The COVID-19 pandemic and the internationalization of production: A review of the literature

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Abstract

Motivation: The COVID-19 pandemic has substantially altered the context for cross-border business. This is reflected in trade flows but the conditions for conducting dispersed production functions across countries are also affected. This "new normal" period presents the need to examine the main problems and challenges in international trade and business.

Purpose: The article aims to establish the scope, aspects, and implications of the COVID-19 pandemic on international trade and on international production by reviewing recent articles which deal with international trade and global value chain (GVC) issues, encompassing both changes that were already taking place and the challenges that began in 2020.

Methods and approach: The findings of recent articles on trade flows and changes in GVCs (mainly the period 2019–2021) are described in theoretical terms, compared, and systematically reviewed. Special focus is given to the impact of the pandemic on GVCs, renationalization, and GVCs and the impact of the pandemic on GVC governance, and GVCs in the production of vaccines for the COVID-19 virus.

Findings: A drop in trade was recorded in 2020, alongside the introduction of protective trade policy measures. Reduced GVC activities had a negative impact on welfare and the "renationalization" of GVC-related activities is not a real solution. For the development of GVCs it is important to find a trade-off between efficiency and resilience, starting with reorganization (re-engineering) of GVCs, and probably focusing on regional frameworks. Liberal trade policies are essential to ensure the involvement of GVCs in producing the COVID-19 vaccines, since the various inputs are produced in different countries.

Policy implications: The possible directions for the future development of GVCs are elaborated: reshoring, resilience in supply chains, adjustments in governance, diversification, and development of risk-management strategies. The process of internationalization is not in question, but presents challenges which create the need for adjustments in its future development. Current problems with vaccine production arise in part from the erection of trade barriers and rising nationalism. There is a need for greater cross-country co-operation to avoid placing national short-term interests before long-term and broader objectives.
INTRODUCTION

The process of locking down economies around the world in 2020 in response to the COVID-19 pandemic has put a question mark against the process of internationalization, with all its acknowledged benefits in relation to trade, capital, and investment liberalization, by showing up its weaknesses. The pandemic has had a direct influence on production (with infected or at-risk employees) and indirectly (through transport problems, border controls, etc.). The total or partial closing of borders or the imposition of limitations—or conditions, such as negative polymerase chain reaction (PCR) tests—on the free movement of people across borders also complicates (or disrupts) the transport of goods. It may influence foreign trade, foreign direct investment (FDI), and fragmented production processes, i.e. global value chains (GVCs) in forward and backward directions (in the form of imports and exports, including vital inputs, whether products, parts, or vaccine ingredients).

Relevant institutions, such as the Organisation for Economic Co-operation and Development (OECD) and the United Nations Conference on Trade and Development (UNCTAD) indicate that international trade and production started to slow down during the 2010s, long before the pandemic, and the current situation has deepened that process (OECD, 2020a; UNCTAD, 2020a). Trade in intermediate products showed growth trend during the 1990s and 2000s, but from 2010 it started to stagnate, accounting for 45% of total merchandise trade in 2017 (World Bank, 2020; WTO, 2020), indicating the relevance of foreign-produced inputs in production and assembly processes. The pandemic is expected to trigger a recession, and projections show that the fall in global gross domestic product (GDP) will be 4.2% for 2020. UNCTAD projections from December 2020 indicate a fall in international trade of 5.6%, although the predicted decline in trade in services is much greater—15.4% in 2020 compared with 2019 (UNCTAD, 2020d). UNCTAD (2020a) initially predicted that FDI would decline by between 5% and 15% in 2020. Three weeks later it revised its projections to downwards pressure from −30% to −40%, based on updated economic impact estimates and revised revenues of the largest multinational companies (MNCs) (UNCTAD, 2020b).

In such circumstances, the debate about risks associated with international production assumes greater importance (Baldwin & Freeman, 2020) and the idea of reshoring or rethinking of GVCs in order to become more resilient has arisen (Javorcik, 2020).

The article aims to summarize existing research that deals with the influence of the pandemic on foreign trade and GVC issues and changes in their activities in 2020. Given their current importance, we also include GVCs in the production of vaccines and discuss the contemporary trade barriers as threats that disrupt production.

The methodology includes a description and comparison of selected articles and a systematic review of quantitative articles. The policies and implications of the pandemic are analysed at the global level and at the level of the European Union (EU), to gain a wider perspective of the ways in which the pandemic has hit production, but also of anticipated changes and adjustments in international production chains.

The originality of the article is that it includes aspects of trade and GVCs as the main features of globalization and internationalization and that it summarizes preliminary analyses based on available data and research. Added value lies in the attention to the production of vaccines and GVCs in pharmaceutical products.

The article is organized as follows. Section 2 examines the expected impact of the pandemic on trade and trade policy, Section 3 summarizes its impact on GVCs with a special accent on regionalization, deglobalization, GVC governance, and the production of vaccines. Section 4 follows, with a discussion of the findings and policy recommendations, and Section 5 concludes.
2 | IMPACT OF THE PANDEMIC ON TRADE AND TRADE POLICY

2.1 | Data and methodology

The methodology includes description and comparison of the findings of selected articles and other publications and a systematic review of quantitative articles, which synthetizes the selected articles in a systematic, transparent, and reproducible way.¹ This approach identifies and selects relevant published papers, assesses the quality of each study, synthesizes and compares evidence, poses specific questions, and applies a systematic strategy. The focus is on quantitative articles and as such this research method ‘creates a firm foundation for advancing knowledge and facilitating theory development’ (Snyder, 2019, p. 333).

The main advantage of the systematic review is to find some common effect and common methodology across studies and articles. The articles were collected from Web of Science and Scopus databases, as well as relevant publications of the World Trade Organization (WTO), UNCTAD, and the OECD. The contemporary findings are accompanied by the statistical analysis of available secondary data on trade and GVCs.

2.2 | Impact of the pandemic on trade

The main focus of the article is on international production, which depends highly on exports and imports of intermediate (and final) products and on the conditions (trade policy rules) governing such trade. In view of this, we start with some projections about the impact of the pandemic on global exports and imports in order to address the following questions: To what extent did the pandemic cause the trade drop in 2020? Is protectionism an answer to the pandemic? What are the main challenges for trade policy?

All relevant international institutions and organizations made swift analyses and forecasts of the implications of the COVID-19 pandemic on different macroeconomic indicators. The projections indicate a 4.3% fall in global GDP in 2020, and an estimated drop in international trade from 5.6% (goods) to 15.4% (services) and of 30%–40% in FDI flows (IMF, 2020; UNCTAD, 2020b, 2020d, 2020e; WTO, 2020). The predicted drop in trade is huge and the decline in the trade in services is even deeper than for merchandise. The optimistic fact is that the first predictions in early 2020 projected an even larger drop. The latest predictions, made in December 2020, correct the data and present a more realistic (and optimistic) picture, because economies were starting to open and to conduct normal activities from mid-2020 (with just a partial lockdown in the late 2020). The figures are huge and the recovery, even if it starts in 2021, will be prolonged but also accompanied by essential structural reforms, with a particular focus on the proximity of production locations and the possibility of substituting some of the efficient suppliers from very distant countries with others that are closer.

At the time of writing, there are very few articles that deal with the impact of the pandemic on foreign trade. Some are descriptive, with discussion of actual trends, along with publications of international organizations, and a few are quantitative, which are synthesized in Table 1.

Gruszczynski (2020) makes a theoretical contribution to this topic by differentiating between the short-term and long-term impacts of the COVID-19 pandemic on international trade, where a decline can be expected in the short term, while in the long term, business will behave as usual but with some structural changes as businesses adjust their activities in the process of economic globalization.

Hayakawa and Mukunoki (2021), Bekkers and Koopman (2021), and Vidya and Prabheesh (2020) make quantitative analyses. The authors use different methodologies and cover different sets of countries and time periods,

¹This approach was first applied in medicine but is now often applied in management, marketing, and business studies as well as in the social sciences.
### TABLE 1  Impact of Pandemic on International Trade—Review of Scientific Articles

| Authors                    | Methodology                                                                 | Sample                                      | Data sources                | Results                                                                                       |
|----------------------------|------------------------------------------------------------------------------|---------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------|
| Bekkers & Koopman (2021)   | Quantitative trade model (global trade model); scenario analysis. Construction of V-shaped, U-shaped, and L-shaped recovery. | Global, not specified.                     | GTAP                        | - Trade is projected to fall between 8% in the V-shaped (optimistic) and 20% in the L-shaped (pessimistic) scenario. |
| Hayakawa & Mukunoki (2021) | Gravity equation; Poisson pseudo maximum likelihood (PPML) method.           | Monthly data on global trade (exports of 34 to 173 countries) January–August 2019 and 2020. | Global Trade Atlas (IHS Markit) | - Negative effects of COVID-19 on international trade of exporting and importing countries.   |
|                            |                                                                             |                                             |                             | - The effects on importing countries tended to become insignificant from July 2020.           |
|                            |                                                                             |                                             |                             | - Heterogeneous effects across industries (negative effects on non-essential products vs. positive effects in industries providing medical products). |
| Vidya & Prabheesh (2020)   | Trade network analysis; artificial neural networks.                          | 15 global trading countries (according to their share in global trade). | CEIC database and WTO database | - Drastic reduction in cross-country trade interconnectedness after the COVID-19 outbreak. |
|                            |                                                                             |                                             |                             | - Change in the structure of trade network.                                                   |
|                            |                                                                             |                                             |                             | - China’s “centre” position in the trade network not affected by the pandemic.                |
|                            |                                                                             |                                             |                             | - Project drastic decline in trade of most economies until the end of 2020.                 |

Source: Author’s selection.
but all find a negative impact of the COVID-19 pandemic on international trade, particularly in the first half of 2020.

Hayakawa and Mukunoki (2021) also pointed out that sectors are not affected in the same way, i.e. some sectors suffer a negative impact (e.g. durable goods), while medical-related goods have experienced a positive impact. Bekkers and Koopman (2021) provide a quantitative analysis by combining labour supply shocks, reduced supply and demand in some sectors, and an increase in trade costs. They suggest three different scenarios for recovery: V-shaped (optimistic), U-shaped (semi-optimistic) and L-shaped (pessimistic), depending on the combination of anticipated shocks. Regarding trade, the findings indicate a fall of between 8% and 20%.

These negative trends in total trade flows were accompanied with changes in trade policies.

### 2.3 Impact of pandemic on trade policies

From the start of the pandemic in early 2020 there has been a fear about the rise of protectionism. At present, the focus is not on import tariffs (although some were introduced), but rather on the export barriers caused by concerns about national (internal) needs and by ensuring adequate supplies of goods for the national population. This primarily refers to ensuring the medical equipment and medication (COVID-19-related products) for a given country, which may lead to a shortage on the global market. The threat may also have affected the decisions of many governments to close (lock down) all non-essential industrial activities for one or two months in early 2020, and then a partial lockdown at the end of 2020. Such practices will lead to the reorientation of production towards domestic and neighbouring countries, shortening of GVCs and their regionalization, and a fall in FDI. Pauwelyn (2020) explains the rationale for imposing restrictions on exports, especially in the domain of medical masks, medicines, and other medical goods. He points out that, in April 2020, 75 governments had banned or limited exports of medical supplies and medicines. He offers a broad discussion about international agreements and the possibilities of introducing export barriers. Although liberalized trade has been the basic premise in the last 70 years (from signing the GATT), the COVID-19 pandemic has changed these economic policies in many countries. The reasons are both to ensure enough goods for the country’s population, and to keep the prices down. Especially interesting is the EU case where, regardless of a common trade policy, individual countries can introduce export limitations in the special case of protecting the health and life of their citizens. Evenett et al. (2020) analyse the change in trade flows at the beginning of the COVID-19 pandemic, and found trade policy activism in February and March 2020 and heterogeneity across countries in the trade policy measures implemented. In particular, the measures covered the trade of medical products and food, where countries in general imposed restrictive measures on exports. Further, Evenett et al. (2021) critically assess the newly introduced trade policy measures (i.e. limitations on the export of medical supplies and medicines) and presents the possibility of implementing various elements of an alternative, positive, trade policy.

Facing an unfavourable environment (conditions), various barriers imposed, lockdown of economies, and, as a result, trade significantly decreased. The immediate national solution to the “new normal” was to introduce short-term protectionist measures on the export of essential goods, i.e. COVID-19-related products and food.

### 3 IMPACT OF THE PANDEMIC ON GLOBAL VALUE CHAINS (GVCs)

#### 3.1 Pre-pandemic and pandemic challenges to GVCs

The process of spreading international production is closely related (interconnected) to the ongoing process of globalization. Recently, some authors have questioned the “state” of contemporary globalization and whether we are moving towards increasing disruption of global supply chains, and perhaps a new and chaotic “deglobalization”
of the economy (Gupta, 2020; Roscoe et al., 2020). Further, the question is whether we are at the beginning of a move towards resurrecting "lean" and "localized" modes of production, with some manufacturing now in China moving back to the US, the EU, and Latin America (van Hoek, 2020). A report for the European Commission (Comotti et al., 2020) points out the domination of the higher share of intra-EU value added in exports and imports of member states compared to value added from the rest of the world. Handfield et al. (2020) conclude that "many organisations have sought out the lowest cost sources of supply while foregoing more expensive regional suppliers and that executives should now begin to reconsider these actions."

In this section we address the following questions: how will the pandemic affect GVCs? Has the process of renationalization already started? Are GVCs becoming more regional? What should be the direction for their development in the future?

Most recent publications and articles compile analyses of statistical data and are descriptive, so we will highlight the most important findings. The small number of quantitative articles is summarized in Table 2.

GVCs are facing growing distress regarding the social and economic sustainability (Clarke & Boersma, 2017) of ICT development—namely the digitalization of distribution channels—(Hagberg et al., 2016), shorter value chains (Kurpjuweit et al., 2019) and finally the pandemic, which has revealed the fragility of modern GVCs. Even before COVID-19, GVCs had started to focus more on regional markets, i.e. regionalization, with the creation of some regional hubs; location in proximity to consumers; and recognizing the growing role of digitalization.

There is a growing debate about the trade-offs between efficiency and resilience where Gölgeci et al. (2020) conclude that efficiency needs to be sustained to achieve long-term resilience and survival and that the pandemic is not the sole factor that determines the future of GVC structures and strategies. UNCTAD (2020c) gives an overview of the development of international production in the last 30 years, where the first 20 years are marked by huge growth of FDI and GVC development, while the last decade represents stagnation. The pandemic has disrupted production and supply chains, causing global recession and, in the longer term, it has created the imperative to increase the resilience of supply chains and to increase national and/or regional autonomous productive capacities. The GVCs found themselves in a "perfect storm" arising from pre-existing mega trends and the immediate and long-term impacts arising from the pandemic. The former includes (1) technological change, digitalization, less tangible production, less dependence on physical assets, and the greater use of non-equity modes of organizing production; (2) increasing the fragmentation of international economic policy-making (shift from multilateralism towards regionalism and increased protectionism); and (3) sustainable development imperatives (UNCTAD, 2020c). It also points to some possible directions for development in the coming decade, focusing on reshoring, diversification, regionalization, and replication. The OECD (2020a) discusses possible ways that the COVID-19 pandemic could influence GVCs, either directly or indirectly, and makes various suggestions about how to deal with the new kind of risks separately for management levels and also for the government support/channels of support. A report produced by the McKinsey Global Institute also indicates that the shocks that affect global production are not new, but are becoming more frequent and more severe (Lund et al., 2020). They relate to disasters caused by natural hazards, geopolitical uncertainties, terrorism, and cyber-attacks on digital systems. The most recent and the biggest shock is caused by the COVID-19 pandemic. As stated earlier, value chains are not evenly exposed to the shocks; some sectors (communications equipment, apparel) are exposed more than others (medical devices, food, and pharmaceutical products).

Although the authors cited in Table 2 applied different methodologies, different sets of sources, covered different groups of countries and present points on different economic issues, their preoccupation with the Chinese position in GVCs is evident: reorganization or re-engineering of GVCs, welfare impact of reduced GVC activities, and proposed direction for GVCs operating in altered conditions. Baldwin and Freeman (2020) point out two main shocks of the pandemic on production and GVCs: through the number of cases that prevent people's ability to work, and from the expectation that it is hurting demand for manufactured goods. The drop in a nation's income will reduce consumption and imports, while production suffers from a drop in exports. They also show that trade in intermediate products (GVC trade) is more regionalized than in final goods.
| Authors                        | Methodology                                                                 | Sample                                      | Data sources                      | Results                                                                                                                                 |
|-------------------------------|----------------------------------------------------------------------------|---------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Baldwin & Freeman (2020)      | International input-output analysis, Linear algebra analysis               | "Factory Asia," "Factory Europe," "Factory North America" | Inter-Country Input-Output (ICIO) tables, OECD | - Regionalization of GVCs.  
- China is "workshop of the world" (dominance in export of intermediate products).  
- Supply-side disruption in China had huge impact on international production chains. |
| Javorcik (2020)               | Input-output analysis                                                     | China, EU, US, Japan, Korea, Mexico         | EBRD                              | - Businesses will force re-engineering of GVCs.  
- Firms should diversify the supplier base (to avoid huge dependence on China).  
- Reshoring.  
- Resilience. |
| Zeshan (2020)                 | GTAP-VA model                                                              | 140 countries/regions (representing 98% of global GDP) | GTAP database                     | - 10% welfare loss in EU-28. |
| Dallas, Horner, & Li (2021)   | Comparative, qualitative analysis of seven products in the category of personal protective equipment | US, China, EU, Malaysia                    | Eurostat and the US Census Bureau | - Differentiation of two dimensions—GVC "adaptation" and GVC "effectiveness."  
- State policies’ influence on the GVCs.  
- Geographic scope and technological sophistication are key characteristics of GVCs. |
| Meng, Xiuyan, & Xiaoxue (2020) | GVC participation index; GVC position index                               | 64 economies                                | OECD and WTO TiVA (Trade in Value Added) | - China’s role in global economy has increased (as manufacturer; exporter of final goods; dominant supplier of many intermediate inputs).  
- Decline of Chinese backward participation in GVCs (2005-2015).  
- Increase of Chinese forward participation in GVCs.  
- Determination of most affected downstream and upstream sectors and countries by production shocks in China. |

Source: Author’s selection.
Javorcik (2020) shows the dependency of high-tech production in high-income countries on imported intermediate products from China. The pandemic started in China with the closing of borders, and global production suffered (production stopped) due to the unavailability of specific parts that China usually produces. Such a situation will probably motivate businesses, particularly MNCs to re-engineer their GVC. The existing GVCs were designed to reach the greatest levels of efficiency and profits, which the current pandemic renders impossible. One solution could be to put more effort into resilience by diversifying their supplier base, i.e. firms and locations, to avoid possible problems with the (un)availability of inputs, and also through buffer stocks of products. Eppinger et al. (2020) research the impact of the adverse supply shock caused by COVID-19 in China on international trade and GVCs across the rest of the world. They find moderate welfare losses in countries beyond China. They compare the hypothetical welfare loss without GVCs, which is calculated to be 40% in the median country, while in the presence of GVCs the losses are lower for the majority of countries (ranging from -0.75% to +0.12%).

Javorcik (2021) discusses producer vs. buyer-driven GVCs and warns that their reshaping will happen, but it will take time, because this process requires substantial FDI flows. Meng et al. (2020) research the short-term impact of the pandemic on the GVCs that relate to China’s production capacity. They find that downstream countries and sectors are more affected and suffer more from China’s disrupted production than upstream ones. The US, South Korea, Japan, and Germany are the most affected countries, while the most affected sectors include electronic and optical equipment, textiles, machinery, manufacturing, and wholesale trade. Castañeda-Navarrete et al. (2020) undertake detailed research on the global apparel value chain, showing the direct impact of the pandemic through the sickness of workers and reduced production, which they also connect with the situation of reduced demand in high-income countries. The main sufferers are the low- and middle-income countries that are the major producers and exporters of clothing. Zeshan (2020) describes the estimated fall in GDP and trade in 2020. The simulation results indicate that the COVID-19 pandemic has a negative impact on all sectors of the global economy, where the most affected are textiles and clothing, and the most affected countries/regions include the EU, the Middle East and North Africa (MENA), Nepal, and North America.

Foong and Chang (2020) research upstream and downstream interlinkages in Asia, Europe, and North America using OECD input-output tables (with the available data up to 2015). They find that the key intermediaries in both directions in each region are large regional economies, such as China (for Asia), Germany (for Europe), and the US (for North America). Countries in particular regions have multiple nodes which facilitate intra-regional trade in intermediate products, and in relation to countries outside the region, they usually find just a single network from one key regional partner. China underwent major growth in the recent period and was the main extra-regional partner for Europe and North America for upstream intermediary products. Many economies that aim to achieve greater efficiency also have greater dependence on non-regional markets for the absorption inputs (intermediaries, components) in their exports. Diversification of regional partners will reduce concentration and help to deal with potential future risks connected with a situation arising in just one country.

Figure 1 summarizes the already recognized/known challenges that GVCs have been facing recently, and also some existing and new challenges for future development that arise from the literature review. The points in future activities will be in digitalization, building strong regional production chains, resilience of supply chains which are closely connected with diversification (of suppliers), adjustment in governance, and creating appropriate risk-management strategies. The functioning of GVCs in the post-pandemic period is not expected to be the same as it was before. Many questions about trade policy measures, success in combating the COVID-19 virus, possible locking down of economies, and the speed and scope of vaccination are still open regarding the precise direction for their further development. It is certain that efficiency will not be the first or primary concern, and that GVCs’ governance should include consideration of more threats to their strategic development.
The “renationalization” of GVCs

The opposite to the phenomenon of globalization manifests itself in the process of regionalization, with the extreme situation of nationalization, i.e. focusing on self-sufficient production and import-substitution strategies. We highlight selected overviews of articles that calculate the impacts of such reverse policies of renationalization on wealth (Table 3). Bonadio et al. (2020) included 64 countries and 33 sectors to calculate the economic effect of the COVID-19 pandemic. He finds that real GDP will fall by 29.6% during the shock in the case of international production, and that this fall will be even higher (30.2%) in the case of renationalization of supply chains. The shift to domestic inputs (if they are available) would not reduce resilience and contraction generated at the global level, because the domestic economy will probably also be affected by the lockdown of its activities. The localized regimes are characterized by higher protectionism and have significantly lower levels of economic activity and lower incomes. The OECD (2020b) applied its trade model, METRO, for the exploration of two versions of the global economy: (1) production fragmentation in GVCs; and (2) production is more localized, and businesses and consumers rely less on foreign suppliers. The findings are that localized systems with less trade, less fragmentation of production, fewer interconnections, i.e. less internationalization, are characterized by significantly lower levels of economic activity and lower incomes, and will result in economic slowdown and in lower GDP. In addition, it is more vulnerable to shocks due to the limited area of adjustments. Domestic markets need to shoulder most of the adjustment pressures in the localized regime. International (fragmented) production is exposed to country-specific and sector-generic shocks—as in the case of the COVID-19 pandemic—but the impact of the pandemic is harder (in a negative direction) for GDP, consumption, and production in terms of localization. The shift towards a localized regime would reduce welfare and global real GDP by more than 5% on average. Arriola et al. (2020) also point out that relocalization and reducing international linkages will result in less efficiency and less stability. They are focused on quantifying the effects of efficiency and stability in 22 countries (or regions) in the case of interconnection and localization. From the OECD-TiVA database, they calculated the possible exposure to supply or demand shocks. They indicate that exports tend to be concentrated on a few supplying countries, while import destinations tend to be more diversified. The firms that operate in many countries with dispersed production phases and/or interconnections with suppliers (input providers) in different countries create a greater possibility that such firms could be affected by certain kinds of risks specific to a particular country.

From the selected papers, the answer to the question is more than clear and unambiguous. There is no alternative to internationalization, but there may be some new directions in the future processes of GVC development, which would probably diversify into a more regional environment.

Impact of pandemic on GVC governance

Verbeke (2020) discusses the possible impact of the COVID-19 pandemic on the governance of GVCs and identifies four research areas stimulated by the pandemic: investments in intelligence and contracting safeguards, levels of irreversible investments abroad, relational contracting with key partners and ex-post governance, and levels
of diversification. He concludes that “When facing large-scale, uncontrollable risks, firms will adjust their governance systems to mitigate the novel bounded rationality and reliability challenges and create a governance context conducive to sustained value creation” (p. 446). Kano and Hoon Oh (2020) also elaborate the thesis that GVCs in the post-pandemic period will probably be faced with particular changes such as localization, diversification, etc., but they do not expect changes in the principles of GVC governance. Changes that occur will be the result of existing trends that influence GVCs: renewed protectionism, de-Sinicization, and digitization. They emphasize certain specific areas in which the changes/adjustment should be expected: managerial routines for reliability and filling the knowledge gap in micro foundations of GVC governance, geographic scope of GVCs, heterogeneity of actors in GVCs, and GVC performance.

### 3.4 GVC in producing vaccines for the COVID-19 virus

As the data indicates, there was greater trade in so-called COVID-19-related products, from the start of the pandemic. This sector includes protective garments, sterilization products, oxygen equipment, diagnostic testing equipment, medical vehicles and furniture, medical devices, and medical consumables. Many countries around the world imposed export restrictions on such products from March 2020. The WTO collected data about the trade measures (for trade in goods) and, as from February 1, 2021, it includes 276 countries’ specific measures. The EU has implemented 11 different trade measures (mostly directives) and member states have also brought in 21 national measures² (WTO, 2021).

²The EU measures are related to export authorization schemes, regulation of VAT on vaccines, custom issue procedure, ensuring transport flows, border-management measures, public procurement in emergency situations, implementation of green lanes, relief from import duties and VAT exemption on imports granted for goods needed to combat the effects of COVID-19. National measures are related to sales and export of medical products, drugs, and personal protective equipment—they are limited to the specific products and are also time limited. With the balanced supply of these products, those measures were repealed (in April and May 2020) (WTO, 2021).

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| Authors             | Methodology                  | Sample                  | Data sources          | Results                                                                 |
|---------------------|------------------------------|-------------------------|-----------------------|------------------------------------------------------------------------|
| Bonadio et al. (2020) | Quantitative framework and methods developed in Huo et al. (2020) | 64 countries and 33 sectors | OECD Inter-Country Input-Output (ICIO) Tables | Welfare loss in the relocation (renationalization) supply chains is 30.2%, while in internationalization conditions the loss is 29.6% for the duration of the shock (pandemic). |
| OECD (2020b)        | METRO model                  | ...                     | METRO OECD            | GDP decrease of 5% average: supply-chain shocks will more strongly reduce real GDP, consumption, and production in localization regime than in interconnected economies. |
| Arriola et al. (2020) | METRO analysis               | 22 countries            | OECD-TIVA database    | The localized regime (fewer interconnected economies via GVCs), has significantly lower levels of economic activity and lower incomes; localized regime is more vulnerable to shocks, exports tend to be concentrated on a few supplying countries, while import destinations tend to be more diversified. |

Source: Author's selection.
The WTO (2020) points out that trade in medical products grew by 16% (in the first half of 2020 compared to the same period in 2019), where the highest growth was in face-masks (84%), of which China is the leading exporter. In relation to value, medicines remain the largest category, accounting for more than 50% of all traded medical products. This study also found that China, Germany, and the US are the world leaders in such trade (COVID-19 critical products).

According to the Eurostat data, even the EU has a trade surplus in the total trade of COVID-19 products, while most countries had a deficit in intra-EU trade and/or in extra-EU trade. The share of intra-EU exports and imports is just about 50%. This indicates a huge dependence on imports from outside the EU and could result in a shortage of some products. Medical consumables are imported mainly from Switzerland, protective equipment from China, and diagnostic testing equipment from the US. The highest extra-EU import growth in the first half of 2020 compared with the same period in 2019 was protective garments (187%) and sterilization products (73%) (Eurostat, 2021).

At the end of 2020 and in the first half of 2021, the main issue has been to ensure sufficient supplies of vaccines for combating the COVID-19 virus. This highlights the following questions: who will produce the vaccines? How big are the production capacities? How many vaccines can the producers deliver in a short period? How to ensure fair distribution of vaccines?

Those questions are related to GVCs, since the vaccine ingredients are produced in different countries. Fróes de Borja Reis and Guedes Pinto (2021) find that the pharmaceutical value chains are concentrated in North America (predominantly the US), Europe (Germany and Switzerland) and point out that some countries—China, Hungary, India, Mexico, and Poland—became large exporters of pharmaceutical products (due to the low price per kilo, low wages, and deficits in intellectual property rights charges). Kamiike (2020) describes the development of the pharmaceutical industry in India and finds its huge expansion across the world, which resulted from conducting research and development (R&D) and developing generic drugs in order to compete in global markets. Furthermore, the implementation of the TRIPS Agreement has made the Indian pharmaceutical industry more intensive, pushing it up to the higher end of the GVC that includes a continuous process of change, innovation, and productivity growth.

The largest producers of vaccines are Belgium, China, the US, Germany and Belgium together, India, the UK, Belgium and the Netherlands together, Russia, Switzerland, South Korea, Brazil, and South Africa (McCarthy, 2021). The most important producers are companies with production sites in many countries. For instance, Pfizer has 40 Pfizer-owned sites and over 200 suppliers globally, Moderna has five partners, AstraZeneca operates in 15 countries spanning 25 separate manufacturing sites, Johnson & Johnson and Novavax have also established GVCs in vaccine production (Kansteiner & Sagonowsky, 2021).

Although it was announced that the vaccination would start at the end of 2020, with national vaccination strategies leading to most vaccinations having been administered by mid-2021, the first months of 2021 clearly indicated delays in delivery of ordered vaccines and also loss of trust in certain vaccine manufacturers. This rising trend of insufficient (or significantly reduced) deliveries of vaccines motivated the EU to introduce the need to authorize vaccine exports, i.e. export control. The US has reportedly started to impose export restrictions on certain vaccine inputs, including bags and filters (Kay, 2021), which affected producers, especially in India, where the Serum Institute of India, the world’s largest vaccine producer, has contracts to produce the AstraZeneca and Novavax vaccines, and without these US ingredients it cannot fulfil orders. Evenett et al. (2021) call it “vaccine nationalism” and give examples in China, India, the EU, Turkey, and the US. The authors also explain the "Vaccine

Medical goods comprise medical equipment, medicine, medical supplies, personal protective products, not only pharmaceutical products.

Italy was the first EU member state to invoke the EU vaccine export-control regime, blocking a shipment of 250,000 Oxford–AstraZeneca vaccines destined for Australia.

The Biden administration argues that there are not enough raw materials and supplies to go round (the priority is to fulfil the needs of US companies).
Club” of the producers of vaccines and of ingredients. They find that vaccine producers are both the main source and destination for exports of key ingredients. Further, the EU depends on the Vaccine Club for extra-EU imports, while for extra-EU exports the EU has more leverage over those outside the Vaccine Club. They conclude that the EU is largely a self-supplying Vaccine Club, even though that impression may not be the one given in the current situation.  

4 | DISCUSSION AND POLICY IMPLICATIONS

Clearly, the main focus of national policies at this time is to ensure public health and effective health systems. The economic consequences of locking down economies and imposing trade barriers are visible and present, and affecting wide groups of individuals, firms, and MNCs. Global value chains have evolved in the past on the basis of efficiency-seeking, resource-seeking, and technology-seeking strategies. The benefits of their efficiency are not in question; they are fruitful for consumers, owners of firms, and competition in the world markets.

The review of selected publications indicates that the process of changes had already started in the 2010s, with certain imperatives that MNCs had to address. The global trade and investment flows which are the channels of global production had moderate growth in the 2010s, while companies competed with strategies that comprised digitalization, technological changes, fragmentation in international economic policy-making, and sustainability.

The COVID-19 pandemic complicates international production with its numerous barriers: closing borders to movement of people, export bans (authorization schemes), reduced demand, reduced income, raising of national selfishness, unsatisfactory speed and scope of vaccinations, uncertainties about travel, job perspectives, etc.

The "new normal" reality seems to be more oriented towards national interest, primarily to vaccinating most of the population. The examined articles clearly show that renationalization is not the solution for the future activities of GVCs. They should be more focused on diversification and enlargement of the supply chain to be able to replace long-distance imports/exports with those that are closest (regionalization). So, resilience and regionalization are processes which have already started, but which will bloom even more in the future. The example from GVCs in the pharmaceutical industry that is connected with vaccine production highlights the problem of imposed trade barriers on disabling and stopping production of vaccines that have already been ordered on a contractual basis. Also, the main vaccine producers have spread the production process across many countries, which implies that trade policy should be liberalized and a high level of co-operation between countries is needed to enable access to raw materials and other inputs and final products (vaccines). This is the precondition for the producers to manufacture and fulfill their orders. In the process of imposing limitations, the countries of integration (EU) redirect production chains and flows in their national (regional) framework.

5 | CONCLUSION

The COVID-19 pandemic has disrupted production along GVCs and complicated the transport of intermediate products, which has led to losses in many MNCs, and consequently to the drop in global GDP. Trade policy saw a rise in protectionism connected with the domestic supply of medical equipment. The new kind of crisis and unprecedented lockdown of economies swiftly led to discussion about the costs of production around the world and losses that would seem to be overwhelmed if production is located in home countries.

On March 26, 2021, the European Medicines Agency’s Human Medicine Committee adopted a recommendation for new production capacities in Europe: for production of active substances for AstraZeneca’s COVID-19 in the Halix (Leiden, the Netherlands), a new site for production of active substances and finished products for the vaccine Comirnaty (BioNTech and Pfizer) in the German city of Marburg and a new site for production of active substances and finished products for Moderna’s vaccine in Lonza facility (Visp, Switzerland).
This article has reviewed the initial estimations of the impacts of the pandemic on trade and global production. Various authors have pointed out the pre-pandemic stagnation of internationalization (moderate growth of foreign trade and international production since 2010). Global production faces challenges such as the development of new technologies, pre-existing regionalization (with hubs in China, the US, and Germany), fears about deglobalization (or new protectionism), etc. The production of vaccines through pharmaceutical GVCs highlights the problem of imposed trade barriers disabling and halting production processes that are located in different sites and in different countries. The solution will be found in the liberalization of trade policy and a high level of international co-operation.

Some possible new directions of international production development that have been elaborated are the trade-off between efficiency and resilience, shortening of the value chain, refocusing on regional trade links instead of GVCs, reshoring activities, but also closely related to this is that trade policy changes during the pandemic have overshadowed the long-term liberalization process.

What is important is that relocation strategies are neither desirable nor useful, and the empirical findings indicate bigger welfare losses than in the internationalization regime, even in relation to risks (shocks). Internationalization and GVCs will overcome the disruptions caused by the pandemic and will continue their activities with more resilient strategies and with continuous adjustments to new global market conditions.

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DATA AVAILABILITY STATEMENT
Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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REFERENCES
Arriola, C., Guilloux-Nefussi, S., Koh, S.-H., Kowalski, P., Rusticelli, E., & van Tongeren, F. (2020). Efficiency and risks in global value chains in the context of COVID-19 (OECD Economics Department Working Paper No. 1637). OECD Publishing. https://doi.org/10.1787/3e4b7ecf-en
Baldwin, R., & Freeman, R. (2020, April 1). Supply chain contagion waves: Thinking ahead on manufacturing ‘contagion and re-infection’ from the COVID concussion. VoxEU.org. https://voxeu.org/article/covid-concussion-and-supply-chain-contagion-waves
Bekkers, E., & Koopman, R. B. (2021). Simulating the trade effects of the COVID-19 pandemic: Scenario analysis based on quantitative trade modelling. World Economy. Advance online publication. https://doi.org/10.1111/twec.13063
Bonadio, B., Huo, Z., Levchenko, A. A., & Pandalai-Nayar, N. (2020). Global supply chains in the pandemic (NBER Working Paper No. 27224). NBER. https://www.nber.org/papers/w27224
Castañeda-Navarrete, J., Hauge, J., & López-Gómez, C. (2020). COVID-19’s impacts on global value chains, as seen in the apparel industry. Development Policy Review. Advance online publication. https://doi.org/10.1111/dpr.12539
Clarke, T., & Boersma, M. (2017). The governance of global value chains: Unresolved human rights, environmental and ethical dilemmas in the apple supply chain. Journal of Business Ethics, 143(1), 111-131. https://doi.org/10.1007/s10551-015-2781-3
Comotti, S., Crescenzi, R., & Lammarino, S. (2020). Foreign direct investment, global value chains and regional economic development in Europe. European Commission. https://ec.europa.eu/regional_policy/sources/docgener/brochure/foreign_direct_investment_en.pdf
Dallas, M. P., Horner, R., & Li, L. (2021). The mutual constraints of states and global value chains during COVID-19: The case of personal protective equipment. World Development, 139. https://doi.org/10.1016/j.worlddev.2020.105324
Eppinger, P., Felbermayr, G., Krebs, O., & Kukharsky, B. (2020). Covid-19 shocking global value chains (Kiel Working Paper No. 2167). Kiel Institute for the World Economy. https://www.ifw-kiel.de/fileadmin/Dateiverwaltung/IFW-Publications/Gabriel_Felbermayr/Covid-19_Shocking_Global_Value_Chain/Covid-19_Shocking_Global_Value_Chain.pdf

Eurostat. (2021, March). EU trade in COVID-19 related products. Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_trade_in_COVID-19_related_products#Per_capita_trade_largest_in_Ireland

Evenett, S. J., Fiorini, M., Fritz, J., Hoekman, B., Lukaszuk, P., Rocha, N., Ruta, M., Santi, F., & Shingal, A. (2020). Trade policy responses to the COVID-19 pandemic crisis: Evidence from a new dataset. European University Institute Robert Schuman Centre for Advanced Studies. (EUI Working Paper RSCA No.78). https://cdmus.eui.eu/bitstream/handle/1/814/69107/RSCAS_2020_78.pdf?sequence=1&isAllowed=y

Evenett, S. J., Hoekman, B., Rocha, N., & Ruta, M. (2021). The Covid-19 vaccine production club: Will value chains temper nationalism? (Policy Research Working Paper No. 9565). World Bank. https://openknowledge.worldbank.org/handle/10986/35244

Foong, G., & Chang, P.-L. (2020). The potential impacts of COVID-19 on the global value chains: GVC positioning and linkages (Research Collection School of Economics Working Paper No.11). Singapore Management University. https://ink.library.smu.edu.sg/soe_research/2411

Fröes de Borja Reis, C., & Guedes Pinto, J. P. (2021). Center–periphery relationships of pharmaceutical value chains: A critical analysis based on goods and knowledge trade flows. Review of Political Economy. Advance online publication. https://doi.org/10.1080/02783016.2021.1882192

Gölgeci, I., Yildiz, H. E., & Andersson, U. (2020). The rising tensions between efficiency and resilience in global value chains in the post-COVID-19 world. Transnational Corporations, 27(2), 127–141. https://doi.org/10.18356/99b1410f-en

Gruszczynski, L. (2020). The COVID-19 pandemic and international trade: Temporary turbulence or paradigm shift? [Special issue]. European Journal of Risk Regulation, 11(2), 337–342. https://doi.org/10.1017/err.2020.29

Gupta, A. (2020). After Covid: The new normal webinar [Video]. YouTube. https://www.youtube.com/watch?v=UqBqSII3ltU&app=desktop

Hagberg, J., Sundström, M., & Nicklas, E. Z. (2016). The digitalization of retailing: An exploratory framework. International Journal of Retail & Distribution Management, 44(7), 694–712. https://doi.org/10.1108/IJRDM-09-2015-0140

Handfield, R. B., Graham, G., & Burns, L. (2020). Coronavirus, tariffs, trade wars and supply chain evolutionary design. International Journal of Operations & Production Management, 40(10), 1649–1660. https://doi.org/10.1108/ijopm-03-2020-0171

Hayakawa, K., & Mukunoki, H. (2021). The impact of COVID-19 on international trade: Evidence from the first shock. Journal of the Japanese and International Economies, 60, 101135. https://doi.org/10.1016/j.jjie.2021.101135

Huo, Z., Levchenko, A. A., & Pandalai-Nayar, N. (2020). International comovement in the global production network (NBER Working Paper No. 25978). NBER. https://doi.org/10.3386/w25978

International Monetary Fund. (2020, October). World economic outlook: A long and difficult ascent. https://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020

Javorcik, B. (2020). Global supply chains will not be the same in the post-COVID-19 world. In R. E. Baldwin & S. J. Evenett (Eds.), COVID-19 and trade policy: Why turning inward won’t work (pp. 111–116). CEPR Press. https://voxeu.org/content/covid-19-and-trade-policy-why-turning-inward-wont-work

Javorcik, B. (2021). Reshaping of global supply chains will take place, but it will not happen fast. Journal of Chinese Economic and Business Studies, 18(4), 321–325. https://doi.org/10.1080/14765284.2020.1855051

Kamille, A. (2020). The TRIPS Agreement and the pharmaceutical industry in India. Journal of Interdisciplinary Economics, 32(1), 95–113. https://doi.org/10.1177/0260107919875573

Kano, L., & Hoon Oh, C. (2020). Global value chains in the post-COVID world: Governance for reliability. Journal of Management Studies, 57(8), 1773–1777. https://doi.org/10.1111/joms.12626

Kansteiner, F., & Sagonowsky, E. (2021, March 3). What does it take to supply COVID-19 vaccines across the globe? Here’s how the leading players are working it. Fierce Pharma. https://www.fiercepharma.com/special-reports/vaccine-supply-chains-holding-line-against-covid-19

Kay, C. (2021, March 4). Largest vaccine maker warns of delays as U.S. prioritizes Pfizer. Bloomberg. https://www.bloomberg.com/news/articles/2021-03-04/largest-vaccine-maker-warns-of-delays-as-u-s-prioritizes-pfizer

Kurpiuwiet, S., Schmidt, C. G., Klöckner, M., & Wagner, S. M. (2019). Blockchain in additive manufacturing and its impact on supply chains. Journal of Business Logistics, 42(1), 46–70. https://doi.org/10.1111/jbl.12231

Lund, S., Manyika, J., Woetzel, J., Barriball, E., Krishnan, M., Aliche, K., Birshan, M., George, K., Smit, S., Swan, D., & Hutzler, K. (2020). Risk, resilience, and rebalancing in global value chains. McKinsey Global Institute. https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains#
Meng, Q., Xiuyan, L., & Xiaoxue, Z. (2020). COVID-19 shock and global value chains: Is there a substitute for China? *Emerging Markets Finance and Trade*, 56(15), 3588–3598. https://doi.org/10.1080/1540496X.2020.1855137

Organisation for Economic Co-operation and Development. (2020a, June 3). COVID-19 and global value chains: Policy options to build more resilient production networks. https://www.oecd.org/coronavirus/policy-responses/covid-19-and-global-value-chains-policy-options-to-build-more-resilient-production-networks-04934ef4/

Organisation for Economic Co-operation and Development. (2020b). Shocks, risks and global value chains: Insights from the OECD METRO model. https://doi.org/10.3386/w27224

Pauwelyn, J. (2020). Export restrictions in times of pandemic: Options and limits under international trade agreements. *Journal of World Trade*, 54(5), 727–747. https://kluwerlawonline.com/journalarticle/Journal+of+World+Trade/54.5/TRA20200031

Roscoe, S., Skipworth, H., Aktas, E., & Habib, F. (2020). Managing supply chain uncertainty arising from geopolitical disruptions: Evidence from the pharmaceutical industry and Brexit. *International Journal of Operations & Production Management*, 40(9), 1499–1529. https://doi.org/10.1108/IJOPM-10-2019-0668

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

UNCTAD. (2020a, March). *Impact of the Coronavirus outbreak on global FDI* (Global Investment Trend Monitor, No. 34). https://unctad.org/system/files/official-document/diaeiainf2020d2_en.pdf

UNCTAD. (2020b, March). *Impact of the COVID-19 pandemic on global FDI and GVCs: Updated analysis* (Global Investment Trend Monitor, No. 35). https://unctad.org/system/files/official-document/diaeiainf2020d3_en.pdf

UNCTAD. (2020c). *World investment report 2020*. https://unctad.org/webflyer/world-investment-report-2020

UNCTAD. (2020d). *Handbook of statistics 2020*. https://unctad.org/webflyer/handbook-statistics-2020

UNCTAD. (2020e). *Trade and development report 2020*. From global pandemic to prosperity for all: Avoiding another lost decade. https://unctad.org/system/files/official-document/trd2020_en.pdf

van Hoek, R. (2020). Research opportunities for a more resilient post-COVID-19 supply chain, Closing the gap between research findings and industry practice. *International Journal of Operations & Production Management*, 40(4), 341–355. https://doi.org/10.1108/IJOPM-03-2020-0165

Verbeke, A. (2020). Will the COVID-19 pandemic really change the governance of global value chains? *British Journal of Management*, 31(3), 444–446. https://doi.org/10.1111/1467-8551.12422

Vidy, C. T., & Prabheesh, K. P. (2020). Implications of COVID-19 Pandemic on the Global Trade Networks. *Emerging Markets Finance and Trade*, 56(10), 2408–2421. https://doi.org/10.1080/1540496X.2020.1785426

World Bank. (2020). *World Development Report 2020*. Trading for Development in the Age of Global Value Chains. https://www.worldbank.org/en/publication/wdr2020

World Trade Organization. (2020). *World trade statistical review 2019*. https://www.wto.org/english/res_e/statis_e/wts2019_e/wts2019_toc_e.htm

World Trade Organization. (2021, July 2). *COVID-19: Measures affecting trade in goods*. https://www.wto.org/english/tratop_e/covid19_e/trade_related_goods_measure_e.htm

Zeshan, M. (2020). Double-hit scenario of Covid-19 and global value chains. *Environment, Development and Sustainability*, 23, 8559–8572. https://doi.org/10.1007/s10668-020-00982-w

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