

Chapter 2

Multinational Corporations Shape Global Value Chain Development

Key findings

- Global value chains (GVCs) encompass a myriad of firm-to-firm relationships and the full range of activities required to bring a product or service from conception to its end use. These activities are managed and coordinated by multinational corporations (MNCs) via investment, trade, people, technology, and information flows. Their business decisions have profound implications for the global economy.
- It is impossible to understand GVCs without understanding how MNCs make their global production decisions. By understanding the objectives and strategies of MNCs, developing countries can better stimulate their entry into GVCs and increase the development benefits from MNC activities in their economies.
- MNCs have proliferated since the 1970s. They and their affiliates contributed 36 percent of global output in 2016, including around two-thirds of global exports and more than half of imports. Countries that are major global exporters all benefit from a strong presence of MNCs.
- Three objectives dominate the production decisions of MNCs: lowering production costs, mitigating risks, and increasing market power. MNCs balance their level of control, their commitment of proprietary resources, the type and level of risks they take, and the costs and returns of various transaction modes to organize their global production networks.
- The business strategies MNCs use to pursue each of their objectives are inextricably intertwined with the structural characteristics of the specific GVCs they operate within.
- The rise of superstar firms and their increased market concentration have a dual impact on growth and distribution. MNCs' business strategies affect the gains that foreign direct investment and GVCs bring in knowledge spillovers, resources, consumer welfare, and the distribution of value added in the supply chains.

Multinational corporations are the drivers of global value chains

Multinational corporations (MNCs) are firms that conduct direct business activities and own assets in at least two countries (Dietrich and Krafft 2012). Although cross-border direct business activities date back a long time (for example, the British East India Company began its operations in the early seventeenth century), the real forerunners of MNCs were the nineteenth century's joint stock companies. Early MNCs invested abroad primarily to seek raw materials from developing countries. After World War II, many MNCs began operating in manufacturing, and the past three decades have seen more geographically fragmented activities in both manufacturing and services.

The internal organizational structure of companies evolved alongside developments in their activities and geographic scope as well as progress in communication and transportation technologies. Most early companies operated in a single sector with a functional structure. The multidivisional form, in which divisions are established along product lines, emerged only in the twentieth century. A further development, the matrix structure, allowed product lines and geographic lines to be considered simultaneously. Advances in information and communication technologies (ICTs) greatly reduced communication costs; transportation costs also fell dramatically in the past few decades, spurring a wave of globalization. MNCs increasingly outsource to and develop business activities with a variety of external partners, ranging from subcontractors to suppliers to partners in research and development (R&D) or production activities. New structures have been developed to account for these external networks as well as for networks of affiliates internal to the companies (Dietrich and Krafft 2012).

Because of these developments, MNCs have proliferated since the 1970s. Global estimates indicate that there were roughly 7,000 parent MNCs in 1970; this number had jumped to 38,000 by 2000 (OECD 2018) and was estimated at more than 100,000 in 2011 (UNCTAD 2011). Together, these MNCs had close to 900,000 affiliates in foreign countries. Most MNCs originated in developed countries (70 percent according to UNCTAD [2011]), although more and more MNCs are headquartered in developing countries, and those MNCs are growing rapidly. In 2019, 12 companies headquartered in developing countries were among the world's top 100 nonfinancial MNCs as ranked by foreign assets, compared with only 2 such companies in 2003 (UNCTAD 2005, 2020).

Foreign direct investment (FDI) is the primary form of global expansion for MNCs, and until recently it was their defining type of investment. The IMF (1977) sets a threshold of 10 percent as the minimum equity ownership necessary for a parent company to be considered to have a controlling interest in a foreign affiliate. Foreign investment involving a lower percentage of equity is classified as portfolio investment.¹ FDI flows consist of equity capital (assets and liabilities), reinvested earnings (net), and other capital (such as intercompany loans). A direct investment enterprise may be (a) a subsidiary (an enterprise of which more than 50 percent is owned by a nonresident investor), (b) an associate (an enterprise of which 10 percent to 50 percent is owned by a nonresident investor),

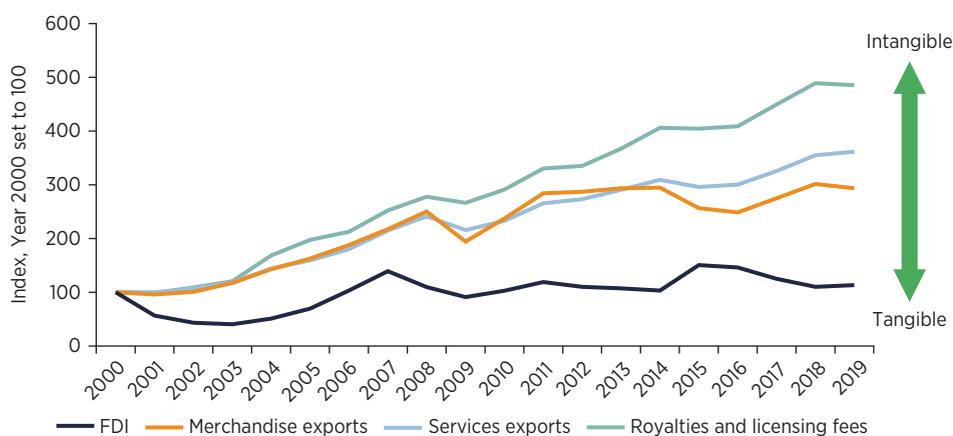
or (c) a branch (an unincorporated enterprise wholly or jointly owned by a non-resident) (OECD 2010).

The use of nonequity modes (NEMs) by MNCs in international production has increased rapidly over the past two decades, outpacing the growth of FDI (figure 2.1). NEMs are contractual agreements, such as licensing, franchising, or management contracts. Global FDI flows have shown anemic growth since 2008; net of one-off factors such as tax reforms, megadeals, and volatile financial flows, FDI has averaged only 1 percent growth per year for the past decade, compared with 8 percent from 2000 to 2007 and more than 20 percent before 2000 (UNCTAD 2020). Much of the continued expansion of international production has been driven by intangibles, such as royalties, licensing fees, and service exports. NEMs have been growing faster than FDI since 2000. They have also expanded fastest in the sectors in which they were most prevalent, as is evident in the relative growth rates of royalties, licensing fees, and trade in services (UNCTAD 2011, 2020). Compared with FDI, NEMs have lower up-front capital requirements, less exposure to risk, and greater flexibility to adapt to change, all of which have become critical so that MNCs can be agile in an ever-evolving market.

Asset-light forms of investment also increased in the past decade because of digitalization and the new business models it made feasible. Top technology MNCs, such as Facebook and Google, can reach markets worldwide through digital channels without a significant physical presence. New business models, such as the sharing economy, allow MNCs such as Airbnb and Uber to enter foreign markets by building peer-to-peer networks and without owning physical assets themselves (UNCTAD 2020).

There is a large body of literature studying the motivation and entry mode of MNCs (Antràs and Yeaple 2014; Helpman, Melitz, and Yeaple 2004; Melitz 2003). Various FDI taxonomies have been developed in different periods with diverse focus (box 2.1). These taxonomies, however, have many overlapping elements given that

FIGURE 2.1 Indicators of international production, by tangibility



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Note: FDI = foreign direct investment.

BOX 2.1 Motivations for and modes of foreign direct investment

Dunning's framework

In 1977, Dunning first established the OLI (ownership, location, internalization) paradigm of why (ownership advantages), where (location advantages), and how (internalization advantages) a firm decides to invest abroad. He identified four types of foreign direct investment (FDI) motives: resource seeking, efficiency seeking, strategic asset seeking, and market seeking. These types are cross-cutting with horizontal and vertical FDI. The potential limitation of this widely accepted taxonomy is that this theory was established before the rapid rise of global value chains (GVCs), and thus tended to pay little attention to the role of GVC network coordination on firms' outward investment motivation.

In addition to Dunning's framework, FDI is commonly categorized as being horizontal or vertical.

Horizontal FDI

Horizontal FDI occurs when multinationals undertake the same production activities in multiple countries. Horizontal FDI with a market-seeking motive is one of the earliest and most established types of FDI. This type of FDI is often associated with trade, that is, investment substitution. The reasons behind horizontal FDI include, among others, proximity to consumers, adaptation to local needs, tax planning, and sometimes tariff jumping. Japanese firms have been very active in using this strategy in the auto industry and electronics in US and European Union markets (Belderbos and Sleuwaegen 1998; Head and Ries 2003). Greenfield FDI and mergers and acquisitions are both common modes of horizontal FDI.

Vertical FDI

Vertical FDI takes place when firms fragment production processes and locate each stage in the country where it can be performed at the least cost. The conventional interpretation for the motivation is factor cost differences, that is, efficiency-seeking FDI (Aizenman and Marion 2004). An increasing portion of the literature also suggests that vertical FDI also entails the strategic asset-seeking motivation to augment firm capacities. Strategic assets can include technology, production processes, management skills, networks, and more (Amann and Virmani 2015; Driffield and Love 2003).

In addition, vertical FDI is used as an organizational format to minimize transaction costs. In a GVC network, market-based cross-border transactions may suffer from high transaction costs because of the absence of strong legal systems. Also, the increasing organizational complexity and growing length and layers of GVCs create additional transaction costs. Firms are therefore motivated to vertically integrate to avoid contract hazards and deficiencies (Antràs 2019; World Bank et al. 2017).

Agglomeration FDI

FDI might also be attracted by location-specific spillovers. Production-unbundling costs associated with cross-border management, coordination, and logistics might outweigh the benefits of reduced factor costs. In such case, a firm may choose to move along with its GVC partners to new locations against its own comparative advantage (Baldwin and Venables 2010). For firms hoping to join new value chains through outward investment, location-specific externalities, such as pooled markets of skilled labor, availability of specialized inputs and services, and benefits of technological spillovers, become attractive conditions. For example, Japanese firms tend to be in proximity to other Japanese firms in the United States to access trained Japanese workers in the cluster (Head, Ries, and Swenson 1995). Also, outward investors from Belgium, Germany, Italy, Japan, the Netherlands, Switzerland, the

Continued on next page >

BOX 2.1 Motivations for and modes of foreign direct investment (FDI) (continued)

United Kingdom, and the United States have demonstrated a positive correlation between locating investment in France with the proximity of nonhome foreign firms. It is possible that new firms use the experience and performance of other foreign firms as an Indicator of the business climate at that location (Crozet, Mayer, and Mucchielli 2004).

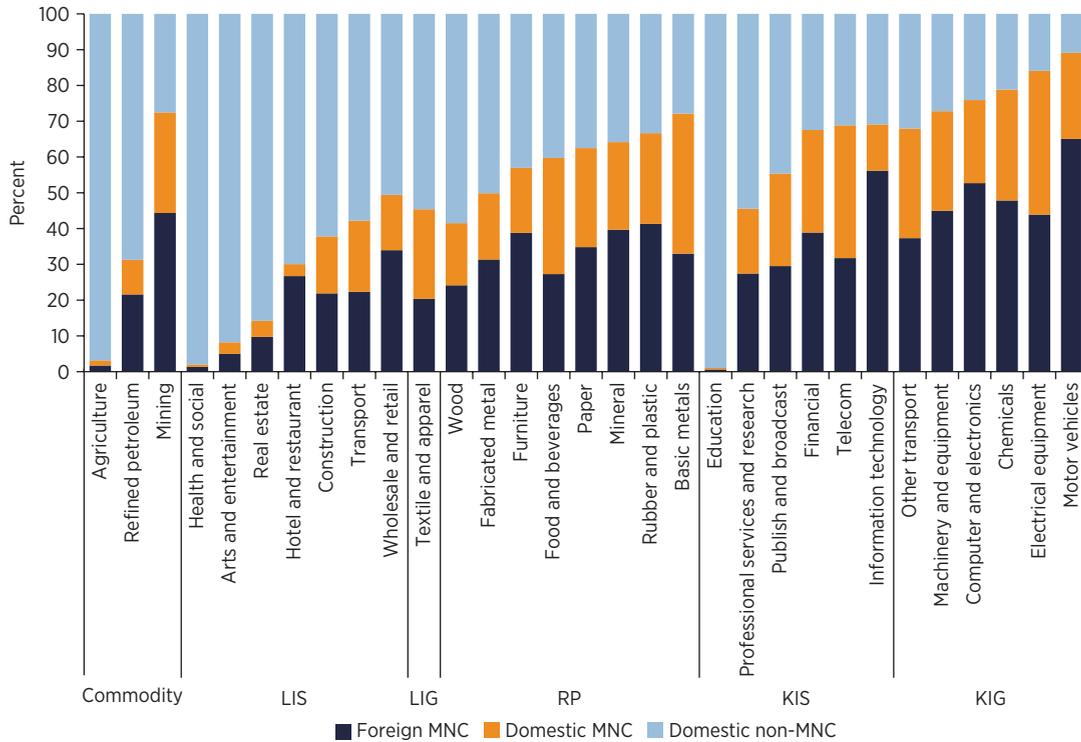
different strands of the literature analyze similar firm behavior through different lenses. This chapter focuses on vertical FDI because it is most relevant for production fragmentation and hyperspecialization.

The significant contributions of multinational corporations to global output and trade

The production and business strategies developed by MNCs to fragment, outsource, and offshore various activities gave rise to global value chains (GVCs). The internationalization of knowledge, technical and commercial alike, benefits both MNCs and the wider economies in their home and host countries. It is impossible to understand GVCs without understanding how MNCs make their global production decisions. As microeconomic data have become increasingly available, research has changed dramatically over the past 20 years: attention has shifted from countries and industries toward firms that engage in international production, investment, and trade.

Data on MNCs' activities and performance are scattered among different sources and are rarely comparable across countries.² This report uses a new database developed by the Organisation for Economic Co-operation and Development (OECD) to shed light on the overall contributions of MNCs to the global economy. This Analytical Activities of MNEs (multinational enterprises) (AMNE) database contains official data collected and published by national statistics offices along with estimates made using various statistical methods. It covers 59 countries and a "rest of the world" group and provides disaggregated data for 34 sectors. Gross output, value added, exports, and imports from 2005 to 2016 are broken down into foreign firms (defined as having at least 50 percent foreign ownership) and domestic firms. The database further distinguishes (from 2008 onward) between domestically owned MNCs and firms that operate only domestically.

MNCs, both domestic and foreign, account for a significant share of exports in most sectors (figure 2.2). According to the OECD AMNE database, MNCs and their affiliates contributed 36 percent of global output in 2016, including about two-thirds of global exports and more than half of imports. Their contribution is especially pronounced in knowledge-intensive goods, knowledge-intensive services, and regional processing sectors. Motor vehicle manufacturing is the most internationalized sector: MNCs make up 90 percent of the sector's exports. In general, foreign

FIGURE 2.2 Multinational corporations' contribution to global exports, by sector

Source: Calculations based on Organisation for Economic Co-operation and Development Analytical Activities of MNEs (multinational enterprises) database.

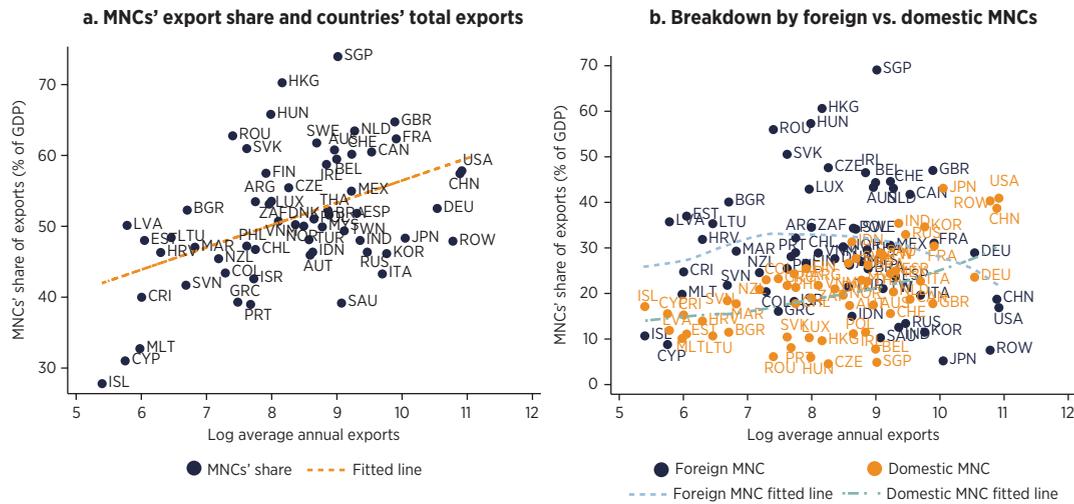
Note: Data are averaged from 2008 to 2016. KIG = knowledge-intensive goods; KIS = knowledge-intensive services; LIG = labor-intensive goods; LIS = labor-intensive services; MNC = multinational corporation; RP = regional processing.

MNCs represent a larger share of output and exports than domestic MNCs, but the opposite holds in a few sectors, such as textiles and apparel, telecommunications, and basic metals.

Positive correlation between the importance of multinational corporations and trade value across sectors and countries

Countries that are major global exporters all benefit from a strong presence of MNCs. Panel a of figure 2.3 shows a positive correlation between a country's total exports and the share of exports contributed by MNCs. The breakdown between foreign and domestic MNCs in panel b of figure 2.3 reveals a more nuanced picture: the relationship between countries' total exports and foreign MNCs' share in those exports is bell-shaped. In other words, the role of foreign MNCs in exports increases first, then declines when a country's exports exceed a certain level. However, the slope of the polynomial line of best fit for domestic MNCs and exports is positive: exports by these

FIGURE 2.3 Multinational corporations' share of exports

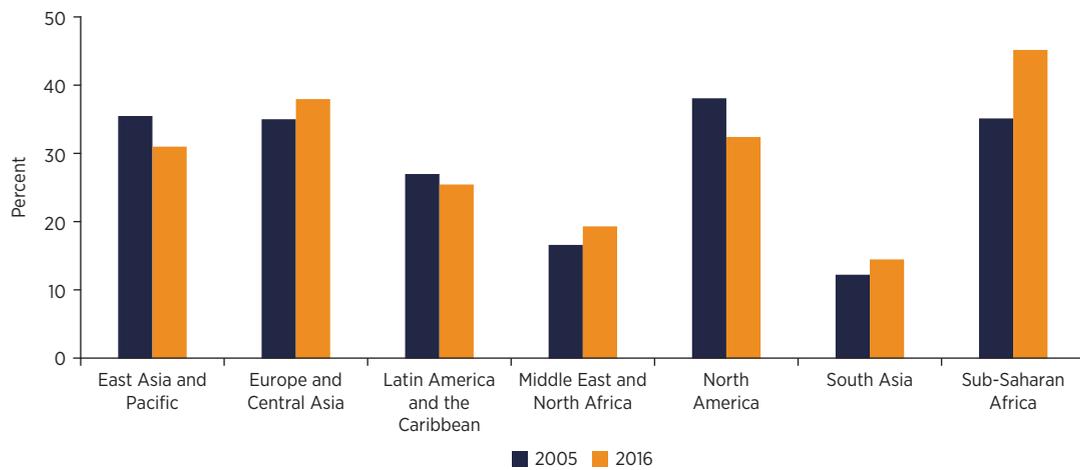


Source: Calculations based on Organisation for Economic Co-operation and Development Analytical Activities of MNEs (multinational enterprises) database, 2008–16 average.
 Note: MNC = multinational corporation.

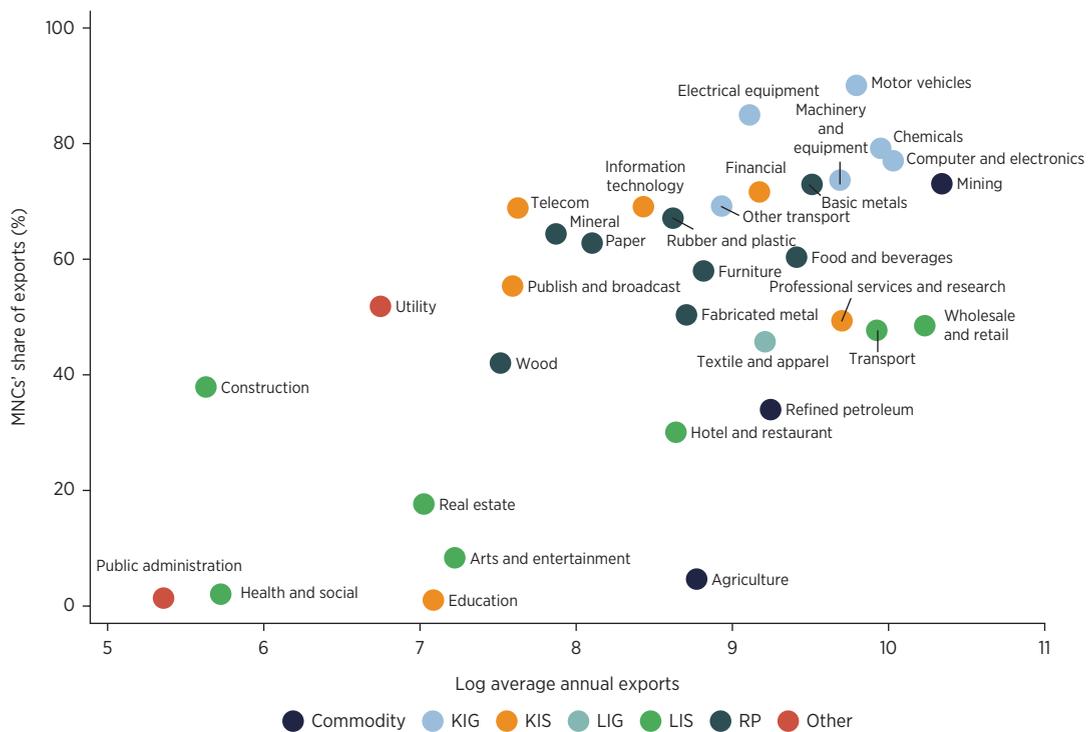
MNCs increase with their countries' total exports. As countries learn through exporting and as their economies grow, their own firms begin to internationalize. These domestic MNCs then play an important role in export expansion. For example, in China, Japan, and the United States, domestic MNCs contribute more than 40 percent of exports, twice as much as foreign MNCs contribute. However, foreign MNCs still act as primary exporters for many small economies with highly liberalized trade and FDI. For example, foreign MNCs' contribution to exports is as high as 70 percent in Singapore.

The contribution of foreign firms to exports in 2016 was highest in Sub-Saharan Africa, having increased from 2005 to 2016 as FDI liberalization attracted more foreign investment and domestic firm capability remained weak (figure 2.4). Some countries in the Europe and Central Asia region also experienced increases in the export share of foreign firms because of the European Union's enlargement and the further integration of Europe's economies. For instance, foreign firms' export share increased by 18 percentage points in Romania. The Czech Republic, Hungary, and the Netherlands also saw increases of about 10 percentage points. In contrast, countries in East Asia, including China, the Republic of Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam, generally experienced a decrease in foreign firms' export share: foreign firms' exports in these countries are still growing but were overtaken by those of domestic firms. Foreign firms' contributions in Latin America and the Caribbean remain relatively low and declined from 2005 to 2016. And, last, foreign firms' contribution is the lowest in South Asia despite modest growth.

The dominance of MNCs increases with total sectoral exports in the manufacturing sector (figure 2.5). Knowledge-intensive goods made up more than half of the global goods trade in 2018; international cooperation is crucial to producing these

FIGURE 2.4 Foreign firms' share of exports, by region, 2005 and 2016

Source: Calculations based on the Organisation for Economic Co-operation and Development Analytical Activities of MNEs (multinational enterprises) database.

FIGURE 2.5 Multinational corporations dominate highly tradable sectors

Source: Calculations based on the Organisation for Economic Co-operation and Development Analytical Activities of MNEs (multinational enterprises) database.

Note: This figure shows average annual global exports from 2008 to 2016 and the share of MNCs (both foreign and domestic) in total sectoral exports. KIG = knowledge-intensive goods; KIS = knowledge-intensive services; LIG = labor-intensive goods; LIS = labor-intensive services; MNC = multinational corporation; RP = regional processing.

products, given their complexity. MNCs contribute about 80 percent of exports in these sectors. Regional processing is the second most highly traded product group, and MNCs contribute about 70 percent of exports within it. Given the bulky or perishable nature of these products, most of the trade in this group happens in regional rather than global value chains. Labor-intensive goods have a much lower total trade value than knowledge-intensive goods because their unit prices tend to be very low, but MNCs still play a leading role in the GVCs of these goods, especially textile and apparel.

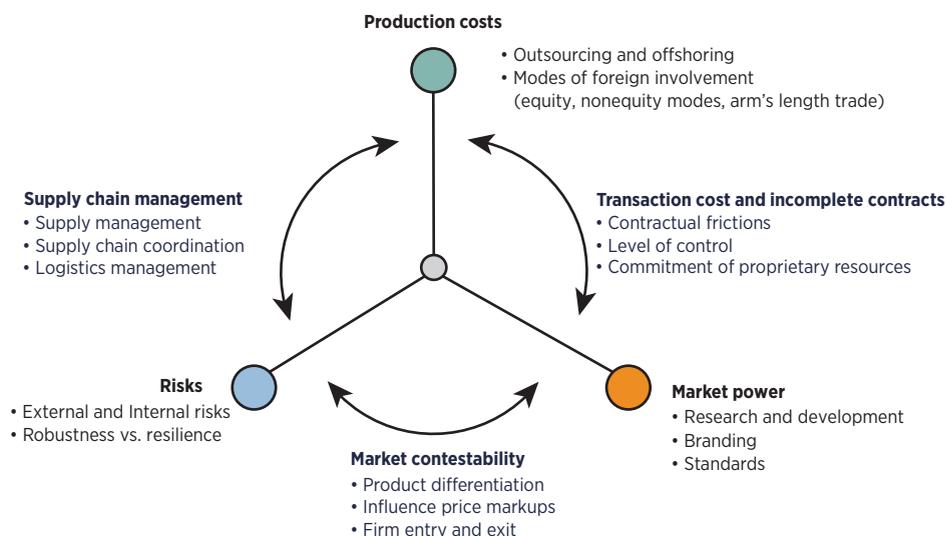
The contribution of MNCs increases with tradability in the service sector. Among labor-intensive services, transportation and wholesale and retail are the most tradable: transportation directly moves goods and people across borders, and retail firms deliver goods to final consumers. MNCs account for about half of global exports in these sectors. For knowledge-intensive services, financial services, information technology, and telecommunications are the top three traded sectors. MNCs contribute about 70 percent of these sectors' global exports. Publishing and broadcasting, professional services, and research activities are also highly tradable, and MNCs' shares in these sectors are greater than 50 percent. Among all the service sectors, education, health and social services, and public administration are the least tradable and are almost entirely dominated by domestic, non-MNC firms.

Multinational corporations' objectives and strategies in global value chains

The business objectives and strategies of MNCs shape the development of GVCs. GVCs encompass a myriad of firm-to-firm relationships and the full range of activities required to bring a product or service from conception to its end use. These activities must be managed and coordinated. MNCs organize their international production networks via investment, trade, people, and information flows. Their production decisions have profound implications for the global economy and for the development of its subunits (Buckley 2009, 2010; Buckley, Driffield, and Kim, forthcoming; Buckley and Strange 2011).

MNCs have three main objectives in organizing their global production: lowering production costs, mitigating risks, and enhancing market power (figure 2.6). These three objectives are rooted in the theory of firms, industrial organizations, and international trade and investment. The "make or buy" decisions of MNCs define the firms' boundaries; their "where and how to make" decisions determine their geographic distribution (in the form of FDI or NEM); and their "where and how to buy" decisions link suppliers from multiple locations into their global production networks with varying coordination intensity. MNCs balance rewards and risks in all these decisions, and they leverage their market power to raise their markups or negotiate better terms of trade with suppliers. These three objectives, and MNCs' business strategies, are inherently interconnected—MNCs often make purchasing, production, and selling decisions simultaneously. This chapter focuses on the purchasing and production decisions and strategies because these decisions are most relevant for GVCs.

FIGURE 2.6 Multinational corporations' three objectives in organizing their global production



Source: World Bank.

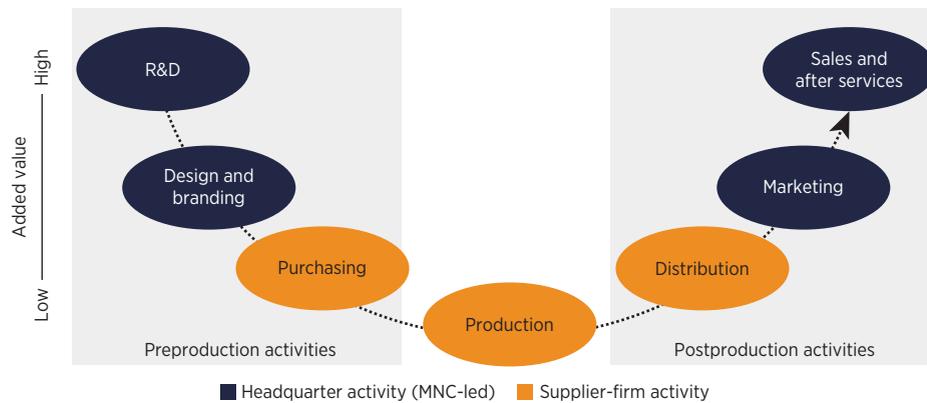
Lowering production costs

MNCs spread their production networks across the globe to benefit from factor cost arbitrage and economies of scale. To lower their production costs, MNCs segment their stages of production and assign each stage to the internal or external units that can perform it most cost-effectively. This process is characterized by the “smile curve” of GVCs, in which the two ends of the value chain, typically conception and marketing, add more value to the product than the middle—manufacturing—part of the chain (figure 2.7). From R&D and product design to marketing and sales, the MNC-led high-value-adding activities mostly concern intangibles, such as technology and branding, which constitute the core proprietary resources that enabled the MNC’s growth and global expansion in the first place. Labor-intensive production is usually offshored to lower-cost locations.

Production segmentation, outsourcing, and offshoring are the most important distinguishing features of contemporary globalization (Arndt and Kierzkowski 2001). Production segmentation is usually the precondition for outsourcing. Both outsourcing and offshoring can increase production length, defined in this report as the number of firms (including cross-border intrafirm trade) a product or service must go through before reaching its final customer (Fally 2012; Wang et al. 2017). Production length captures the degree of specialization and complexity involved in the production process (Antràs et al. 2012; Wang et al. 2017).

Offshoring and outsourcing define not only a firm’s boundary but also its geographic footprint. Offshoring lengthens production through cross-border intrafirm or interfirm trade, whereas outsourcing lengthens production through domestic or international interfirm trade (table 2.1). MNCs can set up their own subsidiaries or

FIGURE 2.7 Smile curve of value-adding activities in global value chains



Source: World Bank.

Note: The base price is the factory price or production cost, in contrast to the retail price, which adds in shipping and insurance costs, tariffs, sales taxes, and various markups. MNC = multinational corporation; R&D = research and development.

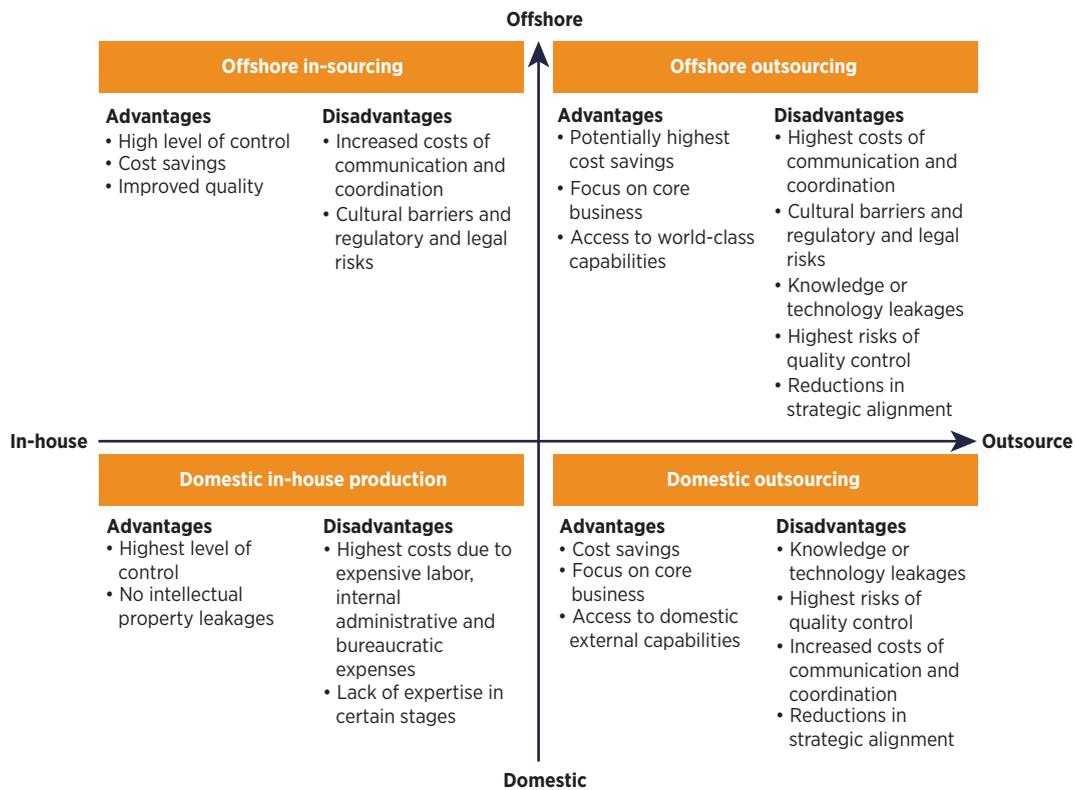
TABLE 2.1 How offshoring and outsourcing affect production length

Production strategy	Offshoring	Outsourcing	Impact on production length
Fully in-house production: Lead firm carries out the whole production process by itself in its home country (internalized production kept in-house)	No	No	No GVC involved, no impact on production length
Offshore in-sourcing: Lead firm sets up its own subsidiary in another country to carry out certain stages of production (internalized production done by foreign affiliates)	Yes	No	Lengthens production through intrafirm trade
Domestic outsourcing: Lead firm hands over some production stages to another firm in the same country (externalized production at home)	No	Yes	Lengthens production through domestic interfirm trade
Offshore outsourcing: Lead firm uses overseas suppliers to supply inputs or carry out certain tasks (externalized production abroad)	Yes	Yes	Lengthens production through international interfirm trade

Source: Adaptation of Radlo 2016 and UNCTAD 2004.

Note: GVC = global value chain.

entities offshore to benefit from cheaper labor costs while ensuring better control over quality and intellectual property. This strategy is called offshore in-sourcing. Firms can also outsource and offshore at the same time, known as offshore outsourcing, if they use foreign suppliers for certain inputs and tasks. Outsourcing and offshoring have resulted in longer GVCs, which offer both advantages and disadvantages for MNCs (figure 2.8).

FIGURE 2.8 Advantages and disadvantages of outsourcing and offshoring

Source: Summary of Inman and Helms 2005 and Radlo 2016.

Economists have developed two main theories to explain firms' boundary decisions (what to outsource and what to keep in house): transaction cost economics (TCE; pioneered by Klein, Crawford, and Alchian [1978] and Williamson [1973, 1975, 1985]) and property rights theory (PRT; pioneered by Grossman and Hart [1986] and Hart and Moore [1990]). TCE assumes that market transactions are plagued by incomplete contracts and locking-in among trading partners. Locking-in usually happens when relationship-specific investment in the trading partner is required. Locking-in leads the value of the partners' relationship to exceed the value of the trading partners' outside alternatives, creating "quasi-rents." Firms decide what to own and what to outsource by comparing the efficiencies of the available transaction modes. TCE thus predicts that MNCs tend to integrate transactions for which there are high levels of quasi-rents and incompleteness in contracts. The PRT theory, in contrast, focuses on distortions in ex ante investments rather than in the ex post haggling costs central to TCE. When one external supplier is acquired by another, the supplier has less incentive to invest in the quality of its products because its profits are shared with the parent firm. The PRT theory predicts that MNCs outsource the production of key inputs

to limit underinvestment in these crucial inputs. Recent empirical studies confirm that TCE and PRT forces jointly shape MNCs' outsourcing patterns (Alfaro et al. 2019; Berlingieri, Pisch, and Steinwender 2018).

Theories and empirical studies also abound regarding firms' offshoring behavior and choice of locations (Alfaro and Charlton 2009; Blonigen 2005; Du, Lu, and Tao 2008; Head, Ries, and Swenson 1995; Helpman 1984; Makino, Lau, and Yeh 2002; Osnago, Rocha, and Ruta 2017). Helpman (1984) developed a general equilibrium model of international trade in which MNCs choose where to locate their product lines to minimize costs. Several economists then developed the "new trade theory of the MNC" on the basis of assumptions of increasing returns to scale and firm profit maximization modeling (Helpman 1985; Helpman and Krugman 1985; Markusen 1984, 1995, 1998). MNCs have developed multitiered, complex offshore outsourcing and in-sourcing strategies that are based on the integration and coordination of materials, processes, tasks, designs, technologies, and suppliers (Monczka and Trent 1991).

There is a tension between cost differences that create incentives to offshore production and colocation or agglomeration forces that bind stages of production together. Reductions in international friction facilitate the relocation of production to align with comparative costs, but this relocation is not necessarily continuous or monotonic (Baldwin and Venables 2010). Geographic proximity to major markets, availability of cheap labor, local industrial agglomeration, supportive business environments, good infrastructure, and open trade and investment policies are the common determinants—along with many other factors, such as international trade and investment agreements and cultural factors—for both offshore outsourcing (trade) and vertical FDI.

Core questions in MNCs' outsourcing and offshoring decisions are how much proprietary resources the MNCs wish to commit to their relationships, what level of control they demand, what type and degree of costs and risks they are willing to bear, and what return on investment they require (McDonald, Burton, and Dowling 2002). MNCs use firm-specific ownership advantages (in R&D, management, or marketing and distribution) as inputs that can serve product lines in multiple locations (Helpman 1984). They manage GVCs through both internalization (ownership) and externalization (NEMs, arm's length trade). FDI thus occurs when a firm can increase its value by internalizing markets for its intangible assets.³ Ownership also offers the benefits of a higher level of control of assets, employees, products, and prices. However, MNCs do not expand their business activities indefinitely because the internal administrative costs of ownership will eventually outweigh its benefits.

MNCs use different transaction modes to balance cost, risk, and control in their interfirm relationships when outsourcing or offshoring business activities. MNCs organize their production networks using three main modes: equity investment (FDI), NEMs, and arm's length trade. Equity investment includes mainly wholly owned subsidiaries and joint ventures. NEMs include, among others, licensing, franchising, and management contracts. Arm's length trade refers to imports, exports, and subcontracting with unrelated parties. Equity investment generally requires higher costs, entails more risks, and promises greater returns than NEMs and arm's length trade. Equity investment also allows a higher degree of control over assets, employees, and operations and is less likely to leak proprietary knowledge. NEMs

offer a mode in between equity investment and arm's length trade. They generally have lower entry costs than equity investment and allow firms to quickly expand into new markets without much risk or large capital investments. NEMs also give firms greater flexibility in adapting to change. Arm's length trade has the lowest setup costs and lowest risks, but MNCs pursuing this approach have little control over their import suppliers and limited access to foreign markets through exports for certain goods and services. Arm's length trade and NEMs can either pave the way for future FDI or serve as substitutes for FDI, depending on the specific motivations of the MNCs in question. There is high heterogeneity in firms' configurations of investment and trade and the range of nonequity, contract-based partnerships in GVCs across sectors and markets (Andrenelli et al. 2019).

Which mode of foreign involvement an MNC chooses often hinges on the host country's context, especially its trade, investment, and competition policies. Many countries still impose caps on foreign equity shares and limit FDI in certain industries. Tariff jumping is another key motivation for MNCs to set up production facilities abroad to serve local customers: MNCs can avoid tariffs imposed by the host country by establishing local production capacity. Foreign acquisitions can alter the domestic and global competitive landscapes for the host country; host countries tend to use competition policy to regulate foreign takeovers to ensure market contestability. MNCs constantly adapt their transaction modes to reflect their host countries' regulations and business environments.

FDI, NEMs, and arm's length trade have different implications for development, depending on the specific sector involved and the stage of production in a GVC where they take place. All three modes have made significant contributions to employment worldwide. NEMs can drive export growth, transfer intellectual property, improve labor skills, and foster local entrepreneurship. They encourage domestic enterprise development and investment in productive assets. Eventually, NEM activities can enhance the productive capabilities of developing countries and deepen those countries' integration into GVCs. FDI generates productivity spillovers in host countries through the demonstration and linkage effects (Alfaro et al. 2004; Barba Navaretti and Venables 2004; Du, Harrison, and Jefferson 2011; Farole and Winkler 2014; Javorcik, Lo Turco, and Maggioni 2017; Javorcik and Spatareanu 2009; Lipsey 2004). FDI can also improve resource allocation by pushing out the host countries' least productive firms (Alfaro and Chen 2018), but doing so requires an ecosystem of good institutions, a deep talent pool, quality infrastructure, and other complementary factors to attract FDI in the first place and to spread its benefits throughout the host country's wider economy.

Once MNCs have set up their global production networks, supply chain management becomes pivotal to increasing their efficiency and reducing waste. As different parts of the world have become more connected and MNCs' supply chains have grown longer, the need for better supply chain management has intensified. MNCs leverage their worldwide purchasing power, production capacity, and distribution channels to reduce material inventories, eliminate waste, and improve efficiency.

Supplier selection, supply chain coordination, and logistics management are key elements in MNCs' supply chain management (Tomas and Hult 2003). Once an MNC determines its needs, it identifies a pool of suppliers capable of fulfilling them. It then

evaluates each potential supplier on the basis of a set of criteria and finally contracts with the suppliers it selects. MNCs often have hundreds or even thousands of suppliers. Coordination is therefore crucial to improving supply chain performance by aligning the plans and objectives of MNCs and their suppliers. Supply chain coordination usually focuses on inventory management and ordering decisions in distributed intercompany settings (Kumar 1992). Logistics management is also central to inventory management and ordering decisions because access to efficient and reliable transportation, warehousing, and distribution can be a core advantage for MNCs over their competition. This global supply chain management affects all functions of an organization. Successful global supply chain management requires focused efforts across the entire company and collaboration with all outside suppliers and service providers.

Ultimately, MNCs' choices as to which markets to serve, where to operate plants, what products to export, and which countries to source inputs from are interdependent (Bernard et al. 2018). These decisions affect variable production costs and prices and influence exports of products to markets and imports of inputs from source countries. Incurring the fixed costs of sourcing inputs from one country can give a firm access to lower-cost suppliers, reducing its production costs and prices while increasing its profits. This effect in turn allows the firm to increase its scale of operation, making it more likely that the firm will find it profitable to incur the fixed costs of outsourcing (Antràs, Fort, and Tintelnot 2017; Tintelnot 2017). Exporting and importing decisions are also interdependent. More productive firms lower their production costs by sourcing inputs from more countries. They also expand their scale of operation by both exporting more products to each market and exporting to more markets overall.

Mitigating risks

In their unrelenting quest for efficiency, MNCs also try to minimize and mitigate value chain risks. Such risks stem from multiple sources, both external (such as macroeconomic, social, health, environmental, political, and regulatory risks) and internal (such as operational, process, financial, personnel, management, planning, and control risks) (Calatayud and Ketterer 2016). The trade-off between production efficiency and value chain robustness has been a perennial challenge for MNCs.

Supply chain risks are affected not only by production length but also by several other factors. MNCs tend to face growing risks as their global supply chains lengthen, their tiers of suppliers multiply, and their overall complexity increases. However, the relationship between supply chain risks and production length is complicated. For example, geographically dispersed production networks may be more prone to disruption, but they also diversify locational risks. Idiosyncratic shocks to any individual firm could propagate through the entire network and lead to aggregate fluctuations; how risk affects upstream and downstream firms depends on the network's structure and input specificity, among other factors. (Acemoglu et al. 2012; Barrot and Sauvagnat 2016).

Supplier diversification is a key strategy for mitigating supply chain risks. For each specific need, a firm chooses between single sourcing and multiple sourcing on the basis of input specificity, supplier capability, and a range of other factors. MNCs often source the same inputs from multiple locations and multiple suppliers. This multiple

sourcing often promotes innovation and competition among suppliers, giving MNCs access to better prices and higher quality. Multiple sourcing also helps MNCs maintain their supply chains' agility and thus reduces their risks.

However, supplier diversification could result in high costs because identifying potential suppliers and building stable relationships requires significant investment and effort. Diversification is also not always an option: capable suppliers that can deliver products or services with the required quality, timeliness, and volume can be rare in highly specialized segments. Complex products often require special machinery and customized components, requiring relationship-specific investments in suppliers and stable, long-term contracts. Additionally, although single sourcing may seem more risky than multiple sourcing, it requires much less work to initiate and maintain, particularly when it comes to qualifying suppliers. Single sourcing also maximizes an MNC's volume leverage over its chosen supplier's prices and allows it to maintain a stronger relationship with the supplier, which can result in better terms and more stability in the long term (table 2.2).

Increasing supply chain visibility is another frequently cited strategy for MNCs to map and manage risks. MNCs with very complex global supply chains have realized the importance of end-to-end visibility as they face more frequent supply chain disruptions. They work to increase transparency throughout their multitier supply chains, constructing databases with information on the location, performance, audit results, and risk factors of both direct and indirect suppliers. MNCs also work closely with key suppliers to monitor the most relevant risks, define possible scenarios and assess their impacts, and develop response strategies.

As with supplier diversification, gaining end-to-end supply chain visibility is easier said than done. The weak links in a supply chain often purposefully conceal their weaknesses; uncovering them can be quite challenging. Studies show that business risks increase with the tier of a supplier: second-tier suppliers often have many

TABLE 2.2 Pros and cons of single- versus multiple-sourcing strategies

Sourcing strategy	Pros	Cons
Single sourcing	<ul style="list-style-type: none"> • Less work to qualify the source and less administrative effort involved, which can be a significant advantage when dealing with highly technical materials • Maximizes leverage based on total quantity; firms more likely to negotiate a volume-based price • Stronger relationships that may offer better terms in the long term 	<ul style="list-style-type: none"> • Potential loss of market-competitive pricing • Difficult to find alternative suppliers during supply shortages • High risk of product unavailability, with possible catastrophic loss of customer goodwill, should the supplier's operations be interrupted
Multiple sourcing	<ul style="list-style-type: none"> • Diversified suppliers act as safety net to ensure products' availability • Could promote innovation and competition among suppliers, leaving the MNC more likely to get better prices and quality • Supply chain agility maintained by developing a database of qualified suppliers, enabling opportunities in a variety of scenarios 	<ul style="list-style-type: none"> • More costly to build and maintain relationships with multiple suppliers; high administrative costs • Loss of the volume leverage that can help MNCs obtain attractive pricing

Source: Blome, Constantin, and Michael Henke 2009. Burke, Carillo and Vakharia 2007.

Note: MNC = multinational corporation.

more risk issues than first-tier suppliers, and so on. The criticality of risk issues also increases further down the supply chain, with third-tier suppliers showing on average more critical issues than second- and first-tier suppliers (DeAngelis 2015). To detect such risks, MNCs need in-depth and proactive supply chain management that can monitor and analyze many more variables than would seem humanly possible. Big data and new technologies are making supply chain visibility much more effective and affordable.

MNCs are increasingly willing to trade efficiency for risk mitigation as they grapple with increasing geopolitical tensions, environmental concerns, natural disasters, and volatile demand. Increasing uncertainty calls for more rigorous risk management. MNCs thus need to invest more time and resources into building risk management capability, assembling dedicated teams for risk management, and embedding risk management processes into their operations and decision-making processes.

Enhancing market power

MNCs are generally the largest and most productive firms in their respective markets. They often use their market power to charge higher markups and improve their terms of trade with suppliers and customers. The textbook definition of market power is a firm's ability to influence the price at which it sells its products (Syverson 2019). Using this definition, the magnitude of a firm's market power is tied to the size of the gap between price and marginal cost at its profit-maximizing level of output.

Decades of microeconomic study have built a sound knowledge base for market power analysis. The structure-conduct-performance paradigm describes how market structure affects economic performance through firm conduct (Boner and Krueger 1991). Market structure, as captured mainly by the number of sellers and buyers in a market, their relative negotiation strength as measured by their ability to set prices, the degree of concentration among sellers and buyers, the degree of differentiation and uniqueness of products, and barriers to entry and exit, is the primary determinant of both firm conduct and firm performance. At one extreme—perfect competition (a market with very many sellers and buyers and no barriers to entry or exit, among other conditions)—no seller or buyer has the power to influence, on his or her own, the price (or terms) at which a product is sold or purchased. At the other extreme—a monopoly or monopsony—the seller or buyer has the power to set the price (or terms) most advantageous for him or her. The great majority of markets fall between these two scenarios and involve imperfect competition.

Markups are difficult to measure directly because doing so requires information on not just prices but also hard-to-observe marginal costs (Syverson 2019). As a result, many alternative metrics have been used in economic research, such as the number of competitors (actual or potential), profit rates, the costs of market entry, market shares, and market concentration (Aghion et al. 2005; Autor et al. 2020; Collins and Preston 1969; De Loecker, Eeckhout, and Mongey 2018; De Loecker, Eeckhout, and Unger 2020; De Loecker and Warzynski 2012). The two most common concentration measures are the Herfindahl-Hirschman index, which is the sum of firms' squared market shares, and C_n , which is the combined market share of the largest n firms.

For lack of data measuring market power through price markups, this chapter uses the total sales, market shares, gross margins, and earnings before interest and taxes (EBIT) margins of lead firms to proxy their market power.⁴

MNCs gain market power through firm-specific assets as well as a combination of strategies. Some sectors tend to have natural monopolies because of economies of scale and network effects. MNCs in such sectors benefit hugely from first-mover advantages. In many sectors, MNCs also gain market power through intangibles, such as branding, design, and technology. They tend to invest aggressively in R&D, patenting, and marketing to establish their dominance. Table 2.3 summarizes some common strategies MNCs adopt to maximize their market power. Most MNCs implement multiple strategies, and the importance of each strategy varies from one MNC to another.

The market power MNCs possess allows them to benefit disproportionately from GVCs. Although most existing research on market power focuses on product market power, firms can also have market power in factor markets. MNCs can require a monopsony markdown on the prices they pay their suppliers, employees, and capital service providers. As a result, consumers may have to pay a much higher price than they would in a perfectly competitive market, and suppliers may get only a fraction of the value they add (figure 2.9). For example, in the coffee value chain, large roasters and retailers like Nestle and Starbucks are estimated to capture 85 percent of the retail

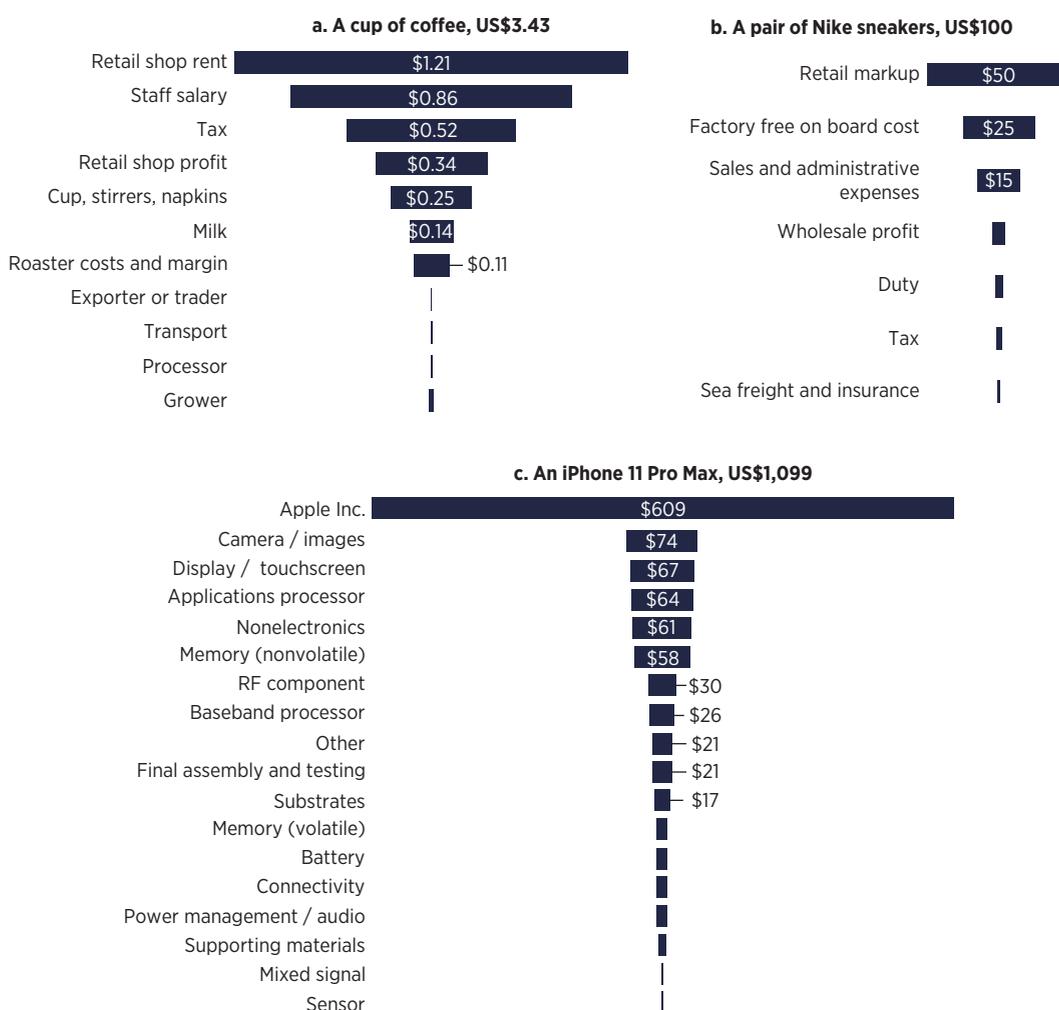
TABLE 2.3 Multinational corporations' strategies to increase market power

Strategy	Description
Branding	Construct an entry barrier by establishing a brand. This strategy tilts the bargaining power in production to the firm that holds the brand. Branding promotes recognition among customers, helps set a firm apart from its competitors, and lets customers know what to expect from the brand.
Undertaking R&D and innovation	Invest aggressively in R&D and patenting to ensure a firm's technological lead, and protect its proprietary assets through patents, trademarks, and other forms of intellectual property protections to reduce the potential for technology leaks.
Setting standards	Set, monitor, and facilitate compliance among actors within the value chain with rules covering a range of parameters (such as the resolution, display type, and picture mode of a television) and standards. Setting and enforcing industry standards gives the lead firm a powerful edge with which to entrench its first-mover advantage and market dominance.
Engaging in mergers and acquisitions	Acquire competitors to increase market share and consolidate resources.
Strengthening customer relationships	Increase switching costs and gain customer loyalty by strengthening customer relationships. This strategy not only helps retain existing customers but also can attract new customers.
Segmenting the market and catering to niche audiences	Identify a market segment that has the greatest need or want for a firm's products or services and tailor the firm's message to that market. This strategy works best when the firm targets a highly specific, clearly defined customer demographic.
Exploiting network effects and building ecosystems	Incur large up-front costs to develop a product or service, race to the market, and entice new users to reach a critical mass. Once the number of users hits a critical mass, network effects induce a virtuous cycle because the product or service becomes more valuable as more people use it. Develop an ecosystem of products or services. This ecosystem further increases switching costs for users, and lead firms can collect multifaceted user data to strengthen their dominant positions.

Source: World Bank summary based on Boston Consulting Group 2020; Clifton 2009; Dalgic 2006; Hill 1997.

Note: R&D = research and development.

FIGURE 2.9 Value chain cost breakdown for selected products



Source: World Bank illustrations based on news reports.
 Note: RF = radio frequency. All dollar amounts are US dollars.

value of a US\$3.43 cup of coffee. Coffee growers get only one cent, or 0.4 percent of the final retail price (Bruce-Lockhart and Terazono 2019). For a pair of Nike sneakers sold at US\$100, the factory free on board cost is only US\$25; Nike is estimated to capture US\$21.50 of the value added, and the retail shop charges another 100 percent markup (Kish 2014). A breakdown of the iPhone 11 Pro Max by Tech Insights (Yang, Wegner, and Cowsky 2019) reveals that the total cost to produce an iPhone that sells for US\$1,099 is US\$490.50. Apple keeps US\$609, or more than 55 percent of the sales price, far greater than the amount received by any other firm in the supply chain. MNCs in service sectors sometimes have even higher profit rates. For example, Microsoft’s gross margin exceeded 63 percent in 2019.⁵ MNCs then reinvest the huge profits they make from GVCs into R&D, marketing, expansion, and innovation to maintain their leading positions.

Bringing it together: Global value chain archetypes and multinational corporations' business strategies

The previous section of this chapter introduces a general framework for MNCs' objectives and business strategies; this section explores how these strategies interact with the characteristics of different GVC archetypes (table 2.4). Note that sectors within a given archetype still have very different characteristics—this table covers only the most common characteristics and MNCs' business strategies.

Structural characteristics of global value chains across six archetypes

This report classifies sectors into six archetypes. This section elaborates on the structural characteristics of each of the six GVC archetypes and how these characteristics influence the business strategies of MNCs. There is still vast heterogeneity across sectors, segments, and tasks within each GVC archetype; this section focuses on the most salient features of each archetype and explains how sectors within an archetype can differ.

Commodities are natural resources, such as agricultural products, energy, or metals, that have a global market. Commodity markets are characterized by nearly homogeneous products and high fungibility. Still, different types of commodity producers have distinct characteristics and can vary vastly in production organization, supply chain management, and market power. For agricultural commodities, MNCs' level of control is very low, their production length is short, and their suppliers are extremely diversified. As the most ancient industry, agriculture has very low barriers to entry and remains the only source of livelihood in many low-income areas. The four major agricultural commodity traders, Archer Daniels Midland, Bunge, Cargill, and Louis Dreyfus, collectively known as the "ABCD" companies, share a significant presence in many agricultural commodities; for example, they control as much as 90 percent of the global grain trade (Murphy, Burch, and Clapp 2012). Their main suppliers are numerous farmers, together with seed, fertilizer, agrochemical, and agricultural machinery companies. They sell agricultural products to all sorts of downstream buyers and final consumers. Despite their high market share, the lead firms have relatively low market power. The gross margin for the ABCD firms averages about 6 percent, and their average EBIT margin was only 2.3 percent in 2018.

In contrast to agricultural commodities, energy and metal GVCs are capital and knowledge intensive but do not create as many jobs. MNCs tend to have higher levels of control in these sectors, and equity investment is the most common mode by which they enter foreign markets. Production length is relatively short, and lead firms enjoy high market power and profitability because of the nonrenewable nature of the commodities and the high barriers to enter the market (for example, high sunk costs). Most commodities have inelastic supply in the short term: tiny changes in demand result in huge price fluctuations (Caldara, Cavallo, and Iacoviello 2016). Inelastic demand and supply often subject both commodity exporters and major commodity importers to magnified shocks.

Labor-intensive services encompass a hodgepodge of activities that have absorbed most unskilled labor in recent years. These industries include retail, wholesale,

TABLE 2.4 Global value chain characteristics and multinational corporations' business strategies

GVC archetype	Sectors	GVC characteristics	Strategies		
			Lower production costs	Mitigate risks	Increase market power
Commodities	Agriculture, fuel, minerals	Nearly homogeneous products and high fungibility, inelastic supply and demand, high price fluctuations	Arm's length trade, contract farming; short value chains	Multiple sourcing, usually extremely diverse suppliers, various strategies to hedge commodity price risk	Economies of scale
Labor-intensive services	Wholesale and retail, transportation and storage, tourism, health and social services, personal services, leasing, other services	Labor intensive, low entry barriers, some sectors less tradable	NEMs (for example, management contracts, franchising); short value chains	Multiple sourcing, improving logistics, demand forecasting, data sharing with suppliers for inventory management	Branding
Labor-intensive goods	Textiles, apparel, toys, leather products, footwear	Production requires human dexterity, highly differentiated products with short lifespans, highly tradable	Contract manufacturing; long value chains	Multiple sourcing to diversify risks, trend analysis and prediction, agile supply chain management and small-batch production, supply chain visibility	Branding
Regional processing	Food and beverages, fabricated metal products, rubber and plastics, glass, cement and ceramics, furniture	Perishable, fragile, or bulky products; high transportation and storage costs; relatively low entry barriers; highly differentiated products	Arm's length trade, contract manufacturing, FDI; short to medium value chains	Multiple sourcing to diversify risks	Economies of scale, branding
Knowledge-intensive services	Research and development, IT services, professional services, education	Knowledge intensive, tradability varies across sectors	FDI; short value chains	Limited outsourcing, intellectual property protection	R&D, network effects, setting standards
Knowledge-intensive goods	Automobiles, transportation equipment, computers and electronics, electrical machinery and equipment, chemicals and pharmaceuticals	Highly sophisticated products, high level of specialization, high switching costs, highly tradable	Contract manufacturing and FDI; extremely long and complex value chains	Likely single sourcing for key components, strong ties with suppliers, intense supply chain coordination, supply chain visibility	R&D, branding, setting standards

Source: World Bank.

Note: FDI = foreign direct investment; GVC = global value chain; IT = information technology; NEMs = nonequity modes; R&D = research and development.

transportation, real estate, health and social services, food and accommodations, and personal services. Service value chains are very different from value chains for goods: some services link different stages of goods production, such as transportation, wholesale, and retail; other services are stand-alone, such as health and social services. Franchising and management contracts are most common in fast food, retail, and hotel chains, although equity investment coexists with this model. Both labor-intensive and knowledge-intensive services value chains tend to be short, usually even shorter than commodity value chains. Entry barriers for labor-intensive services are very low. Most small enterprises and microenterprises operate in labor-intensive services. Establishing a brand, acquiring competitors, and catering to niche markets are among the most common strategies lead firms in these industries use to maximize their market power.

Textiles, clothing, footwear, and toys are typical labor-intensive goods that are highly tradable and employ many unskilled manufacturing workers. The garment and footwear sectors have many different segments serving a range of consumers who differ in demographics, location, purchasing power, and fashion taste. MNCs' control remains low to moderate. Big-brand companies work on design and marketing and outsource manufacturing to contractors who often operate multiple factories in Asia and Sub-Saharan Africa. Textiles, apparel, and footwear value chains are long and global; suppliers are well diversified to reduce their risks. For example, Nike, the world's top sportswear company, outsources production to 42 countries, and its 567 independent factories employ more than 1 million workers. The largest single footwear factory accounted for only 5 percent of Nike's total footwear production, and the largest single apparel factory accounted for 7 percent of Nike-brand apparel production. MNCs in these sectors enjoy high market power from their branding and sales channels. Nike's gross margin was 43.8 percent, and its EBIT margin was 12.2 percent in 2018, whereas the average gross margin of its top five direct suppliers was 23 percent and their average EBIT margin was 6.3 percent.

Regional processing sectors feature perishable, fragile, or bulky products that have high transportation and storage costs. Food and beverages, wood and furniture, and metal and mineral products fall into this archetype. Firms in these sectors face intense competition globally and locally; most small and medium-size firms earn only marginal returns. MNCs' mode of involvement in GVCs of this archetype varies by sector and segment, ranging from contract manufacturing to wholly owned subsidiaries. Regional processing sectors have, on average, slightly longer production length than commodities, with diversified suppliers. These sectors' lead firms enjoy economies of scale and highlight product differentiation to persuade buyers that their offerings are better, faster, and safer than those of their competitors. Sales, marketing, and logistics thus play an important role in these sectors. PepsiCo, for example, spent US\$2.6 billion—4 percent of its total revenue—on marketing in 2018, and it pales in comparison with its rival Coca-Cola, which spent US\$5.8 billion on global advertising. Lead firms capture a high share of value added along these value chains. Nestle, PepsiCo, and Coca-Cola, the three lead firms in food and beverages, earned an average gross margin of 58 percent and an EBIT margin of almost 20 percent in 2018.

Knowledge-intensive services include professional services, education, scientific research, and ICT. Some knowledge-intensive services, such as ICT and R&D, are highly tradable and generate huge spillovers for the entire economy. The network

effect is a prominent feature of digital services, and it has created superstar firms in the ICT sector. Technology has advanced rapidly in the ICT sector, and major players generally spend as much as 10–20 percent of their revenue on R&D. Talent, data, and algorithms are the most valuable assets in this industry, and firms need a whole ecosystem of digital hardware and software to operate. These firms tend to set up wholly owned subsidiaries to expand into foreign markets without risking data or technology leaks. Concerns have grown around concentration in the digital market: a handful of “gatekeepers” have come to control key arteries of online commerce, content, and communications. Google, for example, both dominates the search engine market with a market share of 90 percent (Desjardins 2018) and offers a wide array of digital services, such as email, maps, translation, and cloud services, that permeate every nook and corner of modern life. Another leading firm, Microsoft, dominates the personal computer operating system market and leads the market for software products.

Knowledge-intensive goods include chemicals, pharmaceuticals, electrical machinery and equipment, and transportation equipment. These products are highly complex and require hyperspecialization in hundreds of different inputs. Their production is truly global because no country or firm can efficiently produce every part by itself. Many parts and components have special configurations, and capable suppliers of key components are often scarce, resulting in extremely high switching costs. In consumer electronics, MNCs generally use contract manufacturing to assemble the final product, whereas equity investment is more common in automobiles and sophisticated machinery and equipment. The leading firms still capture a dominant share of profits in this GVC archetype, although specialization allows key suppliers to negotiate and achieve high profit margins. Knowledge-intensive goods require close interaction among large groups of trained professionals with a wide spectrum of knowledge.

Production length

Outsourcing and offshoring are most common in manufacturing GVCs, although ICTs have enabled a remarkable increase in services offshoring. MNCs headquartered in advanced economies now use lower-cost countries for product manufacturing, technical support, customer service, claims processing, and data entry activities. Recent empirical studies reveal that MNCs in manufacturing GVCs tend to outsource the inputs that are less technologically important (Berlingieri, Pisch, and Steinwender 2018). Whether a multinational firm outsources the production of a given input also depends on the elasticity of demand it faces, the relative contractibility of stages along its value chain, and its own productivity (Alfaro et al. 2019; Del Prete and Rungi 2017; Luck 2019). MNCs in services GVCs initially used offshore outsourcing mainly for basic services. More recently, direct offshore subsidiaries have been increasingly used to organize complex services (Nieto and Rodriguez 2011).

The level of control held by MNCs tends to be higher in industries that feature high entry barriers, large economies of scale, and differentiated, technology-intensive products. In commodity and regional processing industries, MNCs usually purchase raw materials through arm’s length trade, such as direct or indirect exports or contract farming (as does the Cargill company in the food GVC). In labor-intensive goods, MNCs use contract manufacturing to outsource the production stage (for example, Nike uses contract manufacturing for its sportswear and shoes). In labor-intensive

services, MNCs often use franchising or management contracts to expand their global footprint (for example, Shangri-La's hotel chains). In knowledge-intensive goods, MNCs either outsource manufacturing to third parties (for example, Apple) or set up joint ventures or wholly owned subsidiaries to manufacture the final product (for example, Toyota or General Motors). And, in knowledge-intensive services, MNCs tend to set up wholly owned subsidiaries to access foreign markets without leaking their intellectual property (for example, Google or Microsoft). To compare the degree of outsourcing and offshoring in various GVCs, this chapter estimates production length at the sectoral level using global input-output tables. All economic activities are linked together, making it almost impossible to calculate production length accurately. However, researchers have come up with various methods for estimating the length of forward and backward linkages by industry. This report adopts the method proposed by Wang et al. (2017) and defines industry-level production length as the number of firms involved in backward linkages. Using the World Input-Output Database, production length was calculated for 55 industries in 2014. Manufacturing of electrical equipment, base metals, motor vehicles, and electronics had the longest production length, whereas real estate activities, household activities, education, and financial services had the shortest production length. This result is largely consistent with the literature (De Backer and Miroudot 2013; Fally 2012; Wang et al. 2017) and a separate estimation using the OECD TIVA (Trade in Value Added) database. Compared with previous estimates that were based on data from 2008, these results suggest that manufacturing of electrical equipment, chemicals, and chemical products has become more fragmented over time.

Goods GVCs tend to have greater production length than services GVCs, and, overall, production length is positively correlated with product complexity (table 2.5).⁶ Product complexity measures the diversity and sophistication of the knowledge needed to produce a product. Producing complex products could lead to economic upgrading and sustainable growth (Hausmann et al. 2014; Hidalgo and Hausmann 2009). Knowledge-intensive goods GVCs generally have the longest production

TABLE 2.5 Production length, by global value chain archetype

Broad sector	Archetype	Production length	Average product complexity index
Goods GVCs	Knowledge-intensive goods	3.0	0.63
	Regional processing	2.9	-0.06
	Labor-intensive goods	2.8	-0.53
	Commodities	2.2	-1.06
Services GVCs	Labor-intensive services	2.1	-0.62
	Knowledge-intensive services	1.9	0.31

Source: World Bank calculation based on 2014 data from the World Input-Output Database (<http://www.wiod.org/home>).

Note: Archetypes are in descending order of average production length. The production length of final goods is based on backward linkages. The numbers provided are index scores; higher values mean longer production length. The product complexity index is from the Atlas of Economic Complexity (<https://atlas.cid.harvard.edu/>) and is based on 2017 data. GVCs = global value chains.

length because they involve many intricate parts produced by specialized suppliers. Services GVCs typically have shorter production length because of their limited potential for geographic fragmentation and the cultural, legal, and regulatory barriers they face to offshore activities. Knowledge-intensive services are an exception to the production length–product complexity trend: although their production length is the shortest among all six GVC archetypes, their product complexity is second only to knowledge-intensive goods. Most professional services, such as law, accounting, translation, and consulting, require highly skilled labor and do not generate many backward linkages.

Evidence from firm transactional data largely confirms the macro-level production lengths calculated from input-output tables. Using value added tax data, customs transaction data, and firm registration data from Rwanda in 2017, this analysis found that production length is longer in goods GVCs than in services GVCs and that production length increases from commodities to knowledge-intensive goods. Similar results were also found using value added tax data from West Bengal, India (see chapter 11 of this report).

Outsourcing and offshoring decisions in turn affect the long-term development of MNCs. These firms stand to gain substantially from global sourcing because it will let them purchase inputs from wherever the price is lowest. Global sourcing also allows lead firms to focus their valuable time on the most rewarding tasks. But too much outsourcing and offshoring could put a firm's future at risk even though it makes sense from a short-term financial point of view (box 2.2).

The past decade has seen both increases and decreases in production length across archetypes. On one hand, there has been a trend toward outsourcing activities that can be performed more cost-effectively by specialized actors. This trend has been particularly evident in labor-intensive services such as logistics (especially transportation and distribution) and customer support, which can be provided at lower operational costs, at higher levels of efficiency (particularly in logistics), and with greater flexibility (such as by handling customer support through call centers) by specialists. On the other hand, progress has been made toward the vertical integration of key activities, often in knowledge-intensive goods and services archetypes, such as R&D, to add value and improve firms' competitive edge by establishing specialized departments to encourage process innovation and reduce technology leaks.

Disruptive technologies and new business models have had a noteworthy impact on production length. New technologies such as the Internet of Things (IoT), big data analytics, 3D (three-dimensional) printing, autonomous robotics, smart sensors, and artificial intelligence simplify production processes and weaken the advantage of low labor costs, thereby not only shortening production chains but also enabling nearshoring or reshoring (Dachs, Kinkel, and Jäger 2017). Furthermore, the rise of platform firms and the sharing economy allows producers and service providers to match directly to final users, making production length even shorter. However, new technologies also reduce transaction and communication costs and make production unbundling and offshoring more appealing (Ferrantino and Koten 2019). In particular, the IoT, big data, and cloud computing greatly reduce the costs of tracking and monitoring production across different locations and increase the efficiency of complex coordination and collaboration.

BOX 2.2 Boeing: Aerospace giant hobbled by ill-planned outsourcing

Boeing is among the largest global aerospace manufacturers, as is its European rival Airbus. It is the fourth-largest employer in the US manufacturing sector and employs 153,000 people worldwide (Peterson 2011). It maintained a leading role in commercial airplane production for more than 80 years, led by an expert group of engineers and builders who always worked in proximity to each other. Its executives held patents, designed wings, and spoke the language of engineering and safety as a mother tongue (Useem 2019).

This culture began to change after Boeing bought its rival McDonnell Douglas in 1997. The McDonnell executives ended up in charge of the combined entity, and a stock price-focused culture ascended. Boeing started outsourcing and offshoring on a large scale as a way of lowering costs and accelerating development (Denning 2013). It relied on a complex web of suppliers worldwide to manufacture its planes. In-house labor was replaced with outside partners who did not possess the required skill sets. And, through all these changes, employees' voices went unheard (Denning 2013).

After losing market share to Airbus in the early 2000s, Boeing decided to design a new aircraft that would not only lower costs for airlines but also improve the flight experience for passengers. The 787 Dreamliner program was launched in 2004, targeting a 2008 introduction. Unlike in earlier programs, when Boeing kept design, engineering, and manufacturing in-house as much as possible and subcontracted components only on a strict build-to-print basis, more than 90 percent of the parts for the 787 Dreamliner were outsourced. Furthermore, the contracts for these parts were based on perverse incentives to work at the speed of the slowest supplier. They imposed penalties for delays but no rewards for timely delivery, contributing to a slow and uncoordinated supply chain.

The project's new technology coupled with this new supply chain exceeded Boeing's ability to manage and coordinate effectively. Additional costs also arose because of cultural and language differences and physical distances between suppliers in the supply chain. These factors impeded much-needed communication.

Boeing's tiered outsourcing approach aggravated the project's risks. Boeing established partnerships with about 50 tier-one strategic suppliers, who served as integrators that assembled different parts and subsystems produced by tier-two and tier-three suppliers. However, some tier-one suppliers lacked the ability to develop various sections of the aircraft, and some lacked the experience to manage their tier-two suppliers.

This strategy of delegating engineering and procurement to subcontractors had tremendous consequences. Boeing ended up outsourcing major technological innovations (including new electrical systems, power systems, and distribution panels) that were unproven in any airplane and were introduced simultaneously. This outsourcing increased delays and costs in coordinating the application of the new technologies. The 787 Dreamliner project finally finished in September 2011, three years later than originally planned and with much higher costs.

A corporate culture centered on cost cutting coupled with technical miscalculations and management misjudgments eventually culminated in two fatal crashes that killed 346 people in 2018 and 2019. Boeing continued to outsource work to low-paid contractors and subcontractors for

Continued on next page >

BOX 2.2 Boeing: Aerospace giant hobbled by ill-planned outsourcing (continued)

its other plane models. It laid off experienced engineers and pressed suppliers to cut costs for the software for the 737 Max. Experienced Boeing engineers confirmed that the 737 Max crashes were caused by the outsourcing of some software-development tasks to recent college graduates earning as little as US\$9 per hour who were employed by an Indian subcontractor (Robinson 2019). The Boeing employees were also driven by pressure to get the new planes to customers quickly and without requiring their pilots to undergo extensive retraining (Duncan, Laris, and Aratini 2020).

Taken together, overreliance on outsourcing and offshoring without sufficient up-front effort to define products and assess costs and risks eventually hurt Boeing's prospects and cost hundreds of lives.

Supply chain management and risk mitigation

Different products and services demand distinct supply chain management practices and risk mitigation measures. In the manufacturing sectors, supply chain management involves literally moving objects from one place to another. Transportation and warehousing costs are based on the size, weight, perishability, and fragility of goods. Risks arise at every step: conceiving of the product, securing raw materials, having parts and components manufactured and delivered on time from multitiered suppliers, assembling the product, and storing and shipping it. In service sectors, however, the flow of information matters more. Production is often inseparable from consumption, and hence risks are more likely to stem from the demand side or from internal administration.

Supplier diversification is especially common in commodities, regional processing, and labor-intensive goods and services. Coca-Cola, Gap, Nike, and PepsiCo all adopt this strategy so that no single supplier contributes a significant share of their inputs or sales. Single sourcing is more common in knowledge-intensive sectors, where capable suppliers for crucial inputs are often rare and the costs to identify and evaluate potential suppliers can outweigh the benefits of diversification. Apple (box 2.3) is one such case.

GVCs for knowledge-intensive goods require the most intense supply chain coordination among lead firms and suppliers. These products vary vastly in the type and number of raw materials, parts, and components required. A mobile phone may have hundreds of parts; a single car has about 30,000 parts; and an airplane can have millions of parts. The more parts a product has, the longer its supply chain becomes, and the more supply chain coordination matters in its production. MNCs in knowledge-intensive goods GVCs have gone to great lengths to map their production networks, improve efficiency, and minimize risks (box 2.4).

BOX 2.3 Input specificity limits Apple's choice of suppliers for key components

Apple is one of the most valuable companies to date, with a market capitalization of more than US\$1 billion. It purchases key components and outsources assembly from more than 200 direct suppliers worldwide. A highly profitable company, Apple's gross margin was more than 40 percent in 2019. Owing to its agile supply chain management strategy, Apple churns out hundreds of millions of units without owning any factories.

Apple has long adopted a supply chain strategy of using multiple suppliers for the same components whenever possible. Multiple sourcing helps Apple mitigate supply chain disruptions and maintain its high gross margin. Apple constantly adjusts its ordering ratios with existing suppliers to minimize the risk of third-party issues associated with volume dependency. Apple also has exclusive long-term agreements with its key suppliers and uses prepayments to negotiate favorable pricing terms, secure strategic raw materials, and guarantee high volumes of production.

However, because Apple's key components are highly sophisticated products and are often custom made, it has to single source some components. According to the firm's annual report, several components of Apple's products are currently obtained from single or limited sources. In addition, Apple competes for various components with other players in the mobile communication, media device, and personal computer markets. Many components are subject to industrywide shortages and significant price fluctuations that can materially affect Apple's financial condition and operating results. Apple also uses some custom components that are not commonly used by its competitors, and its new products often use other custom components available from only one source. This hyperspecialized electronics value chain allows both key suppliers and the lead firm to earn high returns (table B2.3.1).

TABLE B2.3.1 Apple and key suppliers' financial performance

Firm	Components supplied for Apple, Inc.	Sales (US\$, billion)	Gross profits (US\$, billion)	Gross margin (%)	EBIT margin (%)	R&D and sales (%)
Apple Inc.		260.0	111.0	42.6	24.6	6.2
Samsung Electronics Co., Ltd.	DRAM, flash memory, application processors, OLED screens	199.0	72.0	36.1	12.1	8.6
Micron Technology	DRAM, other memory modules	23.4	16.1	68.9	31.4	10.4
Qualcomm	Baseband processors, power management modules, GSM/CDMA receivers and transceivers	19.6	12.4	63.2	16.6	27.6

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BOX 2.3 Input specificity limits Apple's choice of suppliers for key components (continued)

TABLE B2.3.1 Apple and key suppliers' financial performance (continued)

Firm	Components supplied for Apple, Inc.	Sales (US\$, billion)	Gross profits (US\$, billion)	Gross margin (%)	EBIT margin (%)	R&D and sales (%)
Analog Devices	Capacitive touchscreen controllers	6.0	4.4	73.4	30.2	18.9
Texas Instruments	Touchscreen controllers	14.4	9.9	69.0	39.7	10.7
Broadcom	Chips	22.6	16.5	72.9	18.8	20.8
Skyworks Solutions	Chips	3.4	2.0	57.8	28.4	12.6
Intel	Chips	72.0	53.0	73.3	31.2	18.6
Infineon	Chips	9.0	3.0	37.7	14.1	11.8

Source: Orbis database.

Note: CDMA = code-division multiple access; DRAM = dynamic random-access memory; EBIT = earnings before interest and taxes; GSM = global system for mobile communications; OLED = organic light-emitting diode; R&D = research and development.

BOX 2.4 Toyota's global supply chain management

Toyota Motor Corporation is a model of successful supply chain management. As the world's second-largest car manufacturer, Toyota has a diverse supply chain distributed around the world. Toyota outsources about 70 percent of its vehicles to a trusted group of partner firms, which has enabled Toyota to develop new cars faster than other market players (Liker and Choi 2004). The firm's Japanese plant buys about 150,000 types of inputs from 200 direct suppliers in Japan and dozens of direct suppliers in other countries. Every vehicle the plant makes requires assembling thousands of parts seamlessly. Toyota's widely lauded supply chain practices adapt to the latest trends and have gone through different phases. Toyota's three most renowned strategies are building reliable relationships with suppliers, manufacturing components just in time, and increasing the visibility of its supply chain.

Maintaining strong ties with key suppliers has been a top priority for Toyota since its founding. Managing a large global supply network requires close collaboration with suppliers at every link of the chain. Toyota has in-house and outside departments that assist suppliers in implementing product and process improvements and in aligning business objectives and supply chain functions. To ensure quality, Toyota maintains tight control of the overall design and engineering of its vehicles and sources only from suppliers that have proven their ability to deliver with the required timeliness, quality, low costs, and continuous innovation. Toyota hands out awards yearly to suppliers that exceed their targets to encourage good performance and innovation.

Toyota is perhaps best known for its just-in-time (JIT) manufacturing system, also known as the Toyota Production System. Toyota has used JIT manufacturing since 1938, but it only realized the true potential of this strategy when the company integrated JIT with the Toyota Production System in the

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BOX 2.4 Toyota's global supply chain management (continued)

1970s (Ohno 1988). After World War II, Japanese automakers faced a sharp decline in demand and high costs of production. Japan's lack of space to build big factories and the country's shortage of natural resources further prompted its firms to improve the efficiency of their production processes. Against this backdrop, Toyota adopted JIT manufacturing and produced its vehicles according to the orders it received through its dealers. In JIT manufacturing, the company uses its supply chain in such a manner that parts are received only as they are needed to manufacture ordered vehicles. Thus, the manufacturing and transportation of parts take place simultaneously, which allows Toyota to minimize its inventory of vehicle parts. JIT manufacturing also emphasizes the importance of efficiency. According to Toyota's website, the "use of JIT within the Toyota Production System means that individual cars can be built to order and that every component has to fit perfectly [the] first time because there are no alternatives available." The Toyota Production System has been crucial to Toyota's enduring success and has become very popular globally. Several multinational corporations in global value chains for knowledge-intensive goods have embraced this strategy, including General Electric, Hewlett-Packard, and Motorola (Plenert 2007).

However, the devastating earthquake that struck northern Japan in March 2011 alerted Toyota that natural disasters can wreak havoc on even perfectly functioning global supply chains. Because many of Toyota's components were single sourced, the earthquake caused a widespread shortage of parts that persisted for several months. As a result, Toyota had to throttle back its production by 30 percent (Marchese and Lam 2014). Stung by the experience, Toyota has made serious efforts to strengthen the resilience of its supply chain. It developed a RESCUE (REinforce Supply Chain Under Emergency) system by establishing a database of supplier information that identifies the vulnerabilities and parts information of more than 650,000 supplier sites. It then worked internally with its engineers, technologists, and business leaders and externally with its suppliers to address the vulnerabilities this database exposed. As a result, Toyota now has a more forward-looking, flexible, and resilient supply chain.

New technologies are dramatically transforming supply chain management and risk mitigation. MNCs across industries are experimenting with a variety of digital and data-enabled tools to improve how they plan, source, make, and deliver. These innovations are making supply chains smarter by increasing their predictability, transparency, and speed of delivery. In particular, the IoT, big data analytics, and artificial intelligence (AI) have automated a broad range of activities that were traditionally performed by skilled workers and have unearthed patterns that have helped firms achieve greater efficiency, minimize waste, and increase growth. They allow firms to view their entire supply networks so that they can effectively monitor and respond in real time to any problems. They can also speed up the flow of goods by tracking shipments and routing delivery trucks on the basis of current road conditions. More important, big data and AI can anticipate and prevent supply chain disruptions more efficiently than older methods. For example, Morrisons, a British grocery chain, reduced its incidence of out-of-stock items by 30 percent and cut its inventory needs by several days by replacing manual stock planning with an AI system for demand forecasting and replenishment. Orsay, a German fashion retailer, used a self-teaching algorithm to make 112,000 autonomous pricing decisions. And Intel, a leading manufacturer of computer chips, estimates that it has saved US\$58 million with better forecast modeling through AI (*Economist* 2019).

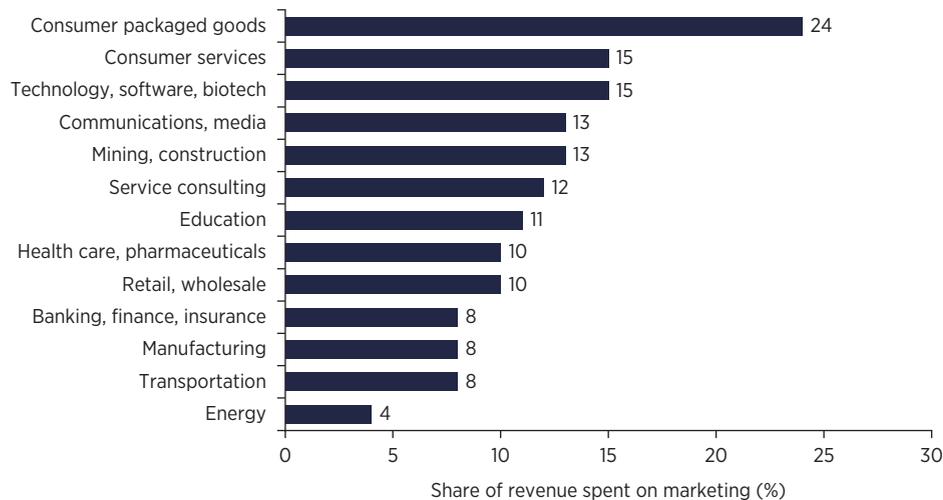
Market power

MNCs' strategies to increase their market power hinge primarily on the nature of their products and the characteristics of their customers. Although branding, R&D, standards setting, and mergers and acquisitions are common across sectors, these techniques are used with different intensity across different sectors. The characteristics of GVCs affect which strategies MNCs' pursue to increase their market power.

Branding is a key strategy in industries with standardized production technology and highly differentiated products and services. Such industries include food and beverages, furniture, apparel, footwear, airlines, consumer electronics, and automobiles. According to the accounting firm Deloitte's summary of listed companies, consumer packaged goods firms spend on average almost a quarter of their revenue on marketing, twice the all-industry average share (figure 2.10). Technology, software, and consumer services firms spend the second-highest share of revenue on marketing (15 percent). Branding not only makes a memorable impression on consumers but also builds an expectation of standard, high-quality products, which is crucial to retaining customer loyalty and creating barriers to entry for competitors. Lead firms can increase their market share and charge higher prices by establishing a successful brand, which will allow them to maintain their long-term profitability and gain bargaining power over their suppliers (Porter 1979).

Investing in R&D and in minimizing technology leaks via patenting is key to protecting firms' core competencies in knowledge-intensive goods and knowledge-intensive services sectors. Today's top technology firms all spend billions of dollars each year to spearhead cutting-edge research. In 2019, Amazon spent US\$36 billion on R&D, more than any other firm in the world that publishes R&D spending, and Alphabet and Samsung rounded out the top three with R&D expenses of US\$26 billion and

FIGURE 2.10 Marketing budgets by sector



Source: Deloitte 2017 Chief Marketing Officer survey (<https://deloitte.wsj.com/cmo/2017/01/24/who-has-the-biggest-marketing-budgets/>).

US\$17 billion, respectively. And, with regard to R&D intensity, smaller firms dwarf these technology giants—small firms often spend more than 40 percent of their revenue on R&D (table 2.6). Chen (2018) estimates that intangible capital investment, including R&D, has also been on the rise in developing countries.

Setting industry standards

MNCs sometimes coordinate activities in GVCs by setting and enforcing product and process parameters. Government agencies and international organizations often help set these parameters because they are concerned with quality, labor rights, sanitary conditions, health, or environmental impact. However, MNCs are the drivers of GVCs, and thus they hold great sway during parameter-setting processes. They set

TABLE 2.6 Top 10 research and development spenders, 2019

By R&D amount				
Rank	Company	Country of incorporation (ISO code)	R&D expenses (US\$, billion)	R&D expenses/sales (%)
1	Amazon.com, Inc.	USA	36	12.8
2	Alphabet, Inc.	USA	26	16.1
3	Samsung Electronics Co., Ltd.	KOR	17	8.6
4	Microsoft Corporation	USA	17	13.4
5	Apple Inc.	USA	16	6.2
6	Facebook, Inc.	USA	14	19.2
7	Intel Corporation	USA	13	18.6
8	Johnson & Johnson	USA	11	13.8
9	Merck & Co., Inc.	USA	10	20.7
10	Gilead Sciences, Inc.	USA	9	39.8

By R&D intensity				
Rank	Company	Country of incorporation (ISO code)	R&D expenses (US\$, billion)	R&D expenses/sales (%)
1	BeiGene, Ltd.	CYM	0.9	216.6
2	Pinterest, Inc.	USA	1.2	105.6
3	United Therapeutics Corporation	USA	1.2	81.0
4	Incyte Corporation	USA	1.2	53.5
5	Snap, Inc.	USA	0.9	49.6
6	Workday, Inc.	USA	1.2	42.9
7	Vertex Pharmaceuticals, Inc.	USA	1.8	42.2
8	Lyft, Inc.	USA	1.5	41.6
9	Cadence Design Systems, Inc.	USA	0.9	40.1
10	Gilead Sciences, Inc.	USA	8.9	39.8

Source: Orbis database.

Note: ISO = International Organization for Standardization; R&D = research and development.

parameters to operate more efficiently and sustainably and to minimize the risk of product failure.

These parameters are often turned into industry standards, a battlefield where many MNCs fiercely compete. Such competition has always been intense, especially in high-tech industries. The first-mover advantage that comes from setting rules and standards can give a company a powerful edge (box 2.5). Many lead firms make aggressive moves to extend their influence by pushing their standards globally, often working in close alliance with governments.

BOX 2.5 Microsoft and Intel: How the Wintel standard ruled the personal computer industry

Establishing its technology as an industry standard is one critical way for a firm to achieve long-term competitiveness. The success of Microsoft and Intel, which still dominate today's personal computer (PC) industry, can be attributed largely to their ownership of the industry's standards (the so-called Wintel standard).

Before the 1980s, the early microcomputer market was rife with chaos and incompatibility (Casadesus-Masanell and Yoffie 2005). Over time, a small number of de facto industry standards emerged, including the S-100 bus, the CP/M (Control Program for Microcomputers) operating system, the Apple II computer, Microsoft BASIC in read-only memory, and the 5¼ inch floppy drive. No single firm controlled the industry, and fierce competition spurred innovation in both hardware and software.

But gradually Microsoft and Intel processors gained ascendance. The two companies had been collaborating since before IBM introduced its first PC in 1981, a machine that used Microsoft's DOS (disk operating system) and the Intel chip design known as x86. Their continuing alliance gave them market dominance and shaped the PC business by defining the standard by which software developers created applications.

The power to decide the shape of the PC rested firmly with IBM in the early 1980s. The IBM PC with the DOS operating system and the x86 chipset soon became the best-selling PC in the world, and a major part of the market began to use the same exact hardware (or a clone of it) to take advantage of the hardware-specific features offered by IBM. However, this group's power to set industry standards began to shift in the late 1980s. Some major PC manufacturers, known as the Gang of Nine, decided to develop a bus type that would be open to all manufacturers, run as fast as or faster than IBM's, and yet retain backward compatibility.

About the same time, Microsoft's Windows operating environment started to gain popularity. IBM planned to replace DOS with the vastly superior OS/2 (originally an IBM-Microsoft joint venture), but instead Microsoft pushed the industry standards in the direction of its own product, Windows. The Wintel alliance became particularly lucrative after Microsoft's easier-to-use Windows software helped make the PC a mainstay in homes and companies. For the many competing computer manufacturers, the only common factors providing joint technical leadership were the operating system from Microsoft and CPUs (central processing units) from Intel.

Over the following years, both firms in the Wintel partnership attempted to extend their monopolies (Wingfield and Clark 2011). Intel made a successful major push into the motherboard and chipset markets—at one point it was the largest motherboard manufacturer in the world and almost the only chipset manufacturer. Microsoft had two competitors in its core market in 1990 but none by 1996.³ It pursued a policy of insisting on per-processor royalties instead of per-install royalties.

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BOX 2.5 Microsoft and Intel: How the Wintel standard ruled the personal computer industry (continued)

Computer manufacturers had to pay a royalty for every computer they shipped (because each computer has a CPU), regardless of whether the machine was preloaded with Microsoft's operating system. If a computer manufacturer shipped a machine with a competing operating system, it still needed to pay the same royalty to Microsoft and an additional royalty to the operating system producer, making competing operating systems unattractive to computer manufacturers (Baseman, Warren-Boulton, and Woroch 1995). Microsoft also integrated DOS into Windows 95 to freeze out other operating system vendors and charged a higher price. The firm was also able to take over most of the networking market with Windows NT and the business application market with Microsoft Office (Kennedy 2008).

By establishing the computer industry's standards, Microsoft and Intel gained the high market power that they maintain to this day. Although MacOS, Linux, and other operating systems have chipped away at Microsoft's lead, Windows remains the front-runner, with a market share of more than three-quarters of desktop PCs as of January 2020.^b

a. "Deal clears deck for Novell DOS 7.0," *Personal Computer World*, October 1994.

b. "Global market share held by operating systems for desktop PCs, from January 2013 to July 2020," Statista (<https://www.statista.com/statistics/218089/global-market-share-of-windows-7/#:~:text=Microsoft%20Windows%20became%20and%20stayed,trailing%20as%20a%20distant%20second>).

Standards tend to look back to validate and document what has worked well over a certain period. A consensus must be reached about them, so they usually capture only mainstream positions or conclusions. Promoting innovation is not an objective of the standards process; in contrast, standards tend to promote the status quo.

Using network effects and creating ecosystems

The most successful companies and products of the internet era have been predicated on the concept and ever-increasing value of network effects. Network effects are key for technology giants like Amazon and Google as well as for open-source projects like Wikipedia. The theory behind network effects is that platforms and products with these effects get better as they get bigger—not just increasing their value to users but also accruing more resources to improve themselves, thus strengthening their advantages (Coolican and Jin 2018).

Platforms can offer multiple players a powerful way to build new revenue streams from products and services that they could not develop and bring to market on their own (Meyer et al. 2018). For example, Alibaba's platform provides a range of services for its users: travel, entertainment, gaming, finance, transportation, and e-commerce. It is an eclectic mix, and it generates a wide-ranging array of data. By capturing and analyzing data from multiple sources, Alibaba can tailor individualized offers to its users—targeting and timing the offers for maximum effectiveness—and provide tools that help its online sellers enhance their respective businesses. The sellers' results, in turn, provide more data to the platform. This cycle reinforces the lead firm's market power by increasing user retention and amassing user data on many fronts.

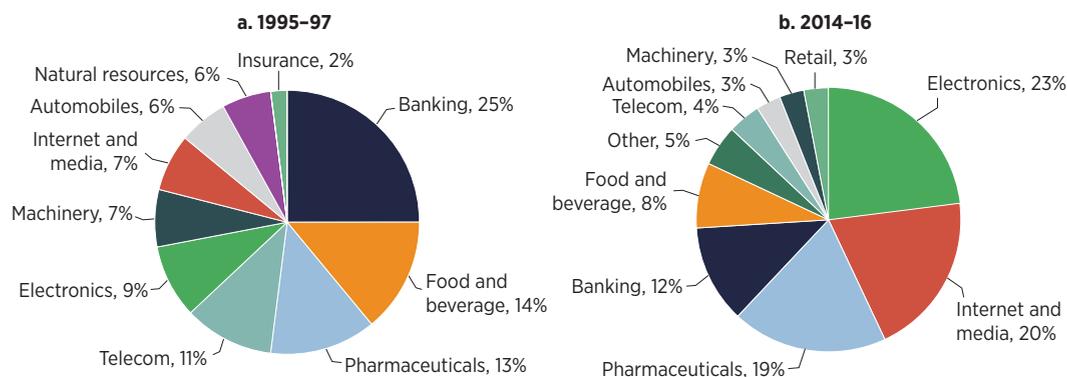
Data ecosystems will play a critical role in defining the future of competition, particularly in business-to-business industries, because they enable companies to enhance their market power through data monopolies. New data-driven products and services deliver unique value propositions that extend beyond a company's traditional hardware products, deepening customer relationships and creating competitive advantage. They thus generate recurring high-margin revenue streams and raise barriers to entry by others. They also help firms build highly defensible positions rooted in economies of scale and scope, similar to positions based on proprietary intellectual property or trade secrets (Ringel, Baeza, and Manly 2019).

Superstar firms and the impacts on growth and distribution

Increased concentration is seen across industries, signaling the greater market power of global lead firms. One category of interest is “superstar” firms, that is, firms that have high sales, market capitalization, and employment. These firms are typically the largest MNCs. A growing body of literature about these firms has emerged (Choi, Lou, and Mukherjee 2018; David et al. 2017; Freund and Pierola 2015; Osgood et al. 2017; Van Reenen 2018; Vavoura 2017). Although the definition of superstar firms varies slightly in different contexts, these firms share common attributes such as higher efficiency, greater profits, higher levels of digitalization, and higher skill and innovation intensity relative to their peers.

Superstar firms capture a higher share of industry output than do other firms (Autor et al. 2020). They lead the way in R&D and in intangible investments, global trade, and productivity. They also shape their home countries' export patterns (Freund and Pierola 2015). Among 32 developing countries studied,⁷ the country's top firm on average accounts for 14 percent of its total nonoil exports, the country's top five firms make up an average of 30 percent of nonoil exports, and the country's revealed comparative advantage can be created by a single firm.

The market power of superstar firms has increased significantly in the past two decades. The most prominent explanations for this increase seem to be technological advancements and changes in market structures (De Loecker, Eeckhout, and Mongey 2018). Technology adoption and innovation can be prohibitively expensive for many small firms, whereas large firms are not constrained by domestic inputs and domestic demand, which helps them grow and realize economies of scale (World Bank 2020). This strength allows large firms to invest billions of dollars to develop cutting-edge technology that further reinforces their market power. The decline in antitrust enforcement also played a role (Gutierrez and Philippon 2018). Superstar firms outperform their peers by using their market power to create various barriers to entry that protect their positions (Autor et al. 2020). Established firms may also lobby for regulatory barriers that complicate market entry or expansion for new and small firms and thus allow incumbent firms higher monopolistic gains (Autor et al. 2020). There is some evidence that markups grow in sectors with rising superstar firm intensity (Hall 2018).

FIGURE 2.11 Sectoral distribution of superstar firms

Source: Manyika et al. 2018.

Note: The panels show sectoral distribution of the top 1 percent of economic profit. Economic profit is calculated as a firm's invested capital times its return above the cost of capital. The sample includes nearly 6,000 of the world's largest public and private firms whose annual revenues are greater than \$1 billion. These firms together make up 65 percent of global corporate pretax earnings.

Continuous adoption of new technologies strengthens network effects and favors firms that can more readily adapt to new modes of production (Autor et al. 2020). Two decades ago, banking and food and beverages accounted for nearly 40 percent of superstar firms. By 2016, electronics and internet and media represented 43 percent of superstar firms (figure 2.11). These new superstar firms include internet and technology giants such as Alibaba, Apple, Facebook, and Oracle. Superstar firms come disproportionately from the world's largest economies, with more than 95 percent hailing from Group of 20 countries.⁸ However, superstar firms are more diverse with regard to source country and sector today than they were 20 years ago. US firms represented 38 percent of superstar firms in 2016, compared with 45 percent two decades ago. Companies headquartered in Asian economies (China, India, Japan, and Korea) make up 27 percent of the top 10 percent of superstar firms. Superstar firms are distributed across various sectors such as electronics, internet and media, pharmaceuticals and medical products, banking and insurance, food and beverages, apparel and luxury goods, automobiles, machinery, and retail.

The rise of superstar firms and increased market concentration have a dual impact on growth. On one hand, superstar firms are more productive and efficient than other firms; they promote productivity growth and innovation. On the other hand, the gains of such firms may be distributed unequally across locations, between capital and labor, and among different firms and workers (World Bank 2020; World Bank et al. 2017, 2019). At the geographic level, urban agglomeration of superstar firms causes unequal distribution of income between urban and rural areas. This division is particularly evident in developing countries where labor is not perfectly mobile.

In the labor market, increasing skill premiums and heightened competition have widened income gaps between workers. Firm size and the skilled worker share are strongly correlated (Akerman 2018). Increasing demand for skilled workers has boosted the skill premium in both developed and developing countries, while

labor-saving technologies have displaced many unskilled workers in developed countries (World Bank 2020).

The emergence of superstar firms has also exacerbated income and wealth inequality between capital owners and workers (Autor et al. 2020; Kehrig and Vincent 2020). Technological change and higher markups reallocate value added from labor to capital—many developed countries experience a declining labor income share (Dorn et al. 2017).

The increased market power of superstar firms could also induce resource misallocation by reducing labor force participation, delaying variable input adjustments, and generating negative effects on market entry and innovation (De Loecker, Eeckhout, and Mongey 2018). Gutierrez and Philippon (2017) find that increased industry concentration is mainly driven by a decrease in domestic competition, which in turn leads to a decrease in firm-level investment, particularly in intangible assets by industry leaders. De Loecker, Eeckhout, and Unger (2020) find similar results.

Notes

1. Portfolio investments include equity securities and debt securities in the form of bonds, notes, or money market instruments. When the equity securities held by foreign investors account for less than 10 percent of an enterprise's capital, the investment is classified as a portfolio investment (OECD 2010).
2. Despite the indispensable role of MNCs in GVCs, evidence on their contribution to global trade and value added is scant. FDI data are often used to study MNCs across sectors and countries, but FDI and MNC activities are different concepts. FDI reflects only the value of financial transactions (flows and positions) between direct investors and investment enterprises. FDI data provide no information on how these funds are being used and what outcomes they achieve. Sometimes large amounts of money go through various shell companies in offshore financial centers before being used productively somewhere else. Tracking such money's real investors and recipients is challenging. Because of these characteristics, aggregate FDI statistics provide only a limited understanding of how MNCs operate in GVCs (Beugelsdijk et al. 2010; Blanchard and Acalin 2016; Cadestin et al. 2018; Leino and Ali-Yrkkö 2014).
3. Such intangibles cannot be exchanged through arm's length trade because of their nonrivalrous and nonexcludable features.
4. However, these alternative measures are one step removed from a firm's ability to raise prices above marginal costs, and they each have various caveats. Market share and market concentration can be noisy barometers of market power. High market concentration itself is not necessarily a problem if markets remain open to competition, including from imports and from other domestic and foreign firms. Even highly concentrated markets will be forced to price "competitively" if the potential exists for "hit and run" entry (Baumol, Panzar, and Willig 1982). In addition, intense competition could result in high concentration if less competitive firms are forced out of the market.
5. See Microsoft's 2019 annual report (<https://www.microsoft.com/investor/reports/ar19/index.html>).
6. Note that production length as measured by industry input-output tables significantly underestimates production length for complex products. Ideally, if a firm-to-firm input-output table for all firms in the world existed, the same method could be used to calculate the true production length from the number of firms a product goes through. However, existing global input-output tables aggregate activities at the industry level, obscuring all intraindustry transactions.

7. These countries are Albania, Bangladesh, Botswana, Bulgaria, Burkina Faso, Cambodia, Cameroon, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, the Arab Republic of Egypt, Guatemala, the Islamic Republic of Iran, Jordan, Kenya, Lebanon, Malawi, Mauritius, Mexico, Morocco, Nicaragua, Niger, North Macedonia, Pakistan, Peru, Senegal, South Africa, Tanzania, Uganda, and the Republic of Yemen.
8. Group of 20 members comprise Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, the Russian Federation, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union.

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