

## BOX SF.1 The impact of COVID-19 on global value chains

*One of the ways that the COVID-19 pandemic is disrupting economic activity is through its impact on global value chains (GVCs), which can amplify the effects of shocks on trade, production, and financial markets. Workplace closures or transportation difficulties have caused interruptions to the delivery of intermediate goods, severely affecting production in manufacturing industries that practice lean inventory management. Governments have become concerned about shortages of essential products from offshore sources. A simulation of the current crisis using a model with input-output linkages suggests that all countries and almost all sectors will suffer a decline in exports, with worse outcomes in regions more dependent on international trade, particularly through GVCs and tourism. In the wake of this shock, firms as well as countries may seek to reduce the risk exposure of supply chains over the medium term by increasing the geographical diversity of their suppliers. Countries that wish to seize this opportunity to become more integrated into GVCs could pursue sound government policies with respect to infrastructure investment, education, and public health. The benefits to real incomes and welfare associated with GVC production have been large, but could be undermined by a rise in protectionism.*

### Introduction

The COVID-19 pandemic is causing the worst contraction in global trade in the post-war era. One important channel for its impact is through global value chains (GVCs). Industries that participate in GVCs are often dependent on “just-in-time” delivery of intermediate inputs. This contributes to lean inventories and higher productivity, but also makes companies vulnerable to interruptions in the supply of critical components from abroad, such as those that have occurred as a result of the regional quarantines, production shutdowns, and border controls implemented to slow the spread of COVID-19. In this context, this box addresses the following questions:

- How has COVID-19 disrupted GVCs?
- How might disruptions to GVCs amplify the impact of COVID-19?
- Which countries and sectors are more vulnerable?

### How has COVID-19 disrupted GVCs?

Even before COVID-19, the growth in GVCs had already been trending lower. GVC’s share of global trade peaked at just over 50 percent prior to the global financial crisis, but slipped thereafter as activity slowed, particularly that of investment, and as trade liberalization efforts stalled (World Bank 2019b). More recently, GVCs had been further strained by the increase in tariffs and uncertainty driven by U.S.-China trade tensions.

The prevalence of GVCs could amplify the disruptive effects of COVID-19. By slowing or halting the

production and transportation of items needed in other processes, the pandemic and the aggressive controls brought in to contain it increase the risk that critical inputs will be unavailable. Many high-productivity GVC participants rely on just-in-time delivery of inputs and lean inventories. In 2020 these buffers are likely to be limited by the fact that the countries at the center of GVC production have been among the worst-affected by COVID-19 (Figure SF.1.1.A).

Supply shocks tend to be felt most among countries with greater backward linkages, i.e., those whose exports embody imported value-added, such as auto or electronics manufacturers (World Bank 2019b). Demand shocks, by contrast, are more acutely felt by countries with greater forward linkages. This includes, for example, many commodity exporters, which experience a fall in demand from manufacturing centers, which is in turn a reaction to the drop in exports to third countries for the finished goods they produce. Thus far, the steepest declines in activity have been in countries with strong forward linkages, suggesting that the demand factor in the COVID-19 economic shock has been more severe than the supply factor (Figures SF.1.1.B and SF.1.1.C).

### How might GVC disruptions amplify the impact of COVID-19?

The propagation of shocks through economic networks and industry interlinkages such as GVCs is historically a major driver of macroeconomic fluctuations (Acemoglu, Akcigit, and Kerr 2015). Global trade, approximately half of which flows through GVCs, is particularly volatile, and tends to fall considerably more than overall activity during crises (Freund 2009; Taglioni and Zavaacka 2016). This has been ascribed to several factors. They include the dependence of export-oriented firms on external finance; the strongly cyclical behavior of investment and inventories; and the fact that fiscal stimulus has tended to

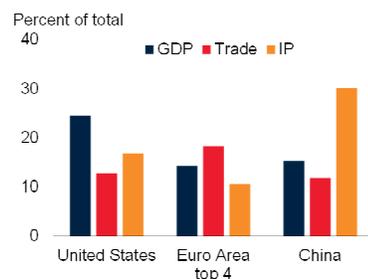
Note: This box was prepared by Patrick Kirby and Maryla Maliszewska, and includes simulation results prepared by Maryla Maliszewska, Aaditya Mattoo, and Dominique van der Mensbrughe.

## BOX SF.1 The impact of COVID-19 on global value chains (continued)

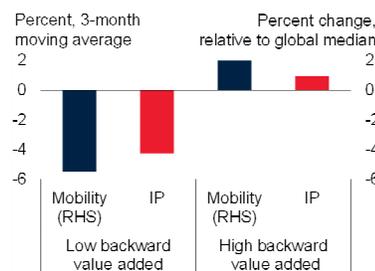
### FIGURE SF.1.1 The impact of COVID-19 on GVCs

The countries at the center of the initial waves of the global pandemic are also those at the center of GVC production, which will contribute to a sharp contraction in global trade. Thus far, the steepest declines in trade and industrial production have been concentrated in countries that export more basic intermediate goods for higher value added (i.e., a concentration of forward value added). This is consistent with a greater shock to demand than to supply.

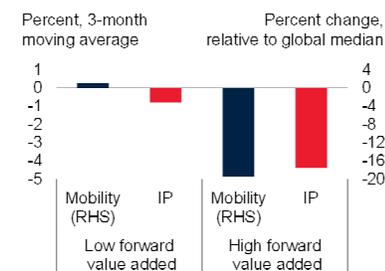
#### A. Major economies' share of global aggregates



#### B. Latest mobility and production growth data, by concentration of backward value added in trade



#### C. Latest mobility and production growth data, by concentration of forward value added in trade



Source: Google; Johns Hopkins University; Organisation for Economic Co-operation and Development; World Bank; World Trade Organization.

Note: GVCs = global value chains. EMDEs = emerging market and developing economies. IP = industrial production.

A. Trade is the average of export and import volumes. "Euro Area top 4" is a weighted average of Germany, France, Italy, and Spain. Sample includes 28 advanced economies and 34 EMDEs, which represent 89 percent of global GDP. Data for GDP and trade are 2019 and industrial production is December 2019.

B.C. Countries are considered to have "low" forward value added if the domestic value added in foreign exports as a share of gross exports is less than 25 percent, and "high" if above 25 percent. The same threshold applies for backward forward value added, in terms of the foreign value added share of gross exports. Last observation for industrial production is March 2020. "Mobility" is the percent change in workplace mobility relative to the global median change for May 21st from baseline, which is the median value for the corresponding day of the week during the 5-week period January 3-February 6, 2020, based on data from Google. Sample includes 32 advanced economies and 23 EMDEs for the Mobility data and 29 advanced economies and 22 EMDEs for IP.

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provide relatively stronger support for non-tradable sectors (Ahn, Amity, and Weinstein. 2011; Bénassy-Quéré et al. 2009; Bricogne et al. 2012; Bussière et al. 2011; Chor and Manova 2012). Sharp declines in trade through GVCs are generally followed by rapid recoveries.<sup>1</sup>

The fact that trade flowing through GVCs is highly dependent on just-in-time delivery of critical components from abroad may make it particularly vulnerable to the interruptions of supply caused by regional quarantines, production shutdowns, and border controls implemented to slow the spread of COVID-19. GVCs are likely to amplify the effects of the pandemic through other channels as well. For example, they are particularly prominent in the manufacture of durable goods, purchases of which can be postponed until consumers have more freedom to travel and shop (Taglioni and Zavacka 2016).

Moreover, GVCs in emerging markets tend to be reliant on external U.S. dollar financing, which increases in risk

spreads has made sharply more expensive (Bruno, Kim, and Shin 2018). This would offset the edge in competitiveness arising from the depreciation of their currencies (Boz, Gopinath, and Plagborg-Møller 2018). For regions with significant backward linkages, such as EAP and ECA, the increased cost of imported inputs also reduces the effect of exchange rate depreciation on competitiveness (Ahmed, Appendino, and Ruta 2015). Disruptions to agri-food supply chains could lead to especially severe problems: food insecurity; health risks; and social unrest. Many countries are suffering from shortages of chemicals, fertilizers, and seeds, which are sometimes exacerbated by restrictions on exports by trading partners (World Bank 2020a). These pose a clear threat of smaller harvests, higher food prices, and rising levels of poverty, with the most vulnerable of the world's population most exposed.

### Which countries and sectors are more vulnerable?

A global computable general equilibrium (CGE) model illustrates the heterogeneous impact of COVID-19 on

<sup>1</sup> This is known as the "bullwhip effect", and takes place even when the negative shock is largely from demand (Altomonte et al. 2011).

### BOX SF.1 The impact of COVID-19 on global value chains (continued)

output and trade, and the transmission channels. It encompasses 20 countries, 7 regional country groups, and 29 economic sectors.<sup>2</sup> The model incorporates GVCs through input-output linkages and durable relationships in production networks. Shocks applied identically to all countries for one year represent the economic impact of a stylized representation of COVID-19:

- *Employment shock.* A 3 percent drop in employment as factory closures and social distancing force capital and workers into idleness.
- *Trade cost shock.* A 25 percent rise in the costs of all imports and exports, driven by a combination of additional inspections, reduced hours of operation, road and border closures, and increases in transport costs, among other factors. The Ebola crisis, in comparison, caused an estimated 10-percent increase in trade costs for affected countries (Evans et al. 2015).
- *Tourism shock.* A sharp drop in international tourism, equivalent to approximately 25 percent, which aligns with the forecast of the World Travel and Tourism Council for 2020.
- *Services shock.* A 15 percent switch in household demand away from services requiring close human interaction—such as mass transport, domestic tourism, restaurants, and recreational activities—towards consumption of goods and other services.

#### Short-term implications

The combination of four shocks in the simulation causes a severe global recession. On a sectoral level, services affected by social distancing and tourism experience a sharper decline than agriculture and manufacturing, as they are negatively impacted by all four shocks. Country-specific results show differences reflecting the composition of output and exports by sector and destination, as well as relative levels of openness, reliance on tourism, and endogenous changes in competitiveness. All countries suffer a decline in exports (Figure SF.1.2.A). The EAP and ECA regions are among the worst-affected, consistent with their significant exposure to GVCs and tourism (World

Bank 2020d). Regions that are less integrated through trade and tourism, such as SSA and LAC, are the least affected. On a sectoral level, industries more integrated in GVCs tend to suffer from more severe contractions in activity (Figure SF.1.2.B). This aligns with the results of other simulations (Sforza and Steininger 2020).

#### Medium- and long-term implications

The shock from COVID-19 comes at the same time as U.S.-China trade relations are once again deteriorating. These shocks may well cause GVC participants to re-assess the viability of existing production networks, and explore whether they should increase the geographical diversification of supply chains, or even reshore production (Freund 2020). Efforts to force reshoring could damage productivity and incomes, especially among EMDEs whose economic development and poverty reduction efforts have benefitted from their participation in GVCs (World Bank 2019b).

The current environment of global recession and heightened risk aversion has been very unfavorable for international trade. This poses a threat to the gains from trade through comparative advantage, specialization, and economies of scale. Regions that are already well-integrated in GVCs should take steps to ensure that they retain, strengthen, or expand their attractiveness as participants in GVCs, including by ensuring the free flow of their manufactured goods across borders. In regions that are not as well integrated, such as MENA, LAC, SAR and SSA, the desire of companies to increase the geographic diversity of their supply chains may provide an opportunity to undertake the structural reforms that would encourage greater integration (Engel, Winkler, and Farole 2016; World Bank 2019c).

Policymakers more generally need to avoid the implementation of trade restrictions that could reverse the global welfare gains, including a large reduction in global poverty, that GVCs have facilitated. Protectionism does not offer a solution to the problems of security of supply highlighted by the pandemic, and countries with more GVC linkages tend to be more reluctant to impose trade barriers (Blanchard, Bown, and Johnson 2017). Shortages would be even more likely in situations where offshore suppliers are shut out, or where domestic suppliers lack the technology and skills available offshore. During the crisis, offshore sourcing has posed less risk to supply in several key sectors than has concentration of production in a few large facilities (e.g., meat packing, medicines)—a reduced reliance on foreign inputs often results in an increased

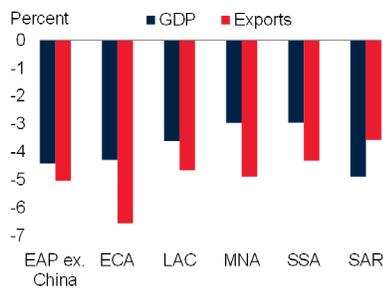
<sup>2</sup>The model and the simulations are detailed in Maliszewska, Matus, and van der Mensbrugghe (2020). This box describes the paper's amplified global pandemic scenario. The model used is ENVISAGE, calibrated to GTAP Version 10A. It is used in its comparative static specification, and uses 2014 as a reference year.

## BOX SF.1 The impact of COVID-19 on global value chains (continued)

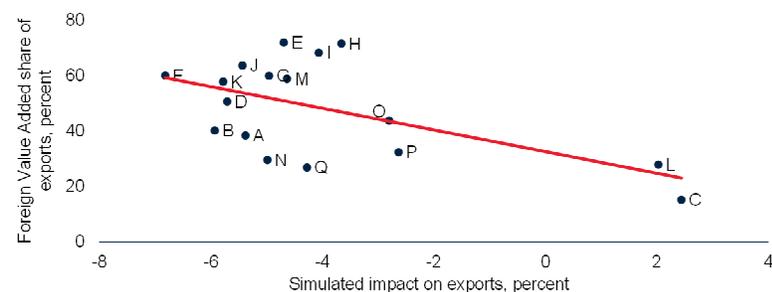
### FIGURE SF.1.2 Simulation results

In the modeled scenario, all countries and most sectors suffer a decline in total exports, with the worst-affected regions those that are closely integrated into global trade or dependent on tourism. Using the example of Vietnam, the worst-affected sectors are those with a high share of foreign value added, such as textiles and transport equipment.

#### A. Regional responses of GDP and exports to modeled COVID-19 shock



#### B. Sectoral responses in a modeled COVID-19 shock, the case of Vietnam



Source: World Bank.

A.B. "Foreign Value Added share of exports" is the value added of inputs that were imported in order to produce intermediate or final goods/services to be exported. "Impact on GDP" and "Exports" show the change with respect to benchmark in the CGE simulation.

B. Sectors are as follows: A = Agriculture, B = Fishing, C = Mining and Quarrying, D = Food & Beverages, E = Textiles and Wearing Apparel, F = Wood and Paper, G = Petroleum, Chemical and Non-Metallic Mineral Products, H = Metal Products, I = Electrical and Machinery, J = Transport Equipment, K = Other Manufacturing, L = Electricity, Gas and Water, M = Construction, N = Wholesale Trade, O = Transport, P = Post and Telecommunications, and Q = Other Services.

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reliance on domestic inputs, which are also vulnerable to disruption from the pandemic (Bonadio et al. 2020). The most effective way to reduce such risks lies in diversification of sources, which may well include some reshoring, as well as a broadening of foreign sources of

supply. The threat to profitability of GVCs provides in itself a market incentive to encourage transnational firms in this direction. Sound government policies with respect to infrastructure investment and improving governance, education, and public health, would facilitate the process.

regions where tourism accounts for a large share of activity, such as MENA (5.5 percent), EAP (5.2 percent), and ECA (4.8 percent).

**Informality and food insecurity.** In the average EMDE, informal activity accounts for one-third of output and two-thirds of employment—and considerably more in SSA and SAR. This may magnify both the health and economic impacts from COVID-19 (Chapter 1; Box 1.4). Workers and firms in the informal sector have limited options to buffer temporary income losses, and often depend on daily incomes that are insufficient to permit the accumulation of stockpiles of food or other essential items. Measures to slow the spread of the virus such as social distancing and self-isolation are more

challenging in the crowded settings of the urban poor. The spread of COVID-19 is expected to cause the number of food insecure people to double in 2020, worsening malnutrition and causing permanent developmental damage, especially in SSA where 20 percent of the population is already undernourished (Figure SF.2.D; WFP 2020).

## Macroeconomic policy responses

Regional outcomes also depend on countries having the space and ability to adopt and implement an effective policy response. Many EMDEs have taken measures to support