



The new face of trade

Key findings

- **Global value chains (GVCs) expanded in the 1990s and 2000s, but that expansion has slowed since the financial crisis of 2008.** One reason is lower global economic growth and investment. Another is the lack of major liberalization initiatives in recent years.
- **GVCs matter for development.** GVC trade exhibits two features that distinguish it from traditional trade: hyperspecialization and durable firm-to-firm relationships. These features allow firms to raise productivity and income, rendering GVC trade more powerful than traditional trade in supporting growth and poverty reduction.
- **All countries participate in GVCs but in different ways.** Developed and large emerging countries participate in complex GVCs producing advanced and innovative manufactures and services. By contrast, many countries in Africa, Central Asia, and Latin America still produce commodities for further processing in other countries or engage in limited manufacturing.
- **The intensification of GVCs was driven by a handful of regions, sectors, and firms.** GVCs grew in the machinery, electronics, and transportation sectors and in the regions specializing in those sectors: East Asia, North America, and Western Europe. Within countries, a few large trading firms dominate GVC trade, supported by foreign direct investment.
- **More-complex value chains have stronger regional linkages, although GVCs have expanded both globally and regionally.** GVCs in East Asia and Europe are more focused on trade within the region. GVCs in North America depend somewhat more on global partners. Elsewhere, GVC integration has been mostly global and is primarily continuing in that direction.

Production of goods and services was increasingly globalized from 1990 to 2008. The process was more pronounced in some regions and sectors than in others as firms began to organize their production in complex global value chains (GVCs). They designed products in one country, procured parts and components from several countries, and assembled the final products in yet another country. As a result, international trade and investment flows increased considerably, far outpacing the growth of economic output. However, with the 2008 global financial crisis and the great recession that followed, the growth of GVCs and trade slowed, prompting speculation that the phenomenon had run its course.

Some aspects of this wave of globalization are not new. International trade in raw materials and intermediate inputs has been a prominent feature of world trade flows since time immemorial. For example, Assyrian merchants who settled in Kanesh (in modern-day Turkey) in the 19th century BCE imported luxury fabrics and tin from Aššur and traded copper and wool within Anatolia.¹ Past increases in the ratio of trade to the gross domestic product (GDP) have been substantial and sustained. The “First Globalization” during 1870–1914 saw a major increase in international trade flows, largely attributed to the steamship. Similarly, today’s wave of globalization has been fueled by falling trade costs due to technological developments such as containerization and policy reforms, particularly the integration of China and Eastern Europe into the world economy and major trade agreements such as the North American Free Trade Agreement (NAFTA) and the Uruguay Round, which established the World Trade Organization (WTO) in 1995.

This wave of globalization has, however, some new features. For example, by integrating in GVCs developing countries can take advantage of richer states’ industrial bases rather than having to build up entire industries from scratch. In this way, they accelerate their industrialization and development. Moreover, trade within GVCs intensifies the effects of standard trade integration. Fragmented production makes it possible for firms in developing countries to enter foreign markets at lower costs, benefit from specialization in niche tasks, and gain access to larger markets for their output. Companies can also access cheaper and better inputs, productivity-enhancing technologies, and improved management practices developed elsewhere, and thus grow at a faster rate, contributing to the creation of better, higher-paying jobs. Because

of these features, GVCs are becoming more attractive to policy makers in developing countries.

Given their development potential, the stagnation of trade growth and GVC formation since the financial crisis is a concern. The slowdown is partly cyclical. Trade growth is lower because output growth is lower in the major trading economies, including Europe—which accounts for one-fourth of global output and one-third of world trade—and China. The slowdown is also structural. Trade growth has become less responsive to income growth over the last decade, particularly in China and the United States, both major actors in GVCs. Part of this development reflects changes in the two economies as China moves up the value chain and the U.S. energy sector expands. But it also reflects the absence of major new liberalization initiatives, such as the Uruguay Round, and of major reforms by the large emerging markets—reforms similar to those by China and Eastern Europe in the 1990s.

This chapter analyzes the changing patterns in global trade and investment over the last 30 years and the importance of GVCs in shaping these shifts. Using new data, it characterizes the GVC phenomenon across regions, countries, and sectors. In so doing, it provides a better understanding of what is new in the world of GVCs, setting the stage for the Report’s analysis of how GVCs affect economic development, inequality, and poverty alleviation.

This chapter offers three main findings. First, countries participate in GVCs in different ways. Argentina, Ethiopia, and Indonesia are more engaged in simple manufacturing production chains, whereas Algeria, Chile, and Nigeria export commodities or raw materials for further processing. India and the United States produce services that are being increasingly traded and embodied in manufactured goods. And mostly advanced countries and large emerging economies are producing innovative goods and services.

Second, the intensification of GVC trade is concentrated in a handful of regions, sectors, and firms. GVC linkages have expanded fastest in the three trade hubs—East Asia, Europe, and North America—in part because these regions account for a large share of production in the sectors whose production processes have become the most fragmented across countries, particularly electronics, machinery, and transport equipment. In each country, GVCs tend to be concentrated among 15 percent of large firms that both import and export and together account for 80 percent of total trade flows. Related-party trade,

such as that through multinational corporations, is especially important.

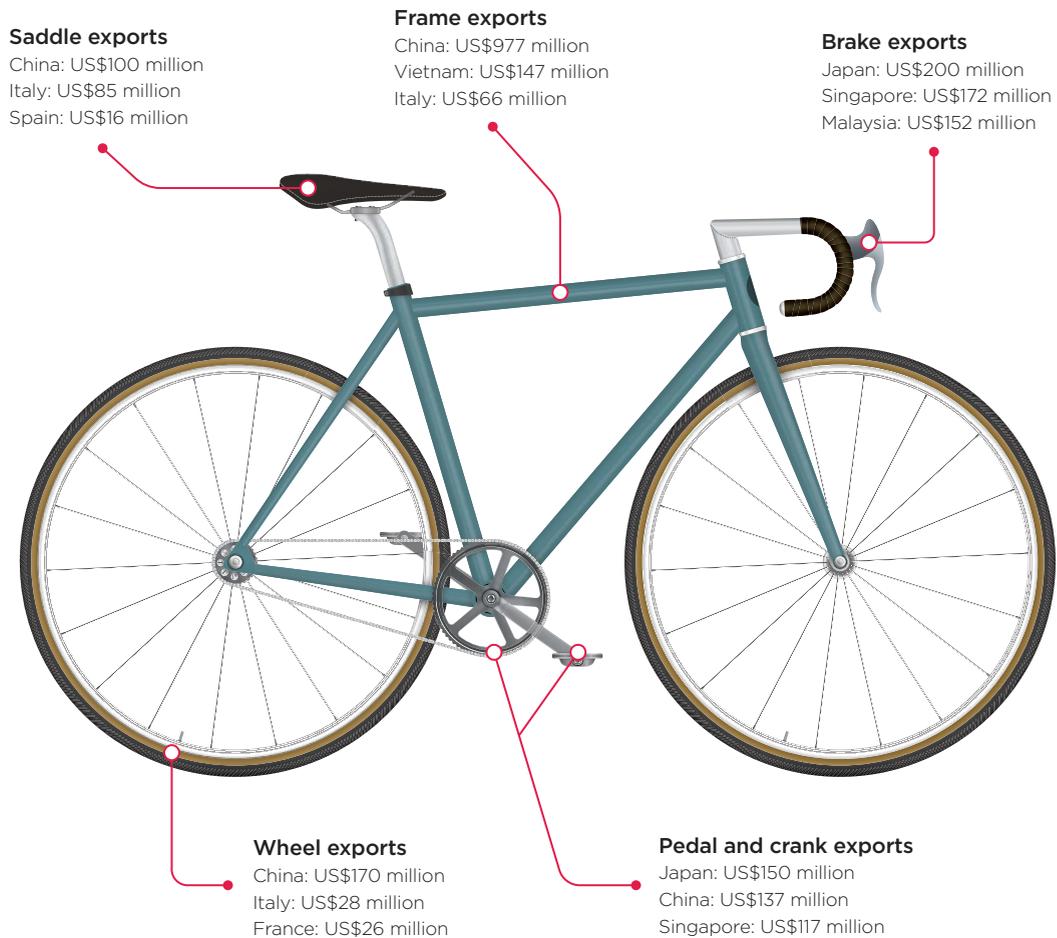
Third, more-complex value chains tend to have especially strong regional linkages, although the expansion of GVCs has been both global and regional. Europe is the most integrated region, with four times as many regional linkages as global linkages. In East Asia, linkages are more regional than global, and the regional linkages have intensified substantially since 1990. By contrast, GVCs in North America depend somewhat more on global partners than regional partners, and integration has been increasing on both fronts. Elsewhere, GVC integration has been mostly global and has been increasing primarily with global partners. Importantly, in recent decades the differences in GVC participation across regions have been far greater than the changes within regions. The same dynamic applies to sectors.

What is a global value chain?

The bicycle is the world's most popular form of transport. Invented in Germany in the early 19th century, bicycles were mass-produced by the Dutch at the end of that century, sometimes with frames imported from England. Global production later grew from about 10 million units in 1950 to more than 130 million units today.

Bicycles are heavily traded. They are assembled using parts and components from all over the world, especially Asia and Europe (figure 1.1). For example, Bianchi carries out all of its design, prototyping, and conception work in Italy, and then assembles most of its bicycles in Taiwan, China, Japan, Malaysia, and many other parts of the world. Each parts producer has niche expertise—

Figure 1.1 Where do bicycles come from?



Source: WDR 2020 team, using data from UN Comtrade database. See appendix A for a description of the databases used in this Report.

Shimano of Japan, for example, makes brakes for Bianchi, and the handlebars are made in Taiwan, China.

Assembling a bicycle from parts and components made around the world improves efficiency and results in a cheaper and higher-quality bicycle for the consumer. The bicycle frame requires steel, aluminum, or carbon fiber tubing and welding. The wheel must be straightened in both radial and lateral directions to ensure uniform tension.

A quality saddle requires the know-how to produce high-tech gel.

Because of the extensive bicycle value chain, the trade in bicycle parts has outstripped the trade in bicycles by 15–25 percent in recent years. In Finland, 33 percent of value added is from outside the country, including 13 percent from the European Union (EU), 11 percent from Asia, and 5 percent from North America.² Boxes 1.1 and 1.2 define GVCs and explain how data are used to estimate GVC participation more broadly.

Box 1.1 Defining global value chains

A global value chain (GVC) is the series of stages in the production of a product or service for sale to consumers. Each stage adds value, and at least two stages are in different countries. For example, a bike assembled in Finland with parts from Italy, Japan, and Malaysia and exported to the Arab Republic of Egypt is a GVC. By this definition, a country, sector, or firm participates in a GVC if it engages in (at least) one stage in a GVC.

Defining spiders and snakes

The definition of a GVC does not specify the form the foreign value added in production will take, although it is often associated with either international trade in raw materials (such as tin or aluminum), in intermediate inputs (such as car parts), or in tasks (such as back-office services). Similarly, the definition does not mention the various configurations that a GVC might take, including simple spiderlike structures, with multiple parts and

components converging at an assembly plant, or snakelike structures, with value created sequentially in a series of stages.^a

Regardless of the shape of GVCs, the possibility of fragmenting production across borders gives rise to a finer international division of labor and greater gains from specialization. GVCs allow resources to flow to their most productive use, not only across countries and sectors, but also within sectors across stages of production. As a result, GVCs magnify the growth, employment, and distributional impacts of standard trade.

In summary, unlike traditional international trade whose transactions involve only two countries (an exporting country and an importing country), GVC trade crosses borders multiple times. This approach to trade not only leads to the rich set of determinants and consequences of GVC participation described in this Report, but also creates challenges for measuring GVC activity in the world.

a. Baldwin and Venables (2013).

Box 1.2 Measuring global value chains

The main challenge in measuring where value is added in a GVC arises from the fact that customs data, the standard source for international trade flows, provide information on *where* the transacted good or service was produced, but not on *how* it was produced—that is, which countries contributed value to it. Similarly, customs data record *where* the transacted good is flowing to, but not *how* it will be used—that is, whether it will be fully consumed (absorbed)

in the importing country, or whether it will be reexported after the importing country adds value to it.

A macro view of GVCs

With the goal of tracing value-added trade flows across countries, a body of work has combined information from customs offices with national input–output tables to construct global input–output tables. The most widely used are

(Box continues next page)

Box 1.2 Measuring global value chains (continued)

the World Input–Output Database (WIOD), a collaborative project led by researchers at the University of Groningen; the Trade in Value Added (TiVA) database compiled by the Organisation for Economic Co-operation and Development (OECD); and the Eora global supply chain database, constructed by a team of researchers at the University of Sydney.^a On a very broad level, these collaborative projects can be thought of as “scaled up” versions of product-level studies, such as the bicycle study, which showed that 33 percent of value added came from foreign countries.^b

Such global input–output tables can be used to devise alternative ways of measuring the extent to which production processes have globalized in recent years and how countries and sectors participate in GVCs. Building on global input–output tables, a natural measure of the importance of GVC trade in total international trade is the share of trade that flows through at least two borders (see Borin and Mancini [2015, 2019] for details on the methodology). Such trade encompasses two broad types of GVC trade:

- *Backward GVC participation*, in which a country’s exports embody value added previously imported from abroad. For example, if the bicycles exported by Taiwan, China, use imported intermediates, then its GVC participation is considered backward because the intermediates used in exports are from the previous stage.
- *Forward GVC participation*, in which a country’s exports are not fully absorbed in the importing country and instead are embodied in the importing country’s exports to third countries. In the bicycle example, if India sends aluminum tubing to Taiwan, China, where it is further used in the production of the bicycle later exported, then India’s GVC participation is considered forward because the exporter is at the early stage of production of the bicycle.

Despite their widespread use, global input–output tables have two limitations. First, because they rely on aggregated input–output data, the resulting sectoral disaggregation of GVC flows is coarse. They therefore miss a lot of GVC activity within the broadly defined sectors. For example, one can compute the origin of “fabricated metal products”

in the production of “motor vehicles” in the United States but cannot infer where more specific components such as tires, car engines, or windshield wipers originate. Second, in constructing the tables, researchers are forced to impose strong assumptions to back out some bilateral intermediate input trade flows that cannot be readily read from either customs data or national input–output tables.^c

A micro view of GVCs

A more granular approach to measuring the fragmentation of production processes across countries, first suggested by Yeats (1998), computes the share of trade flows accounted for by industry categories that can safely be assumed to contain only intermediate inputs (reflected in the words “Parts of” at the outset of the product description). Yeats found that intermediate input categories accounted for about 30 percent of OECD merchandise exports of machinery and transport equipment in 1995, and that this share had steadily increased from 26 percent in 1978. Yeats’s classification has continued to be refined in recent years based on the Broad Economic Categories (BEC) product classification of the United Nations Conference on Trade and Development (UNCTAD).^d

More recently, customs data at the firm level have been used to advance measurement of GVC linkages. An important strength of these data is that transactions between firms and their foreign partner countries can be observed rather than inferred. In addition, firm-level data capture the heterogeneity in GVC linkages across firms that is obscured by aggregated industry-level data and thus allow a finer understanding of firms’ input sourcing decisions, how import and export participation are linked, and how multinational firms organize their production networks. However, such data do not trace firm-to-firm transactions across countries. This would require linking customs offices and firm identifiers across the world.^e Thus in the absence of such data, the best option is to continue improving the measurement of GVC linkages at both the macro and micro levels across a wider range of countries to gain a more complete empirical measurement of GVCs.

a. This chapter and the rest of this Report rely on several global input–output databases for the analysis. The choice of database is dictated by the level of geographical or sectoral coverage needed for the analysis. Eora offers the largest country coverage for the longest continuous time period, but its sectoral coverage is more aggregate and thus less precise than the WIOD and TiVA databases. See Lenzen, Kanemoto, Moran, and Geschke (2012) for a description of EORA; and Borin and Mancini (2019), Johnson (2018), and appendix A for a more detailed description of these and other databases used in this Report.

b. Kalm et al. (2013); OECD (2013).

c. The homogeneity and proportionality assumptions are conveniently imposed to resolve the fact that the available data sets have no

information on which domestic industries buy which imports. However, such assumptions are not necessarily valid. Specifically, under the homogeneity assumption all firms in the same industry are assumed to have the same production function and use the same bundle of inputs. Yet at the country–industry level, input use varies with output because firms exporting to different countries and industries participate in different value chains and face distinct rules of origin (de Gortari 2019).

d. UN Trade Statistics, Intermediate Goods in Trade Statistics, <https://unstats.un.org/unsd/tradekb/Knowledgebase/50090/Intermediate-Goods-in-Trade-Statistics>.

e. Johnson (2018).

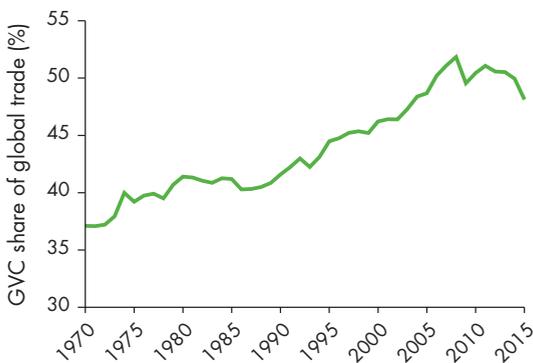
The evolution of GVC participation

The overall share of GVC trade in total world trade—encompassing both forward and backward linkages—grew significantly in the 1990s and early 2000s, but it appears to have stagnated or even declined in the last 10 years (figure 1.2). Still, about half of world trade appears to be related to GVCs.

What explains the remarkable rise in GVC participation in the 1990s and 2000s? And why has this process stalled since the financial crisis?

The global wave of fragmentation of production in the 1990s and 2000s was driven by a combination of factors. The information and communication technology (ICT) revolution brought forth cheaper and more reliable telecommunications, new information management software, and increasingly powerful personal computers (figure 1.3, panel a). Manufacturing firms then found it easier to outsource and coordinate complex activities at a distance and ensure the quality

Figure 1.2 GVC trade grew rapidly in the 1990s but stagnated after the 2008 global financial crisis



Sources: WDR 2020 team, using data from Eora26 database; Borin and Mancini (2015, 2019); and Johnson and Noguera (2017). See appendix A for a description of the databases used in this Report.

Note: Unless otherwise specified, GVC participation measures used in this and subsequent figures throughout the Report follow the methodology from Borin and Mancini (2015, 2019). The Eora26 database is used because it offers the largest country coverage: 190 countries between 1990 and 2015. GVC participation corresponds to the share of world exports that flow through at least two borders. For 1990–2015, the GVC participation measure is computed as the share of GVC exports in total international exports using the Borin and Mancini methodology. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). For 1970–90, the GVC participation measure is backcasted using the above data and the time variation of the measure (1-VAX). The VAX by Johnson and Noguera (2017) is an alternative measure of the value-added content of trade. Although the level difference between (1-VAX) and the GVC participation measure is sizable, the correlation of their change over the overlapping years (1990–2009) is 0.97. This method allows reconstructing a long series covering 1970–2015 rather than simply 1990–2015 for which the Eora26 database is available.

of their inputs. In addition, firms were able to disperse production across the world because transport costs fell significantly (figure 1.3, panel b). Declining air and sea freight costs boosted the trade in goods, while services benefited from cheaper communication costs.

Successive rounds of trade liberalization have resulted in rapidly falling barriers to trade and investment for both developed and developing countries. Tariffs have declined, especially for manufactured goods, and the gradual, although still insufficient, lowering of nontariff barriers has facilitated the international trade of goods and services (figure 1.4). Finally, the creation of the European single market—together with the integration of China, India, and the Soviet Union into the global economy—created huge new product and labor markets, and so firms could sell the same goods to more people and take advantage of economies of scale leading to the further deepening of GVCs. The new supply of cheap labor encouraged profit-seeking companies to either reallocate their production facilities or find local suppliers in low-wage countries.³

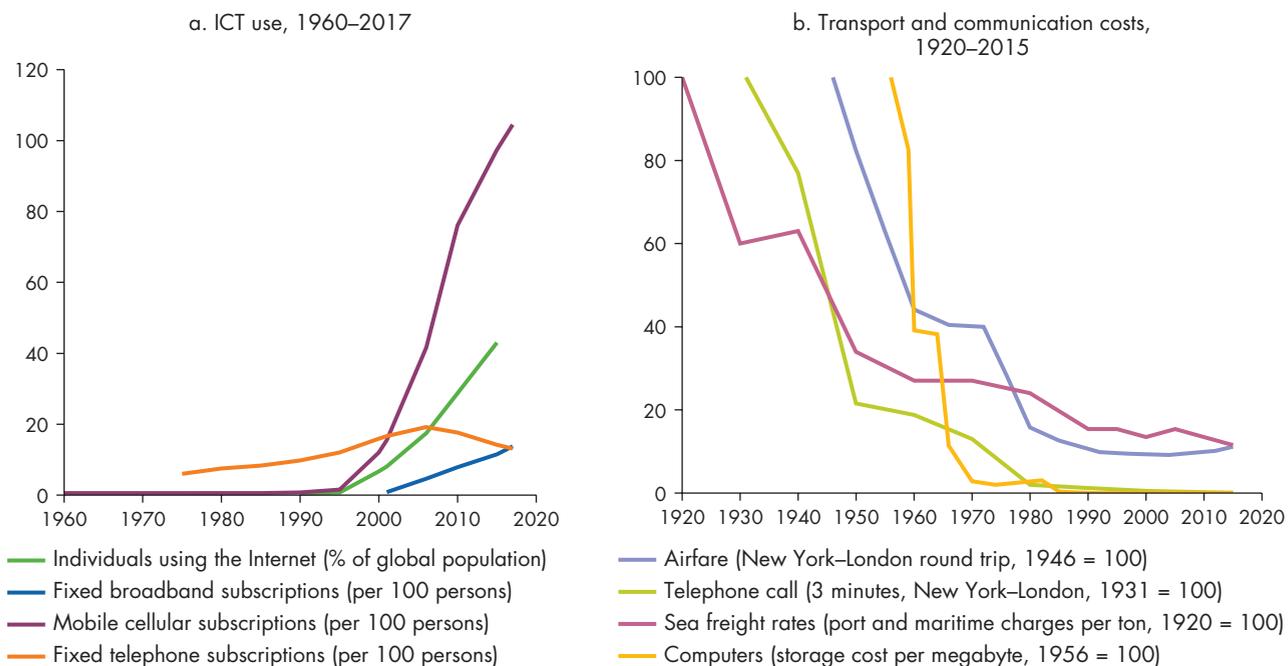
Since the global financial crisis in 2008, the dynamics of GVC expansion have changed. Trade has bounced back from its deep crisis level, but it has grown only marginally faster than output. Trade in parts and components also stalled after the financial crisis and even fell between 2011 and 2014, with a modest increase since then.

The factors behind the trade and GVC slowdown are both cyclical and structural in nature. On the one hand, trade growth is lower because global output growth is lower in economies that account for large shares of global trade and global output, such as Europe and China. Trade has also grown at a slower pace because the trade-to-income elasticity—defined as the amount of trade generated as output rises—has decreased. This is especially true in large trading countries, including China and the United States. China is producing more at home, thereby becoming less reliant on imported components for its exports. The share of intermediate imports in exports of Chinese goods dropped from about 50 percent in the 1990s to a little over 30 percent in 2015. In the United States, a booming shale sector reduced oil imports by one-fourth between 2010 and 2015.⁴

As for any major liberalization initiatives that might have set off a new wave of GVC formation, there have been none. The Doha Round stalled, and no large emerging markets are engaging in the types of drastic reforms undertaken decades ago in China and Eastern Europe.

All countries partake in GVCs, but across the world their participation is uneven (map 1.1). Some countries

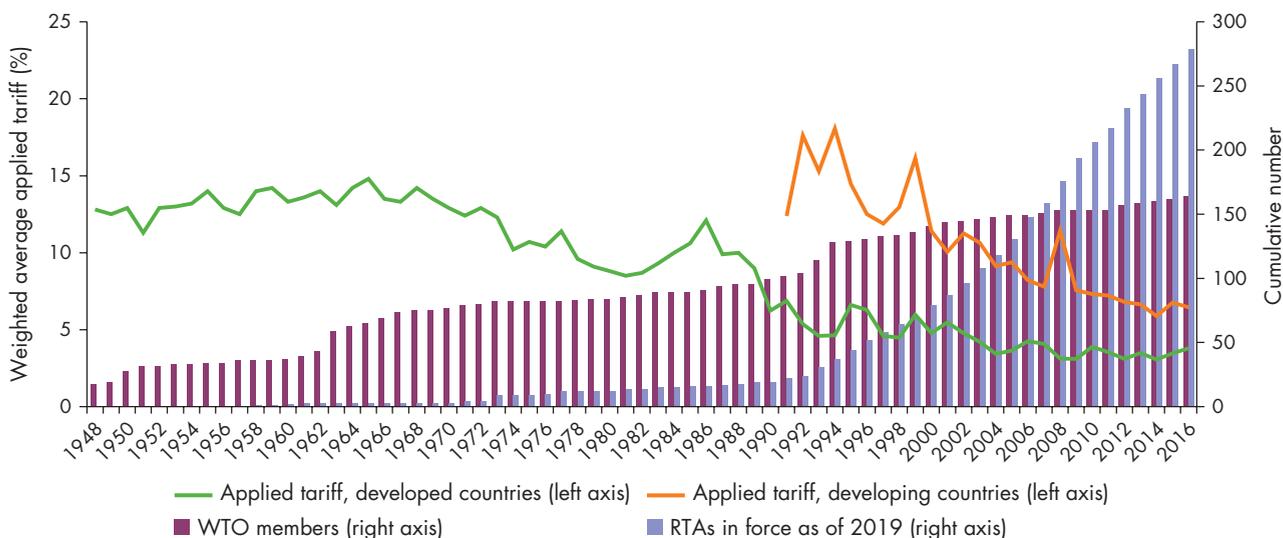
Figure 1.3 The ICT revolution spurred the emergence of GVCs



Sources: WDR 2020 team, using data from ITU's World Telecommunication/ICT Indicators database for panel a and based on Rodrigue, Comtois, and Slack (2017) for panel b.

Note: In panel a, data are available for over 200 countries. Mobile cellular subscriptions per 100 persons may be over 100 as some people may have several mobile phones. In panel b, for each indicator the cost is reported as 100 for the first year with data. ICT = information and communication technology.

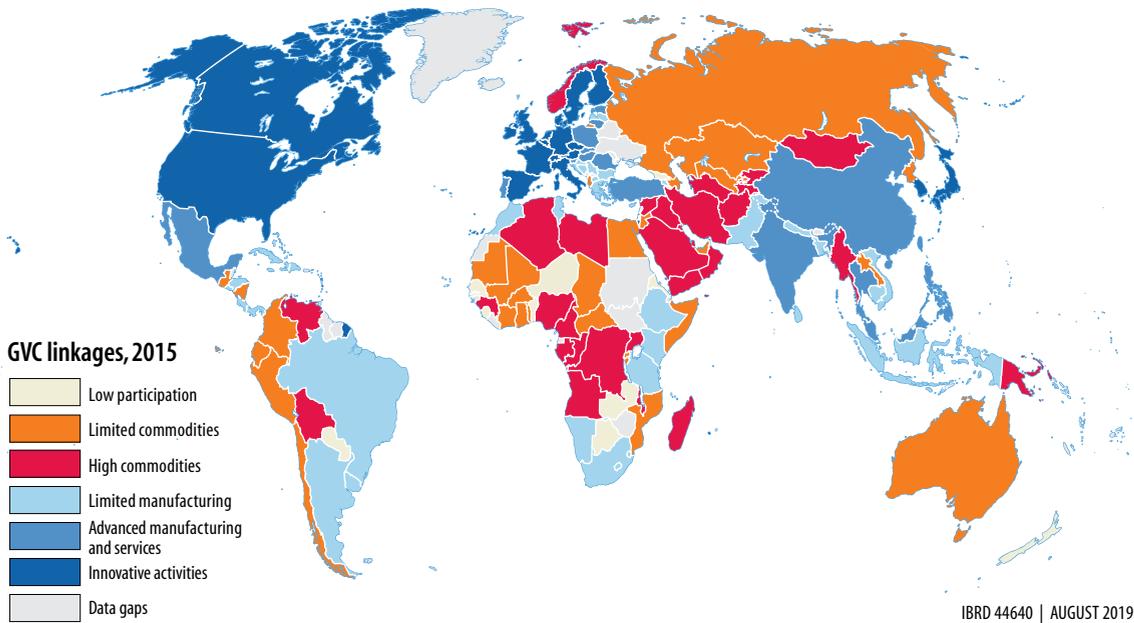
Figure 1.4 From 1948 to 2016, tariffs dropped thanks to multilateral and regional trade agreements



Sources: WDR 2020 team, based on Baldwin (2012). Data for regional trade agreements (RTAs) and World Trade Organization (WTO) members are from the WTO's RTAs database. Tariff data prior to 1988 are from Clemens and Williamson (2004), and those for subsequent years are from the World Bank's WDI database using country-level weighted applied tariffs for all products.

Note: The figure plots tariffs computed as simple averages for developed and developing countries. Prior to 1988, the developed country sample covers 35 countries, including 21 industrialized countries (Argentina, Australia, Austria-Hungary, Canada, Chile, Cuba, Denmark, France, Germany, Greece, Italy, New Zealand, Norway, Portugal, Russia, Serbia, Spain, Sweden, the United Kingdom, the United States, and Uruguay) and 14 developing countries at the time: Brazil, Burma (now Myanmar), Ceylon (now Sri Lanka), China, Colombia, Egypt, India, Indonesia, Japan, Mexico, Peru, the Philippines, Siam (now Thailand), and Turkey. After 1988, developed countries are defined as high-income countries and developing countries as not high-income countries based on the World Bank's 2018 country classification.

Map 1.1 All countries participate in GVCs—but not in the same way



Source: WDR 2020 team, based on the GVC taxonomy for 2015 (see box 1.3).

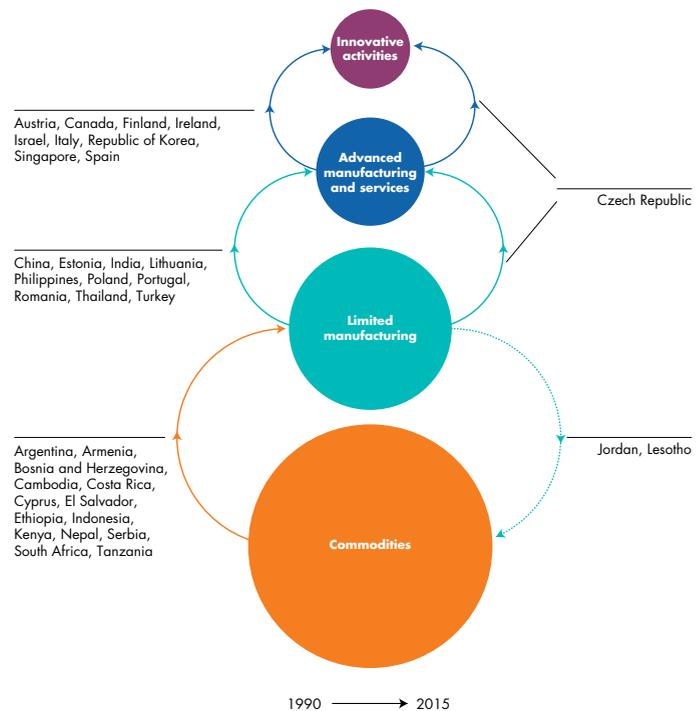
Note: The type of a country's GVC linkages is based on the country's extent of backward GVC participation, measured as the portion of imports embodied in manufacturing exports as a percentage of a country's total exports, combined with the country's sector specialization of domestic value added in exports and engagement in innovation. Countries in the commodities group have a small share of manufacturing exports and limited backward GVC integration. Their share of commodity exports can be low, medium, or high. Countries specialized in limited manufacturing GVCs engage in some manufacturing exports, often alongside commodities exports, and exhibit medium backward GVC integration. Countries specialized in advanced manufacturing and services GVCs have a high share of manufacturing and business services exports and high backward GVC integration. Countries specialized in innovative GVC activities spend a large share of GDP on research and development, receive a large share of GDP from intellectual property, and exhibit high backward GVC integration.

export raw materials for further processing; others import inputs for assembly and exports; and still others produce complex goods and services. In addition, some are heavily reliant on GVCs for trade, whereas others export largely domestic goods for consumption. To capture these distinct features of participation, countries are classified into four main types—commodities, limited manufacturing, advanced manufacturing and services, and innovative activities—based on the products they export and their participation in GVCs. The rules for classification are described in box 1.3.

This taxonomy reveals clear distinctions among regions. East Asia, Europe, and North America are engaged in advanced manufacturing and services GVCs and innovative GVC activities, whereas Africa, Central Asia, and Latin America are mostly in commodities and limited manufacturing GVCs.

GVC participation intensified between 1990 and 2015, as illustrated by the many countries that transitioned up into more sophisticated forms of GVC participation (figure 1.5). Transitions were especially common in East Asia and Europe, where countries were heavily engaged in the sectors most amenable to GVCs, such as electronics and machinery. Among advanced countries, small open economies tended to

Figure 1.5 Country transitions between different types of GVC participation, 1990–2015



Box 1.3 Types of GVC participation

Countries participate in GVCs in different ways, but there are regularities in the type of GVC integration and how countries upgrade. In 146 countries over the period 1990–2015, the following four types of GVC participation are particularly notable: (1) commodities; (2) limited manufacturing; (3) advanced manufacturing and services; and (4) innovative activities.

Data and measures

Countries are classified based on (1) the goods and services exported, (2) the extent of GVC participation, and (3) measures of innovation. A country's sectoral specialization of exports is based on the domestic value added in gross exports of primary goods, manufacturing, and business services. A country's extent of GVC participation is measured as backward integration of the manufacturing sector as a share of the country's total exports. Higher backward integration in manufacturing is an important characteristic of countries entering or specialized in noncommodity GVCs. Two measures are used to capture a country's innovative activities: (1) intellectual property (IP) receipts as a percentage of GDP and (2) research and development (R&D) intensity, defined as its expenditure of public and private R&D as a percentage of GDP.

Definitions of GVC taxonomy groups

The rules take into account country size because smaller countries naturally rely on trade to a relatively greater extent.

The following taxonomy groups are defined *sequentially*:

Commodities

Manufacturing share of total domestic value added in exports is less than 60 percent, *and*

- *Small countries*: Backward manufacturing is less than 20 percent.
- *Medium-size countries*: Backward manufacturing is less than 10 percent.
- *Large countries*: Backward manufacturing is less than 7.5 percent.

These criteria ensure that manufacturing is a small share of exports and that backward linkages in manufacturing are limited.

This group is further subdivided as follows:

- *Low participation*: Primary goods' share of total domestic value added in exports is less than 20 percent.

- *Limited commodities*: Primary goods' share of total domestic value added in exports is equal to or greater than 20 percent but less than 40 percent.
- *High commodities*: Primary goods' share of total domestic value added in exports is equal to or greater than 40 percent.

These criteria define countries according to their export dependence on manufacturing.

Innovative activities (based on remaining countries)

- *Small countries*: IP receipts as a percentage of GDP are equal to or greater than 0.15 percent, and R&D intensity is equal to or greater than 1.5 percent.
- *Medium-size and large countries*: IP receipts as a percentage of GDP are equal to or greater than 0.1 percent and R&D intensity is equal to or greater than 1 percent.

These criteria split groups into those that spend a relatively large share of GDP on research and receive a large share of GDP from IP.

Advanced manufacturing and services (based on remaining countries)

Share of manufacturing and business services^a in total domestic value added in exports is equal to or greater than 80 percent, *and*

- *Small countries*: Backward manufacturing is equal to or greater than 30 percent.
- *Medium-size countries*: Backward manufacturing is equal to or greater than 20 percent.
- *Large countries*: Backward manufacturing is equal to or greater than 15 percent.

Limited manufacturing (rest of sample)

Upgrading trajectories

Based on these definitions, the following countries transitioned from commodities into limited manufacturing GVCs over the period 1990–2015: Argentina, Armenia, Bosnia and Herzegovina, Cambodia, Costa Rica, Cyprus, El Salvador, Ethiopia, Indonesia, Kenya, Nepal, Serbia, South Africa, and Tanzania.

The following countries moved into advanced manufacturing and services from limited manufacturing GVCs: China, the Czech Republic, Estonia, India, Lithuania, the Philippines, Poland, Portugal, Romania, Thailand, and Turkey.

The Czech Republic moved further up into the innovative activities group in 2012 and remained in this group over the

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Box 1.3 Types of GVC participation (continued)

period covered. Other countries moved into innovative GVC activities: Austria, Canada, Finland, Ireland, Israel, Italy, the Republic of Korea, Singapore, and Spain.

Two countries, Jordan and Lesotho, downgraded from limited manufacturing to commodities. Meanwhile, some countries upgraded and then downgraded. Swaziland (now Eswatini) moved from limited manufacturing to advanced

manufacturing and services and then back to limited manufacturing. Five other countries switched from commodities to limited manufacturing and then back to commodities: Botswana, Jamaica, the Democratic People's Republic of Korea, Nicaragua, and Senegal.

All other countries remained in the same group over the period covered.

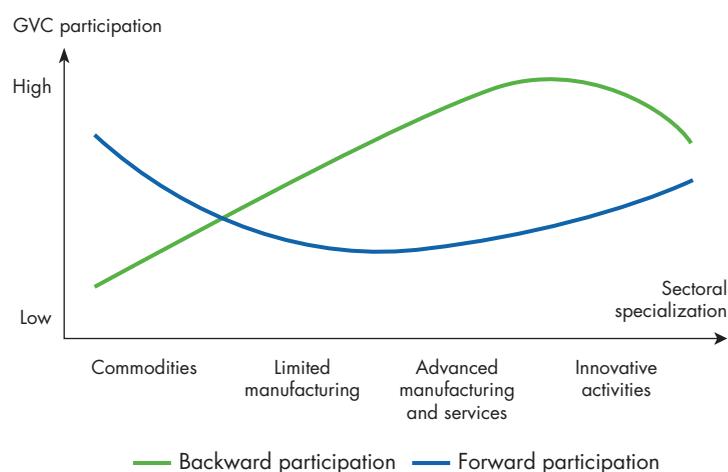
a. Business services include maintenance and repair; wholesale trade; retail trade; transport; post and telecommunications; and financial intermediation and business activities. Business services, not total services, were used to detect advanced countries with a developed services sector.

show the highest participation. Emerging economies such as China, Poland, and South Africa experienced rapid growth in GVC participation between 1990 and 2015 and as such moved up GVC groups. South Africa transitioned from commodities to limited manufacturing while China and Poland transitioned from limited manufacturing to advanced manufacturing and services. Other countries remained in the same group over that period. In Brazil, Morocco, and Pakistan, GVC participation grew less rapidly. The high GVC participation for major commodity exporters such as Algeria, Saudi Arabia, and República Bolivariana de Venezuela reflects extensive forward integration because natural resources are the most upstream sectors.

Countries' sectoral specialization shapes the extent of backward and forward participation. Figure 1.6 shows an approximate distribution of backward and forward GVC integration across the four taxonomy groups. Backward integration is lowest for countries specialized in commodities and starts to expand for countries in the limited manufacturing group. Countries specializing in advanced manufacturing and services are highly reliant on imported inputs for exports. Backward participation is slightly lower for the countries in the innovative group because their activities are less dependent on imported inputs.

The abundance of natural resources or agriculture in a country is linked to high forward integration because commodities are used in a variety of downstream production processes that typically cross several borders. Participation in limited manufacturing reduces forward integration because commodities are less important in trade, and the manufacturing output at this stage (such as garments) is less likely to be used as inputs in destination countries. However, moving to advanced manufacturing and services GVCs and especially innovative activities increases forward participation.

Figure 1.6 Average backward and forward GVC participation across taxonomy groups



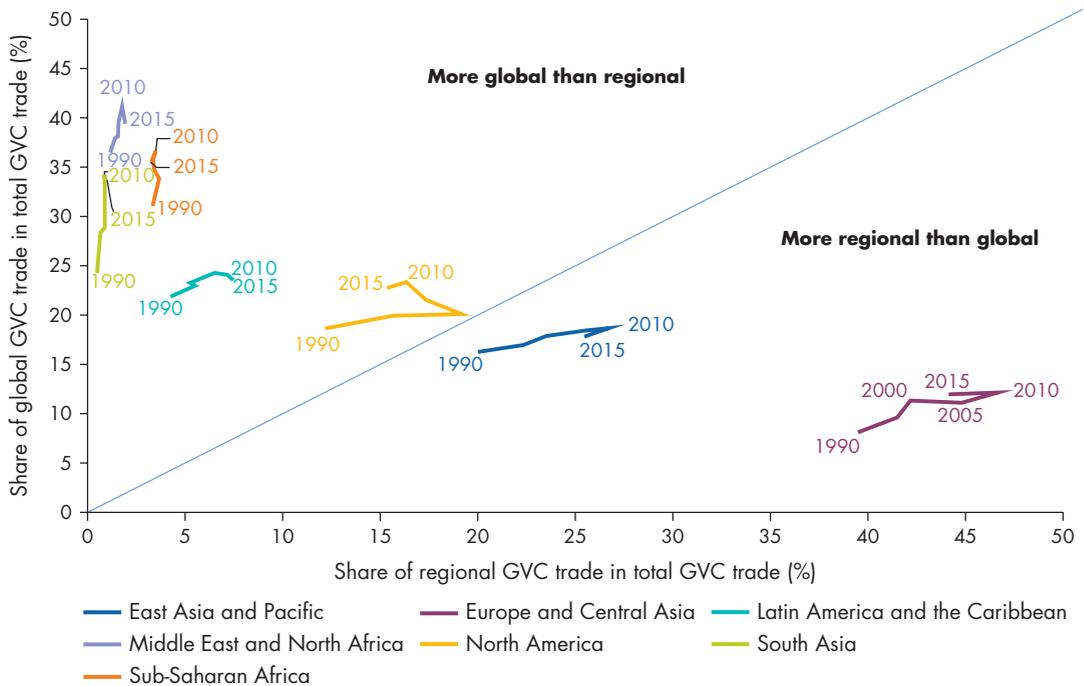
Source: WDR 2020 team.

Note: The approximate distribution is based on backward and forward GVC participation averages by taxonomy group for the period 2010–15. For the definition of taxonomy groups, see box 1.3.

How are GVCs distributed across regions?

GVCs have increased globally and regionally, but the differences across regions remain larger than differences over time. Some regional GVCs are more focused on trade within the region, while others are more dependent on global integration (figure 1.7). Countries' trade with regional (or regional bloc) value chains involves only production partners in the region, whereas extraregional value chain trade involves only partner countries outside the region. Importantly, the differences between regions in the depth of regional integration are stark and vastly dominate changes over time. Europe is the most regionally integrated region, with four times as many regional linkages as global linkages. South Asia and

Figure 1.7 GVC activities increased globally and regionally from 1990 to 2015



Source: WDR 2020 team, using data from Eora26 database.

Note: For each region and intervals of 5–6 years between 1990 and 2015, the figure plots the share of GVC trade involving only production partners in the same region in total GVC trade (regional GVC integration) against the share of GVC trade involving only partner countries outside the region in total GVC trade (global GVC integration). Regional and global GVC participation measures are computed as weighted averages over the countries in each group. The weights are the share of each country in the corresponding region total trade. The economic size of the trading blocs and the number of potential production partners in the region influence these indicators. The 45-degree line marks instances in which the share of regional and global GVC trade in total GVC trade for a given region are equal. In this figure, Mexico is not included in the Latin America and the Caribbean region but in North America, together with Canada and the United States. The economic size of the trading blocs and the number of potential production partners in the region influence these indicators. See the note to figure 1.2 on methodology and data for GVC participation measures.

the Middle East and North Africa are the least regionally integrated regions.

In all regions, the increase in GVC participation between 1990 and 2015 resulted from a combination of regional and global trends:

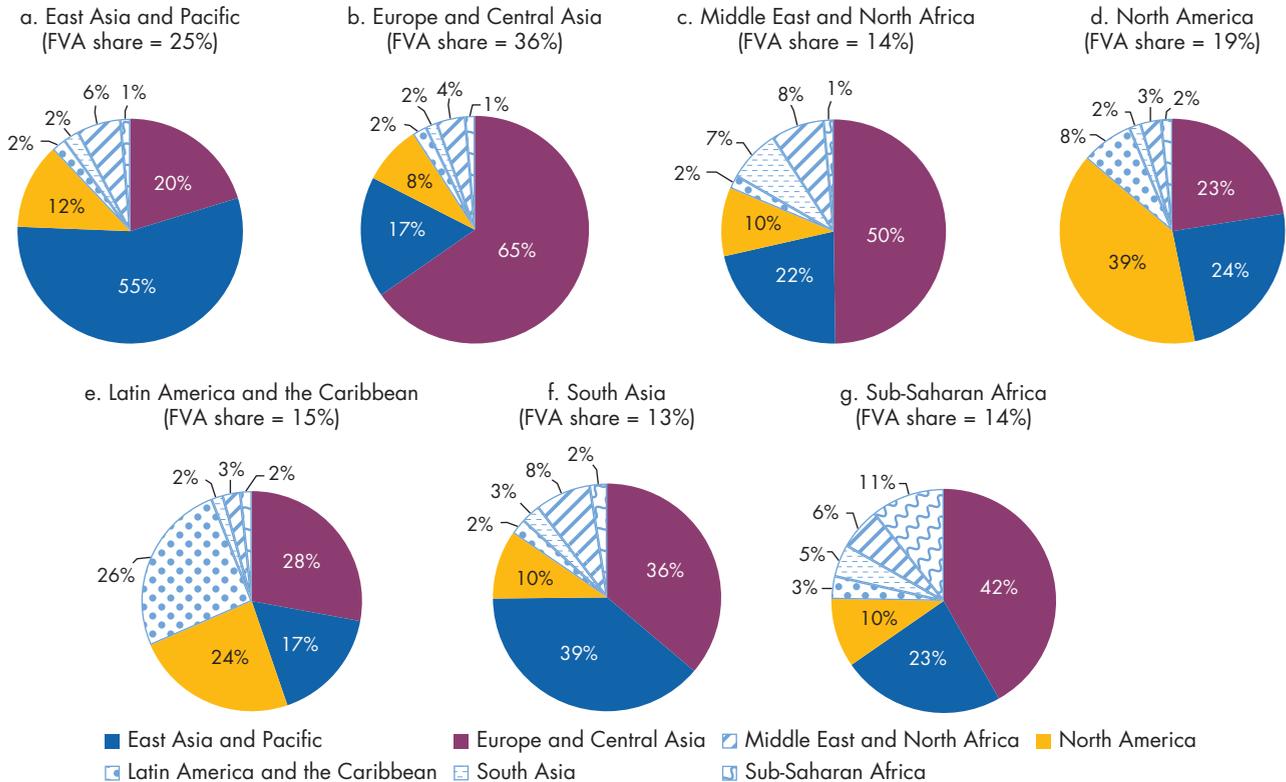
- In Europe, regional fragmentation of value chains increased through successive rounds of enlargement in which Eastern European countries, including Bulgaria, Hungary, and Poland, progressively joined older members' production networks. But global fragmentation was equally important, driven mostly by the larger European economies such as France, Germany, and the United Kingdom, whose linkages with countries in Asia such as China or India expanded.
- In East Asia, linkages are more regional than global, and GVCs became more internationally fragmented after 1990 because of both regional and global fragmentation in the 1990s and 2000s, although regional integration dominated.

- By contrast, the NAFTA GVCs depend somewhat more on global partners than regional partners, and integration has been increasing on both fronts. GVCs expanded more regionally in the 1990s, reflecting the coming into force of the NAFTA trade agreement in 1994, while the 2000s saw a marked acceleration in global GVC activities in part owing to China joining the world economy.
- In Latin America and the Caribbean, value chains are more globally linked, but they have increased both regionally and globally.
- In the three remaining regions, GVC integration has been mostly global and has been increasing primarily with global partners, with South Asia's GVCs expanding almost entirely outside the region.

A look at backward linkages confirms that production networks in East Asia, Europe, and, to a lesser extent, North America are mostly regional (figure 1.8). In an average European country, 65 percent of the imported intermediates embodied in its exports in

Figure 1.8 Global production networks are organized around three main regions, 2018

Share of foreign value added in exports of each region, by source region



Source: WDR 2020 team, using data from full Eora database (latest year for which data are available is 2018).

Note: The full Eora database is used because it offers the largest country coverage. The geographic breakdown across source countries is available for only one GVC participation index, the foreign value-added (FVA) content of exports. For each region, the figure reports the share of imported intermediates embodied in exports in total exports, computed as the ratio of the FVA content of exports in total gross exports (FVA share is in parenthesis). The figure also reports the contribution of each origin partner region to this FVA share. In this figure, Mexico is not included in the Latin America and the Caribbean region but in North America together with Canada and the United States.

2018 originated from other European countries. This share is about 55 percent for an average East Asian economy, and almost 40 percent for a member country of NAFTA. The other regions are all more integrated globally than regionally. The share of imported intermediates embodied in exports originating from regional partners is 26 percent in Latin America and the Caribbean but as low as 3 percent in South Asia.

In Latin America and the Caribbean, the geographic distribution of the foreign content of exports is almost equivalent across East Asia, Europe, and North America. South Asia is especially integrated in production networks in East Asia and Europe, whereas Sub-Saharan Africa is predominantly integrated in European supply chains followed by those in East Asia. These regional patterns reflect geographical distances and trade costs because intermediate inputs are shipped across borders multiple times. For example, just-in-time manufacturing techniques have pushed firms to locate the production of time-

sensitive components closer to home. Trade costs also determine the optimal location for individual production stages along GVCs.⁵

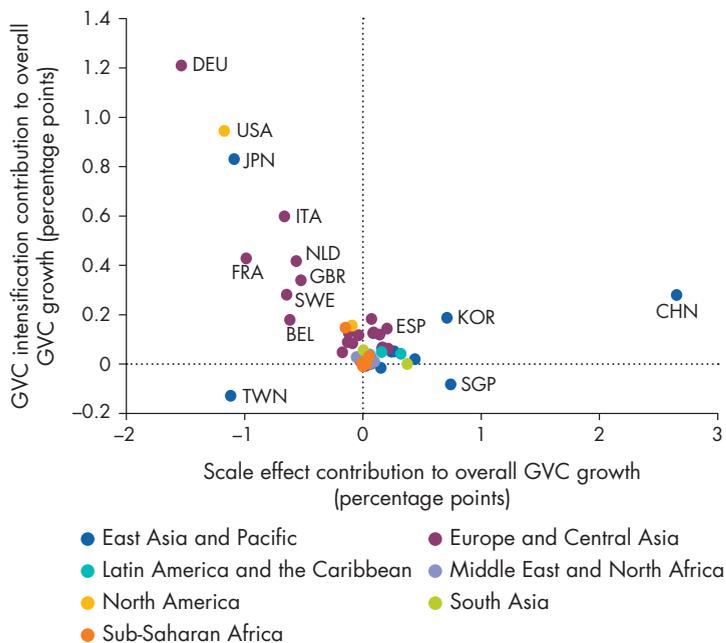
North and Sub-Saharan Africa have managed to join GVCs in the apparel, food, and automotive industries and in some business services. But Africa remains a small actor in the global economy, accounting for just 3 percent of global trade in intermediate goods. African exports tend to enter at the very beginning of GVCs. A high share serves as inputs for other countries' exports, reflecting the still-predominant role of agriculture and natural resources in African exports. Botswana, the Democratic Republic of Congo, and Nigeria have become integrated in GVCs through exports of oil and other natural resources. But Ethiopia, Kenya, and Tanzania have seen faster GVC integration, sourcing foreign inputs for their export-oriented businesses. Most of their integration has occurred in agribusiness and apparel (especially in Ethiopia and Kenya), in manufacturing (in Tanzania), and to a

lesser extent, in transport and tourism. Morocco's efforts to attract major manufacturers in the automotive industries over the past decade are paying off. A new Peugeot facility opened in 2019, following in the footsteps of another French automaker, Renault-Nissan. Overall, GVC participation in some of these Sub-Saharan countries (Ethiopia, Kenya, South Africa, and Tanzania) grew by 10 percentage points or more, approaching what Poland or Vietnam—now success stories—experienced in the late 1990s and 2000s.

Which countries have accounted for most of the GVC expansion?

A few countries in Asia, Europe, and North America have driven GVC expansion over the past 30 years. Between 1990 and 2015, GVC participation worldwide grew by about 7 percentage points, because production processes in some countries and sectors become more fragmented—an intensification effect; or because countries and sectors that were already GVC-intensive boosted their share of world trade—a scale effect.

Figure 1.9 A handful of countries drove global GVC expansion from 1990 to 2015



Source: WDR 2020 team, using data from Eora26 database.

Note: The Eora26 database is used because it offers the largest country coverage, covering 190 countries between 1990 and 2015. The GVC participation measure reflects the share of a country's exports that flow through at least two borders. It is computed as the share of GVC exports in total international exports. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). For country abbreviations, see International Organization for Standardization (ISO), <https://www.iso.org/obp/ui/#search>.

The top contributors to GVC intensification were Germany, the United States, Japan, Italy, and France, which began using more imported inputs in their exports (figure 1.9). By contrast, China's contribution to the expansion of GVC worldwide was predominantly through an increase in its share of world trade, although its GVC intensification remains significant.

How are GVCs distributed across sectors?

The sectoral composition of GVC flows is also quite diverse. Some countries specialize largely in agricultural GVCs (such as Madagascar) or in the natural resource segments of GVCs (such as Chile and Norway). These types of GVCs are classified as commodity-linked. Developing economies (such as Tanzania) specialize in low-tech simple manufacturing, and more developed economies (such as China, Mexico, and the Slovak Republic) in medium-tech manufacturing. One set of countries (including India and Singapore) largely specializes in the services embodied in GVCs. And a small set of very advanced economies (Germany, Japan, and the United States) provide innovative goods and services.

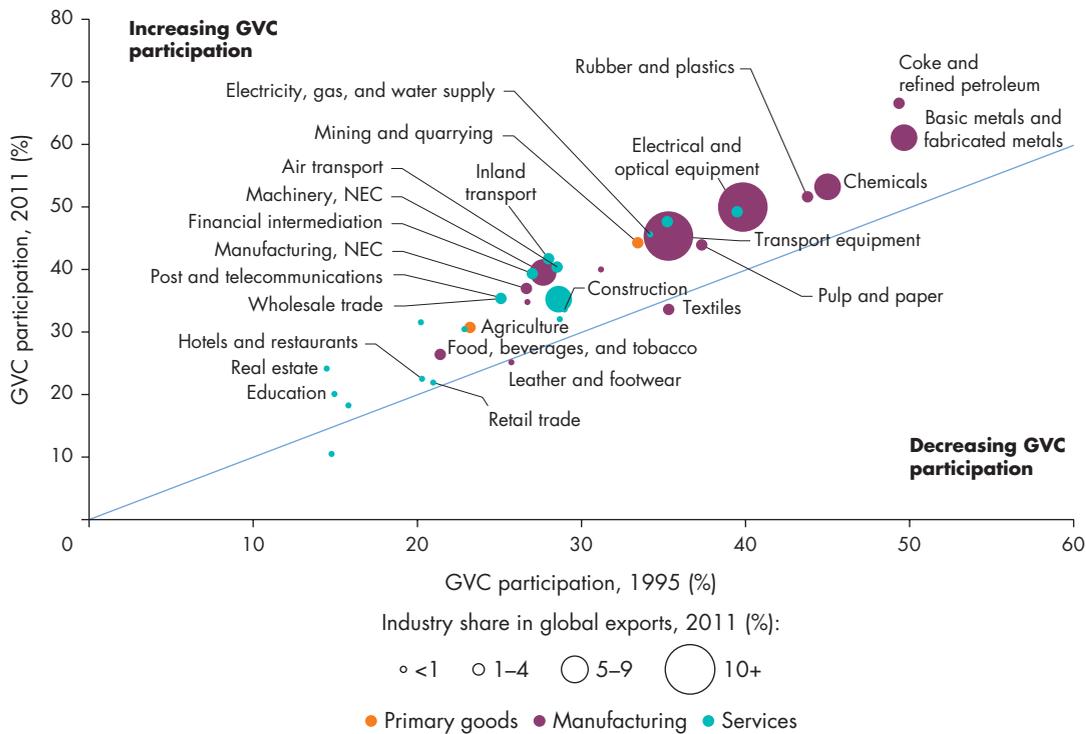
Most GVCs serve a handful of sectors in manufacturing and services

Some industries have used GVCs heavily for decades. Examples are basic industries that are resource-intensive and make heavy use of imported primary inputs—chemicals, refined petroleum, basic metals, and rubber and plastics. These sectors were already displaying large GVC participation in 1995 because of their high foreign value added in exports (figure 1.10). They have intensified their use of supply chains over time.

By contrast, the fragmentation of value chains in textiles and leather has not changed over the past two decades. Most fragmentation of production in these sectors occurred in the 1970s and 1980s, thus the slower pace. The termination of the Multifibre Arrangement in 2004 further concentrated production chains in fewer countries, with China emerging as the largest producer and capturing many stages of production. For services, construction and transport-related activities are the most fragmented. For transport-related activities, GVC participation increased substantially between 1995 and 2011.

For sectors, most of the GVC intensification over the period was driven by high-tech manufacturing industries, whose use of imported inputs increased. At the other end of the spectrum, very upstream mining and other primary industries accounted for most of the

Figure 1.10 GVC participation by sector, 1995 and 2011



Source: WDR 2020 team, using data from WIOD 2013 release database.

Note: The WIOD 2013 database is used because it offers a finer sectoral classification than Eora26. In addition, the 2013 release (covering 1995–2011) is used instead of the latest 2016 release (covering 2001–14) in order to compare the change in GVC participation in the 2010s with that in the 1990s. The GVC participation measure reflects the share of world exports that flow through at least two borders. For each industry-year, it is computed as the share of GVC exports in total international exports. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). The 45-degree line marks instances in which GVC participation for a given sector is the same in 1995 and 2011. NEC = not elsewhere classified.

scale effect, consistent with their high share of GVC integration and growing share of world trade following the large price surge over the period (figure 1.11).

GVCs are not just in manufacturing—they have also expanded rapidly in services

Services are an invisible but vital part of GVCs. The fragmentation of goods production has been associated with outsourcing not just manufacturing tasks but also service tasks, with the back office of many U.S. manufacturers now in India. In addition, transportation, telecommunications, and financial services facilitate and coordinate the geographic dispersion of production in all sectors. And service production is itself being fragmented across countries, such as when preliminary architectural designs, tax returns, and magnetic resonance imaging (MRI) readings are performed in one country and finalized and delivered to customers in another. In France, Germany, Italy, the United Kingdom, and the United States, services contribute more than half the total value added embodied

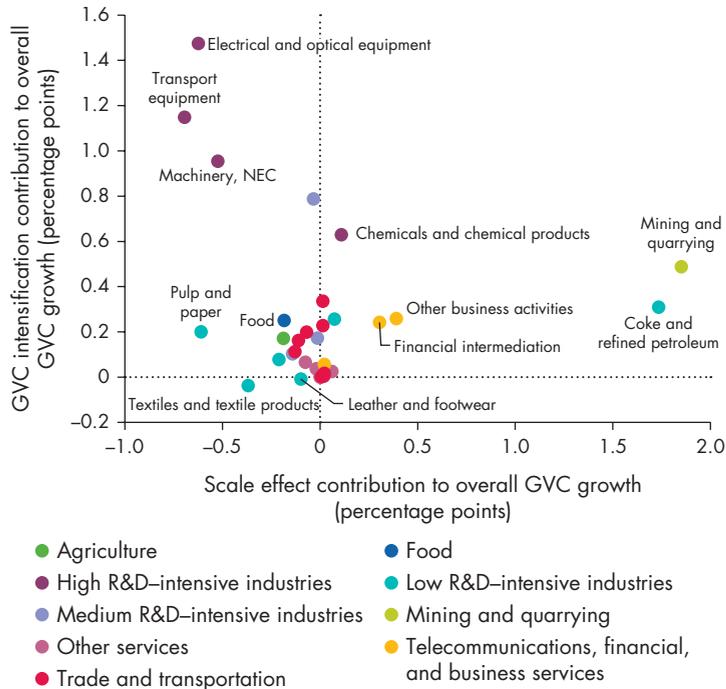
in exports. India, Kenya, and the Philippines also have rapidly expanding ICT and business service sectors. Even in China, traditionally viewed as an exporter of manufactures, more than a third of the value added in its exports comes from services.

For gross exports of services, such as transport, tourism, or business services, the share in trade is fairly flat at about 20 percent. The goods trade is increasingly involving services in production, with the share of services in valued-added trade rising from 31 percent to 43 percent between 1980 and 2009, a result of both forward and backward use of services in production (figure 1.12).

GVCs in agriculture and food industries have also expanded, including those in Africa

Although GVCs in the agriculture and food sectors have expanded over the past two decades, they remain a small share of GVC trade. In 2014 agriculture exports accounted for 2 percent of world exports

Figure 1.11 A handful of sectors drove global GVC expansion from 1995 to 2011



Source: WDR 2020 team, using data from WIOD 2013 release database.

Note: The WIOD 2013 database is used because it offers a finer sectoral classification than Eora26. In addition, the 2013 release (covering 1995–2011) is used instead of the latest 2016 release (covering 2001–14) in order to compare the change in GVC participation in the 2010s with that in the 1990s. The GVC participation measure reflects the share of a country's exports that flow through at least two borders. It is computed as the share of GVC exports in total international exports. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). The 35 WIOD 2013 industries are classified in nine industry groups (see World Bank 2019): (1) agriculture, hunting, forestry, and fishing (ISIC Rev. 3 code 01T05); (2) food (ISIC Rev. 3 code 15T16); (3) mining and quarrying (ISIC Rev. 3 code 10T14); (4) high R&D-intensive industries (ISIC Rev. 3 codes 24, 29T34, 352, 353, 359); (5) medium R&D-intensive industries (ISIC Rev. 3 code 25T28, 351, 37); (6) low R&D-intensive industries (ISIC Rev. 3 codes 17T23, 36); (7) trade and transportation (ISIC Rev. 3 codes 50T52, 55, 60T63); (8) post and telecommunications, financial, and business services (ISIC Rev. 3 codes 64, 65T67, 71T74); and (9) real estate activities, utility, construction, and other services (ISIC Rev. 3 codes 70, 75, 80, 85, 90T93, 95, 40, 41, 45). ISIC = International Standard Industrial Classification; NEC = not elsewhere classified; R&D = research and development.

in contrast to 60 percent for manufactures and around 20 percent for services. When measured in value-added terms, this share rises to about 5 percent.

This finding reflects the fact that in the agri-food sector, unlike in the manufacturing sector, domestic value chains are dominant and dynamic, with GVCs important but secondary. In Asia and Latin America, supermarkets and small and medium enterprises in the food sector such as chain restaurants, processors, and modern wholesale and logistics companies have spread rapidly.⁶

Another factor in this finding is that GVCs in the agri-food sector typically involve less cross-border movement of goods than capital investments through direct and portfolio means and business practices such

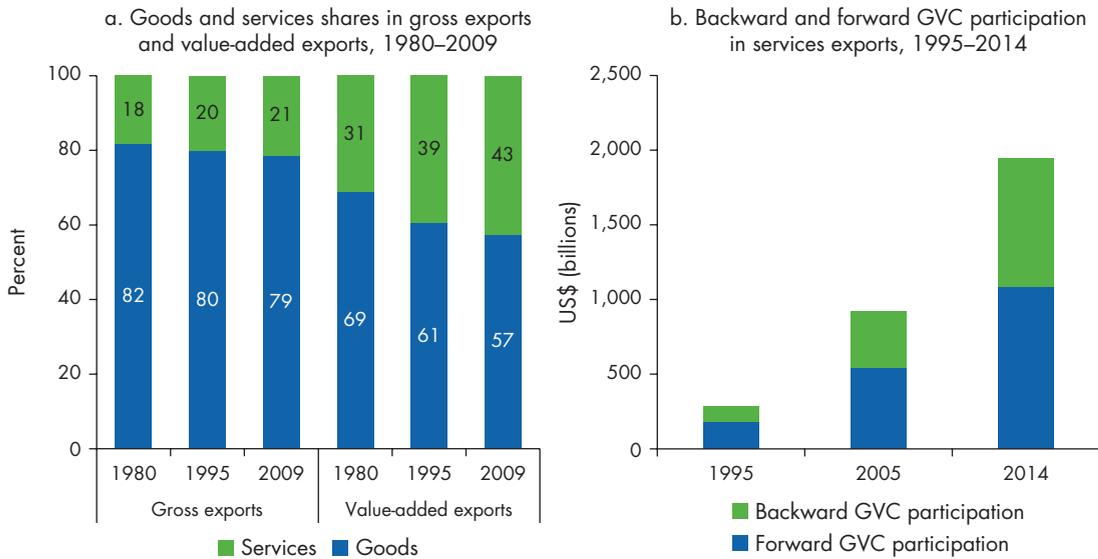
as contracting and logistics expertise. Taken together, Asia, Latin America, and Sub-Saharan Africa saw their foreign direct investment (FDI) inflows in the agri-food sector grow by a factor of three between 2000 and 2010. But such investments are mainly in large and more developed markets within Latin America (Argentina, Brazil, Chile, and Mexico) and Asia (China, Indonesia, and Vietnam), with little flowing into Sub-Saharan Africa (Ethiopia, Ghana, Tanzania, and Uganda). These investments are mostly aimed at the food industry (processing and retail) instead of agriculture.⁷

In overall participation in agriculture GVCs between 1990 and 2015, Ethiopia, Ghana, Kenya, and Rwanda in Africa and Vietnam in East Asia stand out. They increased their GVC participation by almost 10 percentage points or more. By contrast, the Lao People's Democratic Republic, Lebanon, and the Republic of Yemen—and resource-rich economies such as South Sudan—saw their integration in agriculture GVCs drop by between 5 and 30 percentage points (figure 1.13, panel a). For food GVCs, Sub-Saharan African countries including Ethiopia, The Gambia, and Tanzania also saw significant increase in participation, suggesting that those countries have been successfully developing food processing industries (figure 1.13, panel b). Value chains in the food industry are also important in Eastern European countries such as Bulgaria, Hungary, and Serbia.

Importantly, the participation of most developing countries in agriculture and food GVCs is largely forward because it is limited to supplying a specific product such as coffee by Ethiopia or Uganda, cocoa by Côte d'Ivoire or Ghana, oranges by Brazil, and bananas by Colombia.

Agriculture GVCs are also characterized by the prevalence of informality, which has important consequences for workers' poverty and vulnerability. In developing countries, over 94 percent of employment in agriculture is informal versus 63 percent in manufacturing. In African countries, these shares rise to 98 percent for agriculture and 77 percent for manufacturing.⁸ Although firms in GVCs pay higher wages to their formal workers, they also rely heavily on informal workers who do not earn the same premiums. In Peru, 79 percent of all men and 84 percent of all women working on artichoke farms and processing plants have jobs that are not secure. Only about half of the migrant workers in the export pineapple sector in Ghana have permanent contracts.⁹ Hiring workers indirectly through subcontractors or agents further contributes to vulnerability within GVCs as firms transfer their social responsibilities to a third party.

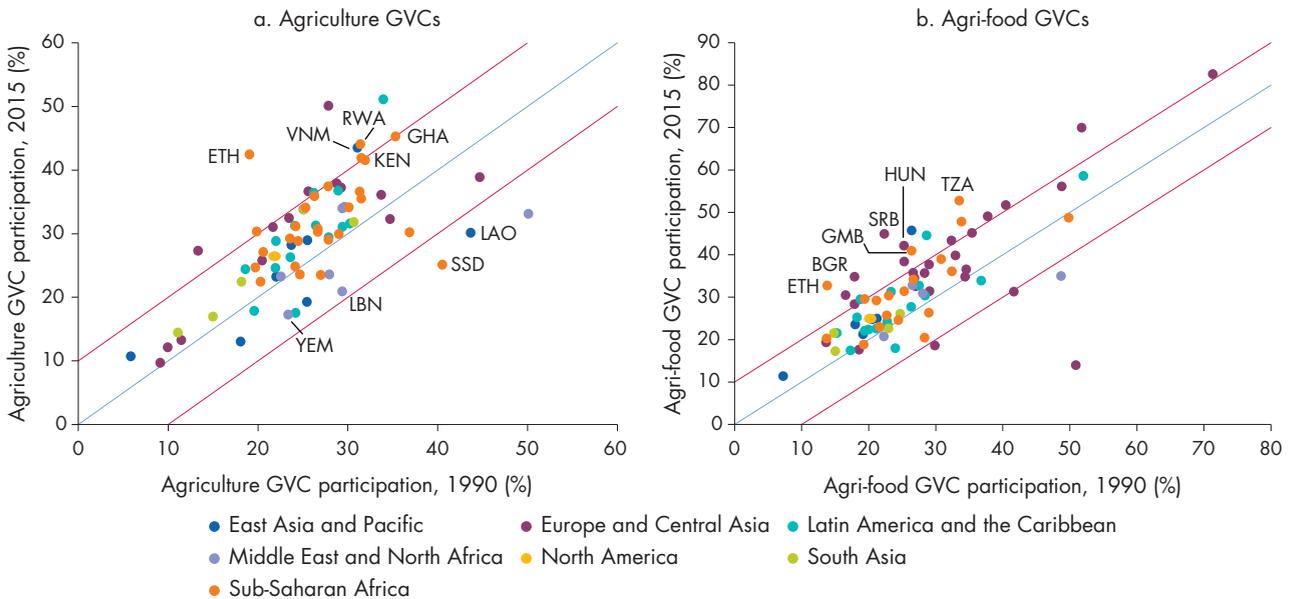
Figure 1.12 Services are playing a growing role in GVCs



Sources: WDR 2020 team, using data from Johnson and Noguera (2017) for value-added exports measure in panel a and WIOD data from the 2013 release for 1995 and the 2016 release for 2005 and 2014 for panel b.

Note: Panel a reports the share of goods and services in gross exports and value-added exports, and panel b the GVC exports of services broken down into their backward and forward components. The GVC exports reflect exports that flow through at least two borders and indicate the extent to which sectors participate in GVCs. The GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation).

Figure 1.13 GVCs expanded in both the agriculture and food industries from 1990 to 2015



Source: WDR 2020 team, using data from Eora26 database.

Note: The Eora26 database is used because it offers the largest country coverage: 190 countries between 1990 and 2015. Plots report only countries with at least 5 percent of their exports in the agriculture or agri-food sector. Agriculture includes forestry, hunting, and fishing. The GVC participation measure reflects the share of a country's exports that flow through at least two borders. It is computed as the share of GVC exports in total international exports. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). The blue 45-degree line marks instances in which GVC participation for a given country are the same in 1990 and 2015. The red 45-degree lines mark a 10 percentage point change in the rate of GVC participation between 1990 and 2015. For country abbreviations, see International Organization for Standardization (ISO), <https://www.iso.org/obp/ui/#search>.

A few large trading firms account for most GVC trade

In practice, it is firms, not countries or industries, that participate in international trade (box 1.4). In line with this simple observation, economic research on international trade underwent a dramatic transformation in the last 20 years, placing firm-level international strategies at center stage. Fueling this shift was the growing availability of longitudinal plant and firm data sets that permitted researchers to unveil new facts challenging the validity of existing models. An important stylized fact from this literature is that in all countries, rich and poor, trade is highly concentrated in a small share of large firms that both import and

export. Similarly, firms that both import and export dominate GVC participation (figure 1.14).

Because firms are the main actors in GVCs, another way to illustrate an individual country's GVC participation is to look at its share of firms engaged in two-way trade—that is, firms that both import and export (figure 1.14). For example, 41 percent of trading firms in China, 32 percent in South Africa, and 22 percent in Mexico both import and export—and all three have large GVC participation. The concentration of trade in a few importing–exporting firms is extreme. Two-way traders account for about 15 percent of all trading firms on average in the sample of countries, and yet they capture almost 80 percent of total trade. These

Box 1.4 A firm-level approach to GVCs

While most conceptual frameworks and empirical measures related to GVCs are at the country or country–industry level, in practice, it is not *countries* or *industries* that trade, but rather firms. In line with this observation, research in international trade has undergone a dramatic transformation in the past 20 years, placing firm-level international strategies at the center stage. This intellectual revolution was fueled by the increased availability of longitudinal plant and firm-level data sets that allowed researchers to unveil new facts that challenged the validity of existing models. At the theoretical level, a seminal paper was that of Melitz (2003), which focuses on the exporting decisions of heterogeneous firms within an industry. In Melitz's framework, firms are assumed to produce differentiated products using technologies featuring increasing returns to scale. Product differentiation confers market power on firms, whereas scale economies are associated with firms facing fixed costs of production and distribution. The decision of a firm to export to a given foreign market is shaped by a comparison of the potential operating profit obtained in that foreign market with the fixed costs associated with distributing products in that market.

This firm-level approach to international trade initially involved only the exchange of final goods, but an active literature has adopted similar ideas to understand the rise of GVCs. Because of the fixed costs of engaging in global sourcing (that is, of importing parts and components), one would expect that the use of imported inputs in production would require importers to attain a minimum efficient scale of production, thereby excluding smaller and less productive firms in an industry from GVC participation.^a

Using a firm-level approach, one can also distinguish GVCs organized by a lead firm, which incurs the bulk of the fixed costs associated with setting up the network of producers for a given production process, from those that are more decentralized, with individual producers incurring the costs to set up links upstream and downstream.^b

Firm-level data sets containing information on the import and export transactions of firms can be used to construct measures of GVC participation similar to those based on the country–industry information in global input–output tables. Specifically, transaction-level customs data sets of the type available from the World Bank's Exporter Dynamics Database can identify the set of firms in a country that participate in trade, further distinguishing firms that export, firms that import, and firms that both export and import. When a given firm in a given country both imports *and* exports, it is natural to conclude that this firm participates in GVCs.

To map this definition more precisely to the definition of backward GVC participation developed in country–industry studies, one would ideally also resort to product-level information to verify that the goods imported by an exporting firm are indeed intermediate inputs (rather than final goods), so that one can more comfortably conclude that this firm is indeed using foreign value added in its production destined for exports. Without linking customs data across countries, it is much harder to come up with analogous firm-level measures of forward GVC participation. Even when a firm is identified as an exporter of intermediate inputs (instead of final goods), it is almost impossible to establish whether those inputs are fully absorbed in the importing

(Box continues next page)

Box 1.4 A firm-level approach to GVCs (continued)

country or whether they are reexported to third markets by the importing firms after having added value to them.

Firm-level measures identify only the *extensive* margin of GVC participation, while industry-level measures based on global input-output tables also capture the *intensity* of GVC participation. Computing intensive measures of GVC participation at the firm-level data is challenging, however (especially if complementary census information is not available), because customs data do not cover firms' domestic purchases of inputs or domestic sales of goods. Thus it is difficult to infer the ratio of foreign inputs used in production, and it is even more difficult to disentangle the foreign input content of exports from the foreign content of overall production.^c

Firm-level information on importing and exporting can also shed light on whether global input-output tables provide an accurate description of value-added trade flows

across countries. Even when the entries in these tables provide an accurate account of the origin of inputs in a country's industrial production, the standard methods used to compute bilateral value-added trade flows from these tables assume that the same combination of inputs is used in production regardless of the destination of sales of a country's and industry's output. In practice, firms selling output to different markets use very different combinations of input sources, and this has implications for the type of bilateral value-added trade flows one infers from global input-output tables. For example, because Mexican exports to the United States embody a disproportionate amount of U.S. value added relative to Mexican exports to other countries, the share of U.S. value in U.S.-imported Mexican manufactures is 30 percent instead of the 17 percent one would infer from standard techniques applied to global input-output tables.^d

a. See Antràs, Fort, and Tintelnot (2017); Antràs and Helpman (2004); Gopinath and Neiman (2014); Halpern, Koren, and Szeidl (2015).

b. See Bernard, Moxnes, and Ulltveit-Moe (2018).

c. See Kee and Tang (2016) for an attempt using processing trade in China.

d. de Gortari (2019). Apart from qualifying the type of implications that one can draw from aggregated input-output tables, firm-level data can also be used to test the validity of the "proportionality" assumptions that go into construction of those data.

"superstar" firms, many of them multinational,¹⁰ drive country trade performance.¹¹

Sticky buyer-seller relations

Modeling global production sharing as simply an increase in the extent to which foreign inputs (or foreign value added) are used in production misses distinctive characteristics of the recent rise of GVCs. That rise entails much more than the intensification of the trade in raw materials and homogeneous intermediate inputs that has been undertaken since the Bronze Age. It is also much more than import and export firms transacting with each other in world markets. The expansion of GVCs entails a finer international division of labor, but it also involves several additional features, four of them especially important: (1) matching buyers and sellers, (2) making relationship-specific investments, (3) exchanging intangibles, and (4) living with limited contractual security.

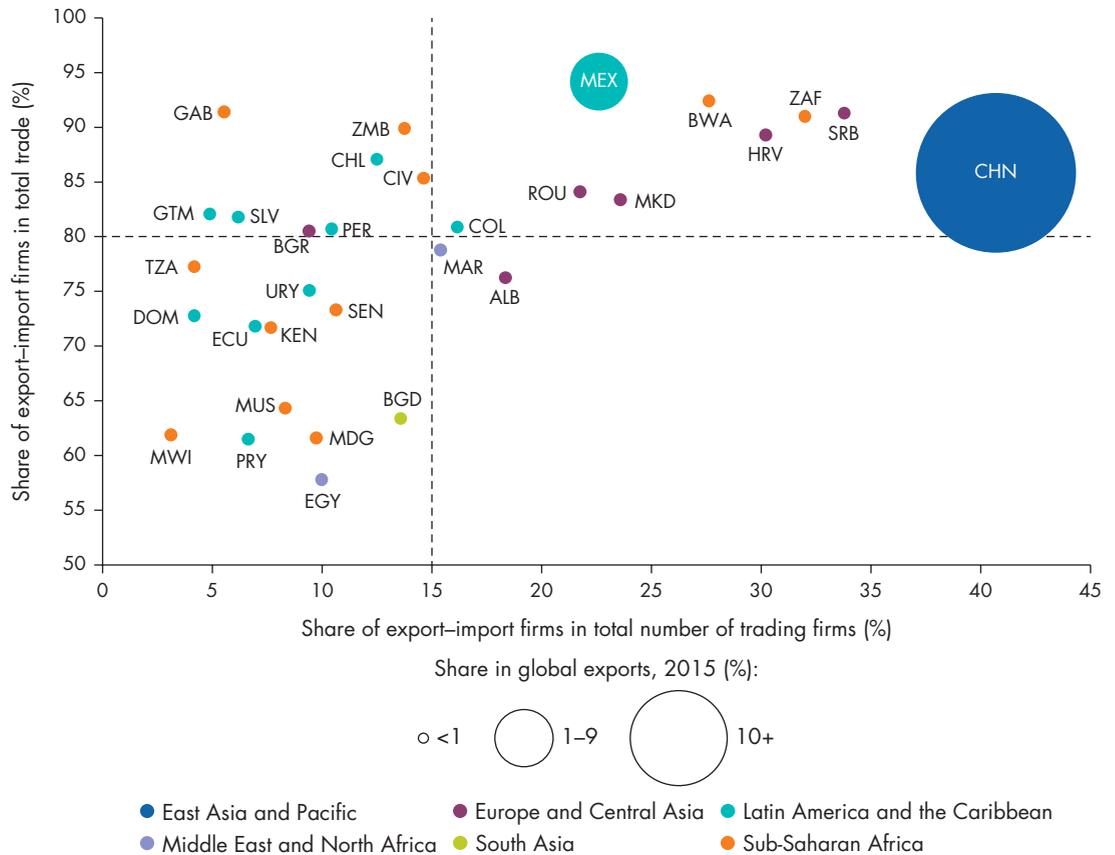
Matching buyers and sellers in GVCs is not frictionless. The fixed costs of exporting and importing reflect in part the costs of finding suitable suppliers of parts and components or suitable buyers of a seller's products. For this reason, these fixed costs are

better understood as sunk costs, which naturally create "stickiness" among participants in a GVC.

A source of lock-in for GVC relationships is that participants often make *relationship-specific investments* (such as purchasing specialized equipment or customizing products), and so they would obtain a much lower return if GVC linkages were broken. The need to customize inputs, coupled with quality sensitivity, makes matching buyers and sellers particularly important. If a firm suddenly faces an increase in the demand for its goods, it cannot easily scale up by buying more foreign inputs from some centralized market. Typically, only a handful of suppliers worldwide can provide the additional customized inputs to scale up.

Meanwhile, GVCs are more likely to lead to technology transfer and standards upgrading. Firms in GVCs do not engage only in trade in tangible goods with other members of their value chains. They often benefit from large *flows of intangibles*, such as technology, intellectual property, and credit. Lead or parent firms may also provide good managerial practices, saving resources and lifting productivity, or labor and environmental standards. The exchange of these intangibles is much more complex than that of simple goods or services.

Figure 1.14 Firms that both import and export dominate GVC participation



Source: WDR 2020 team, using firm-matched export-import customs data collected for 32 countries by the Trade and International Integration Unit of the World Bank Development Research Group, as part of efforts to build the Exporter Dynamics Database described in Fernandes, Freund, and Pierola (2016).

Note: The figure plots the share of two-way trading firms (firms that both import and export in a given year) in the total number of trading firms (firms that import, export, or do both) against their share in a country's total trade value (imports plus exports). For each country, the average of each measure is computed over 2005–15 for the largest available sample of countries. The dashed lines mark the average across countries for each measure on the x-axis and y-axis. For country abbreviations, see International Organization for Standardization (ISO), <https://www.iso.org/obp/ui/#search>.

The lock-in effects and flows of intangibles within GVCs are particularly relevant because of the *limited contractual security* that governs transactions within these chains. GVCs often engage in transactions that require a strong legal environment to bind producers together and avoid technological leakage. And yet GVCs often lack this strong legal environment because cross-border exchanges of goods cannot generally be governed by the same contractual safeguards that typically govern similar exchanges within borders. As a result, GVC participants must have repeated interactions to ensure implicit contract enforcement. As with matching frictions and relationship-specificity, this force contributes to the “stickiness” of GVC relationships.

In summary, these features of GVCs lead to a novel, relational conceptualization of GVCs that shifts the focus away from the mere allocation of

value added across countries through anonymous spot exchanges of goods and services. Instead, the identity of the agents participating in a GVC is crucial, and within GVCs, relationships are more likely to exhibit persistence.

Transactions within firm boundaries

An extreme version of relational contracting arises when parties in a GVC bypass the market mechanism altogether and undertake transactions within the boundaries of firms by having the buyer vertically integrate with the seller or vice versa. Indeed, many value chains are managed and controlled by multinational enterprises that organize their production across different locations. In some cases, goods are closer to new customers and the costs of trade fall (market-seeking investment). In others, it is a matter of taking advantage of lower costs of factors of production

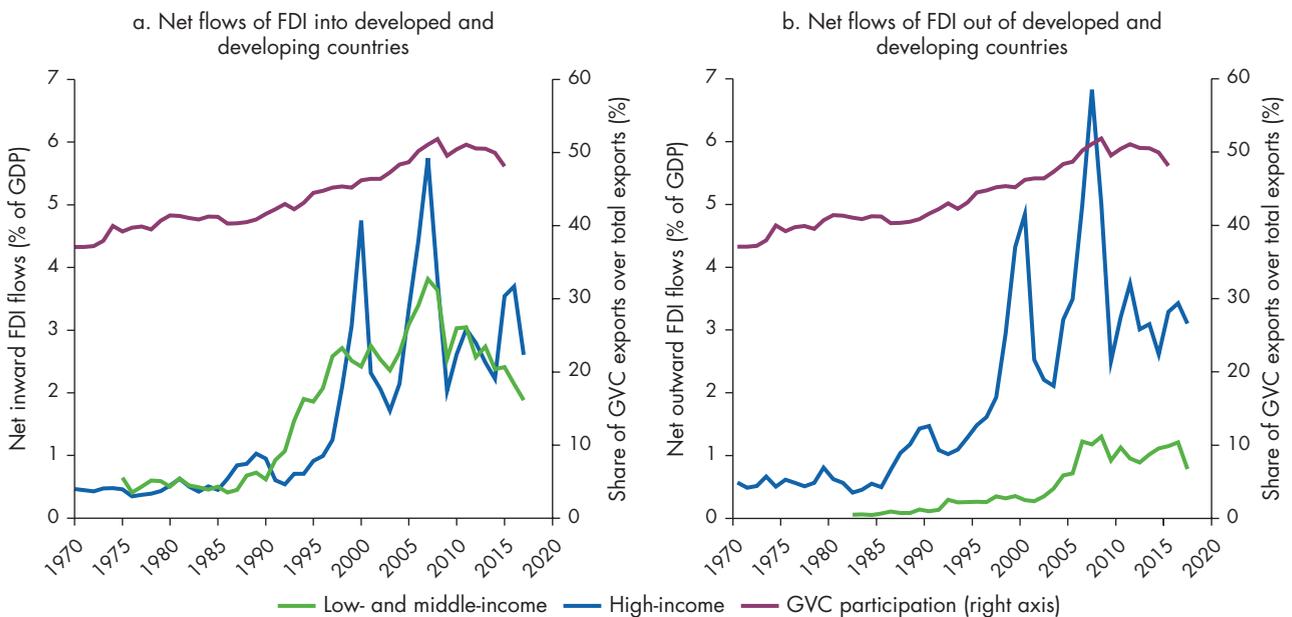
(efficiency-seeking investment). Both types of investment have contributed to the international dispersion of production, but the second has been especially important for GVC growth, which is evident from the growth of FDI flows and GVCs, especially since the 1990s (figure 1.15).

FDI flows into countries in the South and North (inward FDI) are positively correlated, suggesting that the expansion of foreign investments in one market did not come at the expense of the other. For foreign investment flows out of developed and developing countries (outward FDI), those from emerging economies have grown quickly, if from a very low base.¹² Since the early 2000s, companies in the South have sought opportunities to sell products locally, such as when the Kenyan supermarket chain Tuskys opened stores in Uganda. In other instances, firms have focused on taking advantage of cheaper labor, such as when Chinese firms invested in Madagascar's agriculture and textile sectors. From 2000 to 2015, the outward direct investment of firms in Brazil, China, India, the Russian Federation, and South Africa surged—from \$7 billion to \$200 billion, or almost one-third of global FDI.¹³

Intrafirm trade flows in world trade flows also exemplify the relational aspects of the growth of GVCs. For example, U.S. Census data from 2016 show that more than 40 percent of U.S. goods trade involves related-party transactions. At the global level, intra-firm trade has been estimated to be about one-third of world trade flows. In addition to having their own affiliates abroad, multinational companies rely on independent suppliers, including small firms in domestic and foreign markets.

The hierarchy and direction of knowledge flows between the multinational (or lead) firm and its suppliers vary across types of GVCs, depending on the complexity of products, the ability to codify transactions, and the capabilities of supply firms.¹⁴ In producer-driven chains, the lead firm controls the design and most of the assembly of products by affiliates and captive suppliers, who are prevented from sharing technology with competitors. Such chains are typical in industries relying heavily on technology and R&D, such as electronics, automotive, aerospace, and pharmaceuticals, where production requires the assembly of thousands of customized parts into one

Figure 1.15 Foreign direct investment accompanied the fragmentation of production from 1970 to 2018



Source: WDR 2020 team, using data from the World Bank's WDI database.

Note: Panel a reports the net inflows of investment to the reporting economy from foreign investors divided by GDP, and panel b reports the net outflows of investment from the reporting economy to the rest of the world divided by GDP. To avoid composition effects, the definitions of income groups are time-invariant and based on the World Bank's 2018 country classification. The GVC participation measure reflects the share of countries' exports that flows through at least two borders. It is computed as the share of GVC exports in total international exports. GVC exports include transactions in which a country's exports embody value added that it previously imported from abroad (backward GVC participation), as well as transactions in which a country's exports are not fully absorbed in the importing country and instead are embodied in the importing country's exports to third countries (forward GVC participation). FDI = foreign direct investment.

high-end product. Large manufacturers such as Apple, General Motors, Samsung, Sony, and Toyota are typical of producer-driven global supply chains.

By contrast, when production is less complex and can be modularized or knowledge can be codified, captive relationships are less likely. In GVCs driven by the purchasing firms—so-called buyer-driven GVCs—the lead company has few factories of its own and sources its products almost entirely from a large network of independent suppliers, leaving it to concentrate instead on marketing and sales. This type of GVC is mostly found in the textile and apparel industries, where products such as clothes, housewares, or toys require relatively little capital and skills. Large retailers such as JCPenney and Walmart and big brands such as Nike are examples.

From this relational concept of GVCs emerges a richer analysis of them, one that puts on center stage the major actors (such as multinational firms and lead firms in GVCs) that shape GVC activity and FDI flows. Such an analysis underscores the role of institutional factors in shaping the location of global production. By explicitly modeling the mechanisms for dividing the gains from specialization across firms, this relational approach also delivers novel lessons about the implications of GVC participation for inequality and for development, as the following chapters review. It also provides a rich set of predictions about how an increase in automation or digital technologies may affect the landscape of the international economy and the different agents in society.

Notes

1. Barjamovic et al. (2019).
2. Kalm et al. (2013); OECD (2013).
3. Freeman (2007).
4. Constantinescu, Mattoo, and Ruta (2018).
5. Antràs and de Gortari (2017).
6. Reardon and Timmer (2012).
7. Reardon and Barrett (2019).
8. ILO (2018).
9. Barrientos et al. (2009); Chan (2013); Gammage (2009).
10. Freund and Pierola (2015).
11. Freund and Pierola (2015); Mayer and Ottaviano (2008).
12. See also UNCTAD (2019).
13. Cusolito, Safadi, and Taglioni (2016); Gómez-Mera et al. (2015).
14. Gereffi, Humphrey, and Sturgeon (2005).

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