Executive Summary

The theme of the *Global Value Chain Development Report 2021* is Beyond Production. Most research on global value chains (GVCs) focuses on manufacturing production; in other words, the breaking up of production processes into many discrete steps with a resulting explosion of trade in parts and components. But there are aspects of GVCs that go beyond manufacturing processes; in fact, value added and employment generation in GVCs are depending less and less on manufacturing production. This year's report features research on these aspects. For example, by highlighting the role of multinational corporations (MNCs) and, closely related to that, the role of intellectual property (IP) in setting up GVCs. Value chains are an efficient way for firms to exploit their brands, patents, and other IP. In the extreme, this leads to "factoryless" production in which firms that design and market manufactured products own none of the production process. An important part of modern GVCs consists of innovator countries exporting the services of their IP in return for manufactured goods.

Other issues that go beyond production are the role of GVCs in spurring technological innovation; the growing importance of services, both as an input into manufacturing value chains and as a component of final demand produced via their own complex value chains; and the potential for online platforms to enable more inclusive globalization by facilitating the participation of micro, small, and medium-sized enterprises (MSMEs). The report also examines the issue of risks to GVCs. The years 2018–2020 revealed some of the important risks that can threaten the normal functioning of GVCs and trade more generally. It was during this period that the Trump administration imposed a 25% tariff on about half the products that the United States (US) imports from the People's Republic of China (PRC), which disrupted major production chains. Natural hazard events in 2021, including floods in Thailand and the deep freeze in Texas, have highlighted the risks inherent in a production system that relies heavily on the just-in-time delivery of parts sourced from only a few key locations. The COVID-19 pandemic was a huge shock to world trade and GVCs. It is too early to say definitively how GVCs will evolve in response to the heightened awareness of geopolitical, environmental, and health risks, but some early evidence and analysis is emerging. So far, there has been no generalized reshoring of production back to the US or Europe, nor would that likely be effective as a response to most of the risks that have emerged. GVCs are more likely to evolve than to shut down. The rest of the summary looks at the key messages and findings in this report's six chapters.

Recent Trends in Global Value Chains

Chapter 1 updates basic statistics about trade within GVCs; that is, value added that crosses at least two borders between initiation of production and final consumption. Because GVC trade involves value added flowing from one country to another even

when the pair do not have a direct trading relationship, this can also be called indirect trading. The period from the 1990s to around the global financial crisis of 2008–2009 was the heyday of GVC expansion, dubbed the era of hyperglobalization. World trade grew especially rapidly when the PRC joined the World Trade Organization and as more developing countries shifted to open strategies, with global gross exports growing at an average 8.7% per year and indirect exports at 9.7% during 2000–2010. But both gross and indirect exports slowed dramatically in the subsequent decade, 2010–2019. Globalization did not reverse, but its advance slowed, causing *The Economist* to proclaim this the era of slowbalization. The average growth rate of gross exports slowed to 3.7% and indirect exports to 3.8%. Note that indirect exports were still expanding their share, but much more slowly than during the era of hyperglobalization.

Using input–output tables it is possible to trace the discrete steps in a production chain. From 2000 to 2010, chains lengthened for virtually all traded sectors. It was this breaking up of the production process that introduced new efficiencies and productivity gains, and made it possible for developing countries to enter manufacturing production, in particular, by finding a niche in the production chain. No longer did developing countries have to produce complete products; they could expand their comparative advantage by taking on certain tasks in the production chain. From 2010 to 2019, production length stagnated in virtually every sector: it did not shorten, but neither did it lengthen. It is possible that natural limits determine the extent to which the production process can be broken up for specific products. But it is also possible that there are countervailing forces pushing firms to shorten value chains. In the late 2010s, the world was exposed to significant geopolitical risks and environmental change, and, more recently, the COVID-19 pandemic. These events are too recent to have had much effect on 2019 GVC data, but Chapter 5 examines these risks and early evidence on how firms are responding to them, and speculates on the possible impacts of these risks on GVCs.

Although some stagnation has occurred in overall measures of GVC trade, it is important to note the considerable dynamism at the country and sector levels. Some developing countries have dramatically increased their share of GVC trade, most notably Viet Nam, which had 14.3% annual growth in indirect exports during 2010–2019. Cambodia and the Lao People's Democratic Republic, among other Asian economies, achieved similar increases, indicating that GVCs are still offering trade and production opportunities for some developing countries. It may seem surprising that the PRC has gone in the other direction: its growth of indirect exports declined from 20.0% during 2000–2010 to 4.6% in 2010–2019. But it needs to be borne in mind exactly what is being measured here. In 2010, the PRC was a major export processing center, taking in inputs from different partners and assembling them for export. A decade on and the PRC produces many more inputs—so more products are now following the pattern of traditional trade. In other words, the PRC produces the whole product for export. There may be a complex value chain within the PRC, but it is not a GVC. The country has also become the largest market for many products. Firms from the Republic of Korea used to produce electronics in the PRC for export to the US, and this would have shown up as indirect exports from the PRC in the

trade statistics. These firms nowadays sell much of their output in the PRC, so this should be recorded as an indirect export from the Republic of Korea to the PRC. The shifting statistics on GVC trade reflect these changes in the PRC's role in the world system.

One important innovation in the report is spotlighting the role of MNCs. The value added of affiliates of MNCs is recorded as domestic production in national accounts. For example, a firm from the Republic of Korea producing in the PRC has its value added included in the PRC's gross domestic product (GDP), as it should be. As emphasized in Chapter 2, the contribution of MNCs to their affiliates increasingly comes in the form of the use of IP— that is, MNCs' brand, patents, intangible know-how, and marketing networks. Those important services are generally not counted in trade statistics. Thus, often what the data show are foreign firms producing complete products in the PRC, some of which are exported. If the IP contribution of parent firms were properly counted, then this is a type of GVC trade, with the services of IP going from the parent to the affiliate, and additional value added contributed locally and then exported. From an economic point of view this is the same as if the parent were sending physical inputs, but from an accounting perspective the flow will not show up in the data.

The Organisation for Economic Co-operation and Development provides a major data service by reconstructing recent input–output tables in which the value added is divided into production from domestically owned firms and production from MNC-owned affiliates. It can be assumed that the contribution from foreign affiliates includes at least some flow from the parent. If the activities of foreign affiliates are assumed to have some intangible import content, then measures of GVC trade are roughly doubled. Unfortunately, it is not possible to extend this analysis back through time, but the exercise does reveal the extent of GVCs, which are already thought to be large—in fact, twice as large as conventional trade statistics indicate. This role of IP in value chains is the subject of Chapter 2.

Dividing production between domestic- and foreign-owned firms opens up many new research areas. Just one example: the PRC's main export is information and communication products. It turns out that similar amounts of the PRC's information technology exports come from domestic and foreign firms. Chapter 1 traces the value chains for domestic and foreign firms and finds they are strikingly similar, both having conventional "smile" shapes—that is, high value inputs early in the production process with design, finance, and high-tech inputs; low value assembly in the middle; and high-value distribution and marketing at the end. Both domestic- and foreign-owned exporters rely primarily on domestic inputs.

Trade in Intangible Assets along Global Value Chains and Intellectual Property Protection

Chapter 2 begins with the paradox that in 2018 the US's flagship manufacturer, Apple Inc., had $52 billion in sales in the PRC, but none of these products turn up in US trade

statistics; specifically, neither finished products (laptops, tablets, smart phones) nor Apple components. Apple is a prime example of a new breed of firm: the factoryless manufacturer. Factoryless manufacturers organize GVCs based on their IP, including patents, trademarks, copyrights, brand names, product designs, software, databases, and special business organization structures. IP is increasingly the prime asset owned by large international firms. An estimated 90% of the value of firms in the S&P 500 corresponds to IP, which contributes twice as much to the value of trade as does physical capital. While Apple is the best example of factoryless production, other important examples include Advanced Micro Devices Inc. (AMD), Nike Inc., and Qualcomm Inc. Factoryless firms are the extreme example of a more general phenomenon: in many important sectors, such as autos, the major firms have their own manufacturing plants around the world, but their IP is still their most important asset and the basis on which they organize GVCs.

So, how does factoryless manufacturing work? Take Apple as an example to answer this question: it contracts with manufacturing firms in the PRC to use its patents, design, and brand to produce Apple products. A significant part of this output is sold in the PRC and the rest is exported primarily to the US and Europe. From an economic point of view, the US is exporting the services of IP and importing finished products. From an accounting point of view, there are several ways for this trade to be organized. It is possible for a US firm to license patents or brands to a foreign, arms-length firm. Here, the royalty payment will show up as an export of services in US trade statistics. But most firms are reluctant to license their critical IP. Even in countries with the best IP rights protection, this protection is not perfect. And in many developing countries participating in GVCs, IP rights protection is not as strong as in advanced economies. For this reason, many firms with valuable IP prefer to keep these assets in-house and set up foreign subsidiaries. It is still possible that such a firm will charge a licensing fee to its subsidiary, but usually there are tax reasons why it is smart to charge very low fees (transfer pricing) and inflate the taxable profits of the subsidiary. Hence the total amount in trade statistics for payments for the use of IP tends to be modest, and this is a significant understatement of the actual role of IP in trade.

An additional complication comes from the tax-avoidance reasons to vest IP in subsidiaries in low-tax havens. Apple, for example, has vested its IP in overseas subsidiaries. From an accounting point of view, Apple's subsidiaries are earning profits in the PRC using IP to organize production, sales, and servicing there. Apple in the US is the ultimate owner of those profits, but there are tax advantages to booking the profits overseas and leaving them there. As of September 2021, 131 countries had agreed to a new global tax regime with a minimum corporate profit tax. This is an important reform that should halt the race to the bottom in corporate tax rates and ensure that large MNCs pay a fairer share of taxes. This tax reform, however, will not necessarily change the practices just described. The leaders of the world's 20 biggest economies have endorsed a global minimum corporate tax of 15%. Any compromise will probably leave in place the incentives to vest IP in low-tax havens because it is a low-cost maneuver—and as long as there is any tax incentive, the practice is likely to continue.

Chapter 2 explores the ways in which these practices distort bilateral trade statistics. Economists generally do not pay that much attention to bilateral imbalances, but they get a lot of attention from politicians and stakeholders who are being hurt by international trade. The US-PRC trade imbalance, in particular, has got a lot of attention. Various aspects of GVC analysis help provide a deeper understanding of the US-PRC relationship. The data most easy to tabulate swiftly is the movement of merchandise, almost all of which travels by container through major ports. Monthly merchandise trade balance data show a very large deficit in relation to the PRC from the US point of view. If the direct trade in services, such as tourism, education, and royalties on the use of IP, is added, the deficit goes down quite a bit because the US is a major net exporter of services both to the PRC and the world. Using input–output tables it is possible to shift the analysis from gross output to value added. This is important because the PRC still uses a lot of imported intermediates that are assembled for final export. Thus, some of what looks like a deficit with the PRC from the US point of view is actually a deficit with Japan or the Republic of Korea, which tend to be upstream, sending inputs to the PRC for final assembly.

An innovation in this report is introducing the concept of trade in factor income: it basically adds in what is missing from the calculation just discussed—that is, the trade in services of IP that is not directly recorded as an export of services. So, Apple's profits from the PRC, which are recorded at its overseas subsidiaries, are added to US exports to the PRC because that is the underlying economic reality, not the accounting fiction. Using the measure of trade in factor income, the US-PRC deficit is reduced by a third compared with the merchandise balance. Chapter 2 also provides insights into who is winning and losing from globalization in advanced economies. On the winning side are the big companies that own most of the IP (and their shareholders, mostly in the top 10% of income distribution) and the highly skilled technical workers who create IP benefit from exploiting IP internationally. On the losing side are semiskilled workers who find themselves competing with a vast supply of similar workers in developing countries.

The final issue taken up in Chapter 2 is IP rights protection, an issue of ever-growing importance given the expanding role of IP in GVCs and trade. While MNCs deploy their IP internationally, including in developing countries, they are naturally concerned about the protection of their IP rights. An international index shows that IP rights are generally very good in advanced economies and fairly good in most developing countries. The PRC scores modestly better than other large emerging markets, including Brazil, India, Indonesia, Mexico, Thailand, and Viet Nam. Research from the Organisation for Economic Co-operation and Development examines key factors that affect GVC participation, both for advanced and developing economies. For developing ones, the single most important factor is IP rights protection, followed by the quality and availability of infrastructure, institutional quality, and logistics. This makes sense: to operate effectively foreign investors need reasonably good infrastructure, logistics to move goods in and out, and protection of their main asset (i.e., their intangible property).

Building strong IP protection is increasingly important in the age of intangibles. Advanced economies have a strong interest in IP rights protection globally so that their firms can collect the maximum rents from their intangible assets. It also has to be recognized that the interests of developed and developing countries are somewhat different. Developing countries have an interest in implementing IP rights protection that is strong enough to attract foreign investment, including in hi-tech sectors. But much of the benefit of an open development strategy comes from advanced technologies diffusing to domestic firms. This is a natural process that goes back at least as far as US firms appropriating textile technology from Great Britain in the 18th century. Developed countries, however, own most of the IP in the world and benefit from IP rights protection that is as strong as possible. For example, advanced economies favor long patent terms for pharmaceuticals, whereas developing countries favor shorter patent terms. The COVID-19 pandemic illustrates this tension. Firms in advanced economies moved quickly to develop effective vaccines. Leading developing countries, including India and South Africa, proposed that World Trade Organization–based patent protection be waived for these vaccines. The proposal is still under discussion and no consensus has been achieved yet. This was a good start for the developing world's vaccine requirement, but not nearly enough.

Productivity Growth, Innovation, and Upgrading along Global Value Chains

Chapter 3 examines the dynamic effects that developing countries can expect from contributing to GVCs. The economic literature has long established a positive and significant causal effect of trade on aggregate productivity, which works through the channels of increased competition, expanded product markets, and improved access to production inputs. GVC trade offers more opportunities for productivity growth than trade in final goods and services. This is because by outsourcing parts of production to international suppliers, lead firms realize efficiency gains in the form of lower costs or higher quality, which increases productivity. Furthermore, when a foreign firm and a local supplier are part of the same supply chain, they need to interact and coordinate to guarantee the chain functions smoothly. That facilitates the transfer of tacit knowledge, potentially increasing domestic innovative capabilities.

Evidence from advanced and emerging economies supports the idea of domestic suppliers accessing new knowledge and resources from foreign markets and buyers, where GVC-mediated access to foreign research and development (R&D) is shown to boost innovation. Similarly, evidence shows that foreign affiliates of MNCs generate positive local spillovers, especially to their suppliers. Still, the positive effects are conditional on the absorptive capacity of local firms, which depends on human capital, own R&D investment, and broad institutional capabilities. In many developing countries, however, low absorptive capacity, large distances from the global technology frontier, and the highly specialized nature of the knowledge flowing along value chains may

prevent local firms from drawing on the knowledge and technology of lead GVC firms. Precisely because lead firms tend to work closely with their suppliers, the consequence may be that these end up being overly specialized and dependent on lead firms. Imitation remains one of the most effective channels of knowledge acquisition in developing countries, along with collective learning and learning from other non-GVC actors. MNCs also have the incentive to support their suppliers' innovation and upgrading in areas that are complementary to them, but to prevent innovation that could challenge their core competency.

For economic development to occur, productivity growth must be accompanied by sustained employment growth in modern sectors (i.e., manufacturing and, increasingly, services). While exporting through GVCs is often seen as a panacea for the weak industrialization trends in developing countries, the reality is more complex. Productivity growth is not necessarily associated with employment growth in developing countries, and the association even turns negative as economies get closer to the productivity frontier in manufacturing, possibly due to the labor-substituting effect of automation. Even in developing Asia, which has seen a massive increase in the scale of production activities along GVCs, productivity convergence and functional upgrading are slow and far from guaranteed, as shown by the diversity of outcomes across the 15 developing Asian economies examined in Chapter 3. The chapter also shows the importance of upscaling in driving income convergence and that the volume of activity matters just as much as the domestic share of the value of a product in driving income convergence.

The modularization of manufacturing—the building of complex products from smaller subsystems that can be designed independently yet function together as a whole—has reduced the production complexity of high-tech products. This allows new market entrants to catch up with established MNCs based in advanced economies and erode their market shares by sourcing core technologies from international suppliers (or acquiring the firms that own those technologies) and concentrating on noncore technology activities, such as assembly and brand development. Case studies from India and the PRC are presented as examples of the successful deployment of this strategy. While the firms in these case studies used their large domestic market to build their brands before expanding into foreign markets, the key to both success stories is that they leveraged their knowledge of the local context to create competitive advantage. The rising regionalism in GVCs means that firms from small developing countries can also take advantage of modularization and leverage their regional markets for scale. However, a free and fair global trade and investment landscape is paramount to this strategy's success.

It is worth noting that catching up in output capabilities generally means acquiring the technologies and skills relating directly to a product or service, not the ability to enhance or develop that product. The process, however, still involves new-to-the country and new-to-the-firm innovation, which are as important as frontier innovation in driving

productivity growth. The two case studies also emphasize the importance of marketing innovation in product design, packaging, placement, promotion, and pricing, as well as organizational innovation to be able to compete at the global level. In other words, the ability to develop a next-generation product is not the only way for a firm to be innovative.

The Role of Global Services Value Chains for Services-Led Development

The relationship between GVCs and development has often been discussed in the context of manufacturing or agriculture. The past few decades, however, have witnessed an unprecedented shift of employment, output, and trade shares from agriculture and manufacturing toward services industries in all regions globally—the issue taken up in Chapter 4. Services today account for more than 50% of global GDP and tend to employ more workers than manufacturing in countries at all levels of development. They play a crucial role not only for their own sector but also in the production of nonservices sectors, a process defined as the "servicification" of an economy. The upstream position of many highly traded services, with the exception of tourism, implies that the trade in services is mainly trade in intermediates and can therefore also be seen as trade in global services value chains.

Moreover, the "production" process of certain services allows for fragmentation similar to goods. This enables countries to join services GVCs just as they joined goods GVCs. Two countries where these strategies are working well are India and the Philippines. Both are now among the leading countries for offshore business services worldwide because of their low costs, human capital availability, and attractive business environments for services sectors. Here are three takeaways from their experiences. First, human capital accumulation is essential for both joining and upgrading along a value chain, especially in the context of automation, which threatens low-skill labor in many services sectors just as it does in manufacturing. India and the Philippines both have relatively large English-speaking populations with sufficient digital skills. Second, services GVCs can create a large number of well-paying jobs. Estimates indicate that indirectly the information technology industry supports about 16 million jobs in India and that workers in the industry have benefitted from average annual wage increases of 10% over the past decade. And third, developing domestic markets with strong local business networks and economic interactions are vital for sustaining a competitive edge and upgrading along value chains. This should go hand in hand with higher investment in education and R&D.

The rise of services value chains feeds into an active debate on whether servicification can replace the role of industrialization for economic development, especially in the context of export-led growth relevant for global services value chains. On the one hand, "premature deindustrialization" can be detrimental for development as, with trade and

globalization, developing economies "import" deindustrialization prematurely from advanced ones without having enjoyed the same rapid productivity growth that normally accompanies industrialization. Services-led development, relying on globalization and digitization, can become the main development path for low- and middle-income countries. Because developing countries are typically well-endowed with low-cost labor but manufacturing has become increasingly capital-intensive, these countries cannot fully exploit their comparative advantage. But this can be done with services, which require low upfront capital investment and declining trading costs due to the diffusion of information and communication technology. In general, upstream services require less capital per worker than for manufacturing inputs, but these services also require a higher level of education and skill.

The literature on services trade also reports positive effects on labor markets, although the available evidence for developing countries is ambiguous and points to better working conditions but greater employment volatility, mostly due to offshoring and reshoring decisions and to the heterogeneity of services. Nevertheless, in the future, telemigration can offer large opportunities for developing economies if services trade costs continue to decline due to digital technologies and from the expansion of fast-speed internet and the removal of policy barriers.

Trade in services has also typically been found to raise average earnings, which can help achieve the Sustainable Development Goals faster, with services being greener and more inclusive than other macro sectors. For instance, services trade can help close wage and employment gender gaps, as women have a high share of employment in services. Services GVCs can help tackle the growing polarization of incomes via job creation and labor reallocation toward cities. Indeed, cross-country evidence shows a negative correlation between income inequality and services exports. The flip side of this is that services are characterized by temporary employment, they mostly benefit the more educated, and they are more concentrated in cities leading to a larger urban–rural divide. Despite the evidence on the benefits of participating in services GVCs, most developing countries still have more foreign trade and investment restrictions on services than on manufacturing.

The policy implications for a growth model based on services GVCs to be effective and inclusive, and offer decent employment, include liberalized services sectors that can be provided efficiently and inclusively by the private sector (e.g., delicensing, privatization, foreign ownership); reducing services trade costs and barriers to increase their tradability, especially in sectors that are less susceptible to automation; expanding digital infrastructure investment; investing in the training and upskilling of workers to favor human capital accumulation; and narrowing gaps by reducing the relative costs of schooling and information asymmetries, especially in rural areas.

Rising Risks to Global Value Chains

Chapter 5 analyzes the risks that GVCs face from environmental, geopolitical, and COVID-19 sources. While each of them has created major risks for GVCs, they are quite different and require separate approaches to resilience and adaptation. A core underlying observation is that geopolitical shocks have not only become a primary concern for the future of GVCs in recent years but also entail important implications for whether and how states can handle environmental and pandemic shocks affecting GVCs. No definitive assessment of the cumulative effects of geopolitical shocks on GVCs is possible because they are still unfolding. Moreover, the effects of COVID-19 were superimposed on preexisting geopolitical tensions, conflating the two. According to standard measures of uncertainty, the uncertainty triggered by US-PRC tensions added 20% to global uncertainty since 2016, peaking during the first quarter of 2020 and declining under the Biden administration. The increase in policy uncertainty since mid-2018 might account for 1 percentage point of the decline in world trade growth. US and European imports from the PRC via complex GVCs rose significantly after 2016, but declined during 2018–2019 (prepandemic). The PRC's share in total US imports via complex GVCs has also fallen since 2018. Industry surveys suggest that about 90% of GVCs have suffered disruptions from the twin shocks of US-PRC tensions and the pandemic. A March 2020 survey finds that only 44% of firms thought US-PRC economic decoupling would be "impossible," down from 66% in October 2019. Most US respondent firms considered an escalation in trade disputes quite likely or highly likely over the next 3 years, but about 85% retained "in China for China" strategies with no plans to relocate. This is consistent with findings highlighted in Chapter 1. The PRC's role in export-oriented GVCs has declined in relative terms as more of its production is sold domestically. Firms that are in the PRC to produce for the Chinese domestic market are unlikely to relocate in response to the trade tensions, barring more extreme turns to inward-oriented geopolitics. According to surveys, these disputes and protectionism were the top macro risks for 44% of East Asian firms. The response to coping with heightened uncertainty was extremely diverse across firms, and included automation, digitalization, diversification, "just in case" capacity buffers, regionalization, near shoring, and shorter GVCs for some products.

Environmental shocks affect GVCs directly on the supply side (via disruption to people, infrastructure, transportation, and capital) and indirectly (via interrupted flows of intermediate goods and services upstream) and on the demand side, as consumers need different quantities of goods and services in response to shocks. Extreme weather events affect the trade routes, transportation, and modern infrastructure underpinning GVCs. Agriculture and tourism are susceptible to climate change, but here shocks are typically highly localized in domestic networks and temporally confined. Allowing diversified GVCs enables adjustment as shock absorbers. Because environmental risks—including disasters triggered by natural hazards—are projected to increase, the environmental risks to GVCs are likely to grow substantially.

By contrast, COVID-19 has shown how GVCs can hasten pandemic diffusion via international travel, high socioeconomic globalization, urbanization, geographic agglomeration, and population density. In this crisis, reduced production followed declines in labor-force participation because of COVID-19 containment measures, spillovers upstream and downstream (especially among economies with high GVC trade), lockdowns and border closings, rising demand for information and communication technology, and supply chain contagion and waves of reverse supply chain contagion. Other effects included contracting demand for air travel, tourism, and restaurants; rising demand for medical equipment and pharmaceuticals; and overall synergies between supply and demand shocks. Complex, lengthier GVCs with concentrated production or distribution have been the most vulnerable. GVCs, however, have been surprisingly resilient in adjusting to food, pharmaceutical, and medical equipment shortages so far in the pandemic. In general, after a 2-month or so lag, GVCs for these products have functioned well and are meeting the higher demand than before the pandemic.

Chapter 5 reports important findings on the global costs of COVID-19 lockdowns on GVCs (measured in value added), where costs depend foremost on the number of affected countries and the duration (more than strictness) of lockdowns. The spatial extent of COVID-19 is the most important driver of the global cost on GVCs. In a scenario where the PRC alone was affected, COVID-19 lockdowns would have reduced global value added by only 3.5% of GDP. Instead, the pandemic's spread to highly developed countries in Europe and to the US increased the value-added loss nearly fourfold to 12.6%. Propagation through GVCs via forward and backward linkages raises losses significantly. Importantly, low- and middle-income countries are far more vulnerable to the indirect effects of the pandemic than developed countries. Containment measures have had both substantial positive externalities (i.e., all countries benefited considerably when the PRC imposed the strictest containment measures) and negative externalities (i.e., all countries suffered from the containment measures of other countries via reduced demand). But it is the positive externalities of the containment measures that dominate.

The degree of GVC resilience and vulnerability across risks depends on the nature and magnitude of shocks, including their size, sector, and region specificity; GVC features, such as symmetric versus hub design or the presence of choke points; industry features, such as upstream versus downstream; the availability of substitutions (short or long term); and the degree of transactional stickiness. While Chapter 5 primarily examines the implications of the three macro risks *for* GVCs, it also notes GVC contributions to exacerbating each of those risks, whatever their other sources may be. All three risks *from* GVCs are on the rise, as are all three risks *to* GVCs. All three are becoming more predictable, to varying degrees, with improved understandings of their sources and mechanisms. All three could be better contained domestically and internationally if handled appropriately, especially because all three can have anthropogenic sources or mechanisms. All three risks fuel unfortunate synergies across them and all are increasingly vulnerable to cyberattacks. Firms are responding to these risks with measures to enhance resilience via diversification, transparency, mapping, digitalization,

near-shoring, and "just in case" inventories, among other things. As of early 2021, about 87% of firms were investing in enhancing resilience. Reshoring has not been a particularly widespread response so far because it comes at high cost and does not address most risks.

At the level of international relations, countries must avoid the exclusive unilateral pursuit of relative gains via GVCs and unfair trade practices. Rather, they need to reignite international collaboration that fosters reciprocity, trust, and transparency via multilateral institutions and converge on a regime that tackles rising cybersecurity risks. They need to contribute to COVID-19 Vaccines Global Access, the global vaccination initiative, to accelerate vaccine distribution. International collaboration to develop a global cost-sharing instrument ahead of the next pandemic could enable a fairer distribution of the costs of monitoring, containing, and suppressing pandemics while strengthening incentives for early action. The proliferation of extreme weather events worldwide makes clear that new technology must privilege renewable energy and decarbonization. Measures that go beyond the Paris Agreement may be required, including the elimination of global fossil fuel subsidies for both production and consumption, an agreement on a globally negotiated minimum carbon tax adjusted to gross domestic product, improved carbon emission standards, and other urgent measures toward net zero. Urgent cooperation on environmental risks may help soften the rough edges of geopolitical and pandemic-related ones, thus reinforcing mutual commitments across all three domains in a virtuous, synergistic circle.

Digital Platforms and Global Value Chains

The new digital economy is built on platforms as varied as search engines like Google and mobile phone operating systems like iOS. Chapter 6 focuses on these digital platforms, which are the basis of the digital economy itself, and have important implications for GVCs and their participants. They can increase inclusivity for MSMEs and developing economy participants by creating new means of trade and GVC participation through search and connection tools, such as e-commerce marketplaces. But they can also bring new challenges to both, including uneven access to digital infrastructure, a tendency for platform-market consolidation that reduces competition, and a host of direct and indirect costs to participate.

Digital platforms, at their core, make interactions easier between distinct users who interact via the internet, lowering the cost for user interaction and generating network effects as more participants join. The benefits of digital platforms for MSMEs go beyond identifying sales opportunities; they also allow businesses to work together through digital payment services, communication technologies, and financing.

Importantly, information communication technologies have been both the driver of digital platforms and a major factor in GVC growth in the 20th century, helping

firms around the world to reduce the barriers imposed by distance and increasing the manufacturing share of industrializing economies. Just as digital platforms can provide services that make trade and GVC participation easier, GVCs themselves provide opportunities for greater inclusivity. Whether for MSMEs or businesses in developing countries, GVCs fragment production and rely on services, as discussed in Chapter 4. This allows firms to focus on smaller, more specialized pieces of manufacturing, creating opportunities for players with more limited manufacturing capacities and MSMEs that are more likely to trade in services.

For trade, digital platforms have reshaped cross-border trade flows by reducing the importance of physical presence, lowering the costs to get into international markets, and creating new two-sided markets. Individuals can provide their virtual inputs to online tasks from marketplaces like Mechanical Turk and e-commerce marketplaces provide opportunities for MSME trade and exports from developing countries. All of these are significant changes that have led to the proposal for a new "internet driven" value chain containing both e-commerce marketplace transactions (and the data they generate) and direct business-to-business e-commerce facilitated by platforms.

Chapter 6 presents a systematic review of what digital platforms are; how they affect trade inclusivity, especially for MSMEs and developing countries; the evidence that digital platforms can facilitate GVC participation; and how this participation can be characterized. On a policy level, given the benefits of the digital platform economy and its potential for inclusivity, the chapter encourages policymakers to mitigate the digital divide through reduced access costs and increased infrastructure, to increase the availability of secure servers that permit online transactions with reduced risk, and to provide greater access to formal banking to facilitate the ease of digital transactions. It also underscores the importance of ensuring competition by preventing over-consolidation among digital platforms and making the user data that is generated within these platforms both secure and portable.

David Dollar
Senior Fellow
John L. Thornton China Center
at the Brookings Institution