, and certainly for Sub-Saharan Africa and, to a lesser extent, Latin America, distance from more developed and higher income markets matters, especially for landlocked economies. And just as strong domestic chains matter for global integration, so too do strong regional chains. For many economies, regional chains are a necessary intermediate step.

It is possible, of course, that even without targeted action, the benefits from GVCs will begin to trickle down—in much the same way that GVCs are trickling inward in central China from the coast. This could happen as countries in Africa and Latin America that are on the periphery of richer regions begin to develop as a result of larger spillovers southward from the European and North American poles of activity and westward from Asian poles of activity. But there is no guarantee that this will happen, especially with trade slowing and signs emerging that the GVC engine may be stalling, especially with growing calls for protectionism in richer markets and emerging signs of reshoring, and with automation on the horizon.

Worryingly, the evidence suggests that new free trade agreements that overlap with existing arrangements may not improve regional trade, especially if they are not broad in their liberalization and facilitation policies. It is perhaps no coincidence that in Sub-Saharan Africa and Latin America, with significant shares of small and medium-size firms and relatively low regional integration, overlapping agreements create a spaghetti bowl—adding barriers that many firms are ill equipped to deal with. In this respect, the more comprehensive multilateral agreements such as the Common Market for Eastern and Southern Africa–East African Community–Southern African Development Community Tripartite Free Trade Area, with 26 African countries and 58% of the continent's GDP, bode well. Similar arguments could be made for Asia, but the starting point here differs. Integration has been facilitated by significant FDI flows, drawn in part by lower unit labor costs, and significant poles of higher income, with multinationals better equipped to handle the multiple layers of free trade agreements.

Improving regional integration may also help address competitiveness gaps that exacerbate those caused by geography (and indeed costs related to poor infrastructure). This is especially important since entry to GVCs through cheap labor alone does not seem to be enough. What appears to matter is the combination of labor and productivity, in other words unit labor costs. Despite, for example, the recent rise in China's labor costs, its unit labor costs appear to have remained competitive with those of Sub-Saharan Africa and Latin America. It is important, therefore, to make inroads in improving productivity, particularly through FDI, bringing much needed capital, technology, and know-how. But FDI has to be coupled with policies that can extract maximum spillovers through robust domestic supply chains, including a more robust entrepreneurial environment.

Efforts to increase and preserve participation in GVCs in the years to come may face a more difficult economic environment, reinforcing the need to better understand the challenges, the drivers of success, and the barriers that impede it. The diversity of success stories and the diversity of failures point to pragmatism and a realization that there is no one-size-fits-all approach. Different pathways exist, each delivering specific results and entailing a different balance of risks and gains, depending on the characteristics of a country, including its market structure and policy approach. For developing countries today, it is crucial to look forward and anticipate changes in the global organization of production in order to adapt to the future of production and services delivery.

**ANNEX 3.1****Result, variables, and data sources for the study by Kowalski and Lopez-Gonzales (2016)**

The annex tables present information and detailed results from the Kowalski and Lopez-Gonzales (2016) model analysis of changes in domestic value added in exports.

**TABLE A3.1.1** Determinants of changes in the domestic value added in exports (standardized coefficients)

Variable	(1) All countries	(2) Developed economies	(3) Emerging economies
Capital–labor ratio (log)	0.0739*** (0.0163)	0.0280 (0.0195)	0.112*** (0.0299)
Skill intensity	0.0928*** (0.0354)	0.118*** (0.0343)	0.844 (1.027)
Relative output per worker	0.0978*** (0.0276)	0.0802*** (0.0291)	–0.119 (0.138)
Share of foreign direct investment stocks in GDP	0.00512*** (0.00172)	0.0103*** (0.00245)	–0.00497 (0.00315)
Rule of law	–0.0250 (0.0157)	0.0303 (0.0208)	–0.0615** (0.0280)
Lagged foreign value added in industry exports (log)	0.151*** (0.0177)	0.150*** (0.0196)	0.139*** (0.0349)
Tariffs charged (log)	–0.0507*** (0.00794)	–0.0586*** (0.0105)	–0.0131 (0.0114)
Share of exports covered by free trade agreements	–0.00930 (0.00635)	0.00403 (0.00689)	0.0256 (0.0186)
Index of depth of free trade agreements	0.00222 (0.00581)	–0.00134 (0.00669)	–0.00414 (0.0120)
Sophistication of exports	0.0257* (0.0139)	0.0119 (0.0149)	0.0527** (0.0250)
Concentration of exports	–0.00507 (0.00976)	–0.0171 (0.0119)	0.0167 (0.0206)
Domestic demand (log of value)	0.327*** (0.0276)	0.312*** (0.0322)	0.397*** (0.0734)
Distance to economic activity (log)	–0.130*** (0.0250)	–0.105*** (0.0289)	–0.195*** (0.0504)
Constant	–0.167*** (0.0357)	–0.206*** (0.0418)	–0.138 (0.226)
Number of observations	10,882	7,394	3,488
R-squared	0.649	0.641	0.667
Number of repeating sections	1,838	1,250	588

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Kowalski and Lopez-Gonzales 2016.

Note: Numbers in parentheses are robust standard errors. Regressions are at the sectoral level using a fixed-effects specification that restricts the variance to the country-sector dimension and thus captures the impact of changes in the independent variables on the dependent variable. This setup controls for time-invariant country-sector omitted variables. See table A3.1.2 for a description of the variables and table A3.1.3 for descriptive statistics.

**TABLE A3.1.2 Description of variables**

Variable	Description	Source
Domestic value added in exports (log)	Domestic value added used by industry to produce exports	OECD Inter-Country Input-Output Tables
Capital-labor ratio (log)	Aggregate economywide capital-to-labor ratio	Penn World Tables
Skill intensity	High-skilled workers divided by low skilled workers (aggregate)	International Labour Organization
Relative output per worker	Country output per worker divided by average global output per worker	International Labour Organization
Share of foreign direct investment stocks in GDP	Aggregate share of foreign direct investment stock in country	United Nations Conference on Trade and Development
Rule of law		Worldwide Governance Indicators
Lagged foreign value added in industry exports (log)	Foreign value-added use by industry to produce exports	OECD Inter-Country Input-Output Tables
Tariffs charged (log)	Weighted average applied tariffs (weights from BACI data)	Trade Analysis Information System
Share of exports covered by free trade agreements	Weighted average trade covered by free trade agreements if countries share an agreement all their exports are considered to be covered	Trade Analysis Information System and Design of Trade Agreements Database
Index of depth of free trade agreements	Count of deep provisions in free trade agreements	Design of Trade Agreements Database
Sophistication of exports	EXPY variable calculated following Hausmann-Herfindahl indicators of concentration normalized	BACI
Concentration of exports	EXPY variable calculated following Hausmann-Herfindahl indicators of concentration normalized	BACI
Domestic demand (log of value)	Domestic value added from industry that is consumed domestically	OECD Inter-Country Input-Output Tables
Distance to economic activity (log)	Distances weighted domestic value added in consumption of other countries	Centre d'Etudes Prospectives et d'Informations Internationales Geography

Source: Kowalski and Lopez-Gonzales 2016.

**TABLE A3.1.3 Descriptive statistics**

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Domestic value added in exports (log)	14,302	6.58192	2.28415	-9.876943	13.53801
Capital-labor ratio (log)	14,518	11.70262	0.88856	8.13445	12.84867
Skill intensity	14,450	10.62023	43.35979	0.07450	358.80000
Relative output per worker	14,518	1.00000	0.60184	0.05052	3.59928
Share of foreign direct investment stocks in GDP	14,042	5.12193	7.57578	-16.40000	67.20000
Rule of law	12,036	0.79489	0.86737	-1.19000	1.98000
Lagged foreign value added in industry exports (log)	12,118	4.80752	2.81482	-12.79376	12.37180
Tariffs charged (log)	14,280	1.35067	0.75808	0.00000	3.34222
Share of exports covered by free trade agreements	11,628	0.56681	0.27757	0.00000	0.99390
Index of depth of free trade agreements	14,518	112.60660	116.49580	0.00000	366.00000
Sophistication of exports	14,076	9.69665	0.26274	8.26598	10.38535
Concentration of exports	11,832	0.05517	0.10275	0.00288	0.68158
Domestic demand (log of value)	14,756	11.81066	1.86974	7.47943	16.33693
Distance to economic activity (log)	14,518	13.40891	0.32243	12.43798	13.91208

Source: Kowalski and Lopez-Gonzales 2016.



## Notes

1. According to the World Bank's 2016 Logistics Performance Index, 6 of the 10 lowest ranked countries were in Africa: Somalia, Mauritania, Equatorial Guinea, Sierra Leone, Lesotho, and Zimbabwe.
2. An additional complication should be recognized in attempting to look for signs of functional upgrading (in the classic case where an existing firm upgrades to a higher value part of the chain) using official national aggregated (and not firm-level) statistics. These data typically aggregate firms on the basis of their core activity, usually measured on the basis of their main source of value added. So firms that engage in functional upgrading may appear in different industrial activity codes over two periods, hampering the ability to observe their evolution. But this is not necessarily a complicating feature when investigating functional upgrading at the national (rather the firm) level.
3. Timmer and others (2014) showed that emerging economies specialize in capital-intensive activities, which suggests that financial development can be important for GVC integration and upgrading. Harrison, Lin, and Xu (2014) showed that the key factors explaining Africa's disadvantage at the firm level are lack of infrastructure, low access to finance, and political competition.
4. A fixed-effect model is used that controls for country-sector and year characteristics. This restricts the variance of the dependent variable to temporal changes in domestic value added embodied in exports and controls for sector and country effects that do not vary over time. While this reduces the incidence of unobserved heterogeneity, concern remains about possible correlations between lagged changes in the foreign value added used to produce exports and current changes in the specialization measures. If prior changes are correlated with current changes driven by a common trend, the estimates will be biased. Further checks to account for the dynamic nature of these processes (through the use of a difference generalized method of movements specification) confirmed the robustness of the results.
5. This variable does not overlap with the dependent variable since it captures value added engaged in different activities.
6. Interestingly, positive changes in the rule of law reduce rather than increase domestic value addition in emerging countries. Although this is at odds with the common perception that better institutions lead to better economic outcomes, it likely reflects threshold effects. In other words, when considering the relatively low current rating of emerging economies on the rule of law, a positive association of value-added exports with the rule of law may arise only after a certain threshold has been reached. Perhaps surprisingly, the analysis reveals no correlation with inward FDI. This may reflect, at least in part, disproportionate investment in many emerging economies in existing (rather than greenfield) natural resource activities, coupled with volatile price effects.
7. A simple view of the capital-labor ratio can be given by the share of labor in overall value added relative to capital's share. The capital-labor ratio ( $C/L$ ) can be described simply as  $C/(C + L)$ , where  $C$  is the return to capital and  $L$  the return to labor and  $C + L =$  value added (GDP). Unit labor costs reflect average wages divided by average productivity, or  $L/(C + L)$  or  $1 - C/(C + L)$ .
8. See also Lopez-Gonzalez, Meliciani, and Savona (2015).

9. The economic complexity indicator provides a broad measure of the relative complexity of products and countries by ranking the diversity of products produced by a country with products weighted by complexity based on their ubiquity. Tracking movements over time can therefore provide insights into the relative upgrading (in complexity of production) of countries. Unweighted values of diversity and ubiquity are initially defined as follows, with  $M_{cp} = 1$  if country  $c$  produces product  $p$ , and  $M_{cp} = 0$  otherwise:
 
$$\text{Diversity} = k_{c,0} = \sum_p M_{cp} \quad (3.1)$$

$$\text{Ubiquity} = k_{p,0} = \sum_c M_{cp} \quad (3.2)$$
 Weighted values are generated through an iterative procedure:
 
$$k_{c,n} = \frac{1}{k_{c,0}} \sum_p M_{cp} \times k_{p,n-1} \quad (3.3)$$

$$k_{p,n} = \frac{1}{k_{p,0}} \sum_c M_{cp} \times k_{c,n-1} \quad (3.4)$$

$$\text{Diversity} = k_{c,0} = \sum_p M_{cp} \quad (3.1)$$

$$\text{Ubiquity} = k_{p,0} = \sum_c M_{cp} \quad (3.2)$$

$$k_{c,n} = \frac{1}{k_{c,0}} \sum_p M_{cp} \times k_{p,n-1} \quad (3.3)$$

$$k_{p,n} = \frac{1}{k_{p,0}} \sum_c M_{cp} \times k_{c,n-1} \quad (3.4)$$

Inserting equation 3.4 into equation 3.3 gives:

$$k_{c,N} = \frac{1}{k_{c,0}} \sum_p M_{cp} \frac{1}{k_{p,0}} \sum_c M_{cp} \times k_{c,N-2} \quad (3.5)$$

$$k_{c,N} = \sum_c k_{c',N-2} \sum_p \frac{M_{cp} M_{c'p}}{k_{c,0} k_{p,0}} \quad (3.6)$$

and it follows that:

$$k_{c,N} = \sum_c \tilde{M}_{cc'} k_{c',N-2} \quad (3.7)$$

where

$$\tilde{M}_{cc'} = \sum_p \frac{M_{cp} M_{c'p}}{k_{c,0} k_{p,0}} \quad (3.8)$$

Equation 3.7 is satisfied when  $k_{c,N} = k_{c,N-2} = 1$ . This is the eigenvector of  $\tilde{M}_{cc'}$  associated with the largest eigenvalue. Since this eigenvector is a vector of ones, it is not informative, and the eigenvector associated with the second largest eigenvalue  $p$  is taken. This is the eigenvector that captures the largest amount of variance in the system and is used as the measure of economic complexity. The economic complexity index ( $ECI_c$ ) for a given country  $c$  is therefore defined as:

$$ECI_c = \frac{\rho_c - \langle \rho \rangle}{stdev(\rho)} \quad (3.9)$$

where  $\langle \rangle$  represents an average over all countries,  $stdev$  reflects the standard deviation of  $\rho$  over all countries, and  $\rho_c$  is the second-largest eigenvalue of  $\tilde{M}_{cc'}$ .

10. Some care is needed in interpreting the relationships between foreign value-added content and economic complexity, especially for determining any causality, partly reflecting the nature of economic complexity measures—for example, increased specializations in natural resource exports are likely to generate lower rankings of complexity. In addition, the economic complexity rankings are based on gross trade statistics, so countries that integrate in low-value processing tasks at the end of complex products will, all other things equal, have higher economic complexity measures. Moreover, changes in the foreign value-added content of exports are a far from perfect measure of GVC integration. For example, countries that upgrade through stronger upstream domestic content are likely to see declines in their foreign content but not necessarily lower GVC integration, which partly

explains China's position. Equally, the upper and lower bound ranking of countries necessarily invalidates a linear relationship between the two measures, which explains the omission of the top 20 ranked countries in 1995 from the charts. Japan, Germany, and Switzerland, for example, whose foreign content of exports increased 6–10 percentage points over the period, retained their rankings as first, second, and third, almost throughout the period.

11. See, for example, the OECD–Eurostat Trade by Enterprise Characteristics database ([www.oecd.org/std/its/trade-by-enterprise-characteristics.htm](http://www.oecd.org/std/its/trade-by-enterprise-characteristics.htm)).
12. In November 2016 the World Trade Organization ruled that Inovar's subsidies were illegal; it is currently being reformulated. In addition, Brazil implemented a targeted program in 2014 to facilitate upstream integration (Productive Linkage Automotive Sector) by small and medium-size firms: the program includes targeted training by auto-makers to enhance the production and innovation capacities of their suppliers. Mexico also introduced a technology development program for industry in 2009 (PRODIAT) run by the Ministry of Economy to reduce the information gap between large companies and potential domestic suppliers. The program also offers financial support for certification to allow small and medium-size firms to operate as subcontractors.

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