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COVID-19 AND GLOBAL VALUE CHAINS PARTICIPATION: EXPORT PERFORMANCE OF CROATIAN FIRMS

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Abstract

For the last two-three years, the disruptions of the GVC caused by the COVID-19 pandemic have forced the business sector to restructure and adjust, sometimes very costly and painful. Moreover, with the recent war in Ukraine foreseeable negative implications, it is very certain that large-scale disruptions in the global economic trade and investment flows, and ultimately in the GVC, will dictate the survival and sustainability of business in many economic sectors in the years to come. The main goal of this paper is twofold. First, to review the existing research on the effects of the COVID-19 pandemic on global trends affecting the current reconfiguring and reshaping of the GVC. Second, to analyse the characteristics of Croatian firms that recorded a decrease in their (indirect and direct) exports in the COVID-19 period by performing a logit model and utilising the World Bank's Enterprise Survey 2019, backed up by the Enterprise Surveys Follow-Up on COVID-19 (3 rounds up to now).

Keywords: *COVID-19, global value chains, New EU Member States, Croatia, exports*

JEL Classification: *F14, F23, F60, F61*

1. Introduction

Although participation in Global Value Chains (GVC) has been slowing since the global financial crisis, especially after 2011, the most notable decrease in GVC participation happened since the start of the COVID-19 global pandemic in 2020. The recent devastating war in Ukraine only heavily underlined this trend of de-globalisation, which the *Economist* fitfully coined as general "slowbalisation", i.e. reduction in the scale of the overall globalisation process.

The significant global negative implications of the conflict in Ukraine are already causing large-scale disruptions in global economic trade and investment flows. As the GVC, by its nature, is strongly transmitting these exogenous disruptions, the immediate natural reactions of both businesses and governments are reducing exposure to such kinds of international shocks and reconfiguring their participation in GVC

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more towards regional and local levels (known as nearshoring or re-shoring). In his recent paper, Zhan (2021) argues that one of the essential driving forces behind recent GVC reconfiguring is "resilience-oriented restructuring" to ensure development sustainability, which has been especially underlined in the context of the new geopolitical situation.

The analyses in this paper are concerned with two main research questions:

RQ1: What are the main effects of the COVID-19 pandemic on GVC and global trends affecting the current reconfiguring and reshaping of the GVC?

RQ2: What are the effects of COVID-19 on firm-level export performance and their participation in GVC?

The paper aims to contribute to the current discussions by exploring the case of Croatia as a late-comer member state of the EU. Although the entire EU was hit hard by the COVID-19 pandemic regarding trade and production (Kolev and Obst 2022), there are noticeable differences between the individual Member States. Also, while most GVC analyses and published work focus on aggregate macroeconomic impacts, our attention in this paper is directed towards the level of the enterprise sector where the GVC disruptions have had immediate results and required adequate realigning to the new situation. The novelty of our analysis is that when examining the effects of Covid-19 on the Croatian business sector, we rely on three rounds of the World Bank Enterprise Surveys Follow-Up on COVID-19, combined with the baseline World Bank's Enterprise Survey 2019. These data have assisted us in surmounting the lack of systemic data on the impact of COVID -19 and provided an excellent analytical window into the immediate changes triggered by the pandemic at the firm level. In addition, the novelty of this research is reflected in the grouping of the firms by various definitions of GVC participation that are available in the literature. Precisely, as a GVC firm, we consider the firm that is a two-way trader (joint importer-exporter), in addition to the broader definition of being only exporters.

The paper is structured as follows. In Section 2, following the Introduction, we explore the existing literature, which covers especially GVC during COVID-19 but also touches briefly upon the trends formed since the financial crisis in which notable shifts in GVC have appeared. In Section 3, we analyse the effect of COVID-19 on Croatian firms export performance, primarily focusing on the GVC participation, utilising the three rounds of Enterprise Surveys Follow-Up on COVID-19 and Enterprise Survey 2019 as our baseline. We conducted the logistic regression model that estimates for which firms the probability of a decrease in exports (both direct and indirect) is larger, using the data from all three rounds of ES Follow-Up Surveys and information from the baseline ES2019 survey. We put particular focus on two GVC groups of firms which are, according to the available research, primarily defined as two-way traders (both importers and exporters), backed up by the broader definition of being exporters. In the final, Section 4, we draw some concluding remarks and implications for policy and identify further research avenues worth exploring, especially related to Croatian enterprise sector participation in GVC.

2. GVC during the COVID-19: Some insights from related literature

The COVID-19 pandemic is an unprecedented challenge for countries globally, affecting all aspects of life. One of these aspects includes the disruptions within the globally fragmented production processes and global value chains (GVCs). It is estimated that most international trade today encompasses flows associated with GVCs, which are characterised by the shifts of intermediate goods, services and technology (Zavarská 2022). For example, OECD (2020) estimates that about 70% of world trade is happening via participation in the GVC. However, the downside of rising vertical integration of production processes via GVC is an intensive dependency and interconnectedness on intermediate products and, consequently, the international transmission of global shocks. This became particularly evident in the aftermath of the global financial crisis, especially after 2011. Yet, the most significant blow to the GVC flows came in 2020 with the outbreak of the worldwide COVID-19 pandemic. Furthermore, the February 2022 Russian invasion of Ukraine only aggravated the problem of exogenous shocks on disruptions in international trade and investments and exposed it to its full scale. All these developments have significantly changed global trade flows and resulted in a contraction of its volume and value. WEF (2021: 5) states that GVCs are currently "in a perfect storm at the nexus of emerging technologies, the environmental sustainability imperative and geopolitical tensions". Hence, the new term often used in recent academic and expert analyses is "poly-crises" when exploring an impact on trade flows and GVC (Evenett 2022).

The existing literature dealing with the effects of the pandemic on GVC can in general be split into two

streams - the one dealing with the aggregate data sources and country-level data (such as OECD TiVA) and the one utilising survey data at firm-level (such as World Bank Enterprise Survey Data).

Kersan-Škabić (2022a), in her thorough and systematic literature review of the effects of COVID-19 on GVC disruptions, considers that the pandemic only accelerated and amplified the processes and trends that already existed. Its main contribution was raising global awareness of their presence to a new level. According to the author, the COVID-19 pandemic heightened threats and vulnerability to intensively internationalised segments of production of medical equipment and medication because of shortages caused by high global demand, but also due to breaking of supply changes. In such conditions, global value chains began to be very vulnerable and countries started to re-introduce local production of crucial products (such as masks, hand disinfection gels etc.) and re-impose export restrictions. In examining the rationale for imposing the export restrictions, Kersan-Škabić (2022a) refers to the work of Pauwelyn (2020), who singled out that at the beginning of the COVID-19 pandemic; as many as 75 countries have banned or restricted exports of medical supplies and medicines. As a result, the pandemic was perceived as an extraordinarily health-threatening situation and many nations restricted or suspended some GATT rules of liberalised trade. In the EU, for those specific reasons, individual member countries were also allowed to introduce export limitations despite the EU rules of common trade policy (Kersan-Škabić 2022a).

According to Brenton et al. (2022), who analysed the World Bank data, during the COVID-19 crisis, the volume of global trade in goods and services decreased by 8.3%, primarily due to the extensive COVID-19 lockdowns and border closures. Precisely, the value of goods trade dropped by 8 % while the value of services trade dropped by 21% in 2020, within which travel services were affected the most. In addition, transport services declined even faster due to the severe impact on passenger transport. However, the category of other services proved to be more resilient than transport and travel services which is consistent with the belief that some of these additional services (such as information technology services and e-commerce) were able to function in an online environment (Brenton et al. 2022).

Since a trade statistic based on gross trade flows does not say much about the international input-output linkages, input-output tables were developed to more accurately measure GVCs (Koopman et al. 2010; Ayadi et al. 2022). The sufficient condition for considering trade as GVC is that it crosses at least two borders. This can be seen as the sum of two measures of cross-border linkages, i.e. backward GVC participation and forward GVC participation (Borin, Mancini, and Taglioni 2021). It is often pointed out that in this way an overvaluation problem in gross exports are addressed (Waldkirch 2021). The most widely used measure, as stated by Fernandes et al. (2021), is backward GVC participation which captures the import content of exports, i.e. how much imported materials are used in countries. On the other side, a country's forward GVC participation measures the domestic value added in exports used by the country's bilateral partner countries for export production as per cent of the country's total gross exports. In other words, it captures a share of domestic value added that is not directly consumed by the bilateral partner (Koopman 2014; Fernandes et al. 2021).

By employing backward and forward linkages, Wuri, Widodo, and Hardi (2022) analysed the COVID-19 pandemic effect on GVC participation in different institutional quality countries and estimated the system GMM model using the Asian Development Bank Multi-Regional Input-Output data for the period from 2010 to 2020. Their results showed that the COVID-19 pandemic significantly decreased GVC participation, with forward participation being larger than backward GVC in most countries. Regarding the difference between regions, the results showed that North American countries had the highest average GVC participation from the forward linkage perspective. In contrast, EU countries have the highest backward linkage values.

Ayadi et al. (2021) analysed the COVID-19 pandemic effects on countries through their regional integration and exposure to GVCs using input–output tables from the EORA dataset. Their results showed, contrary to the previously described paper, that most countries have relatively more extensive backward GVC linkages than forward ones. Also, at the level of specific countries, the authors highlight that Italy and France produce more value-added that is absorbed abroad than the foreign value-added they consume.

Further, Espitia et al. (2022) estimated difference-in-difference models that interact with COVID-19 shocks with sector characteristics in a sample of 28 exporting countries from February to June 2020. Their results show that the adverse trade effects induced by COVID-19 shock greatly varied between different sectors. More precisely, in the trade sector, the results showed that participation in GVCs increased the vulnerability of traders to shocks suffered by trading partners. Still, it also reduced their exposure to domestic shocks.

However, as shown within the latest Global Economic Prospect report of the World Bank (2022),

the post-COVID recovery was faster for the trade of goods, while services trade is still lagging, and the recovery in global trade brought an increase in demand for highly trade-intensive manufactured goods, particularly durable goods. According to the report, GVCs pressures in 2021 were driven mainly by temporary factors, such as factory and port lockdowns, weather-induced logistics bottlenecks, and a deficiency of semiconductors and shipping containers. At the same time, industries have exhausted inventories as a response to increased demand. However, at the end of 2021, the supply chain started slightly recovering (World Bank 2022).

When it comes to microdata analysis, in their paper on the resilience of GVCs during Covid-19, Giglioli et al. (2021) analysed to what extent the participation in GVCs has exposed countries and firms to economic shocks, with a particular focus on Italy, which was hit the hardest by the COVID-19 first wave. The authors find that in the initial phases of the pandemic (i.e. first wave), the GVC participation might have contributed to the transmission of shock in terms of GDP variation. However, they obtained a positive correlation between the variables during the later stages and the second wave. Another paper dealing with the firm-level analysis is the one of Waldkirch (2021), who, on a sample of 21 countries, analysed the effect of COVID-19 on firm performance and obtained that effects were predominantly adverse in terms of business closures, fall in sales and significant exports decrease.

Finally, although the literature dealing with the adverse effects of the pandemic on GVCs is prevailing, there are also authors, such as Espitia et al. (2022), who highlight that participation in GVCs can both lessen or increase the adverse trade effects of COVID-19 shocks, as well as those (e.g. Panwar et al. 2022; Coveri et al. 2020, Shepard 2021) who stress the role of the crisis as a mean for strengthening and reconfiguration of the global economy. Several other authors (such as Gupta 2020; Roscoe et al. 2020) have a similar argumentation stressing that predictions of somewhat chaotic de-globalisation as a side effect of sudden disruptions of GVC, which were present in the early stages of the pandemic, did not materialise. Evenett (2022) and Freeland (2022) consider that enterprise sector executives should be beware of misleading narratives of the broad globalisation retreat. Koopman (2022), the former Chief Economist of the World Trade Organisation (WTO), when examining the lessons learned in the COVID-19 pandemic, also considers that despite wide-scale disruptions, trade and GVCs remain relatively robust. When it comes to the practical EU policy response for mitigating the effects of the GVC disruptions and building resilience, the European Commission adopted policies of "Open Strategic Autonomy" which Christine Lagarde (2022), is calling a "managed globalisation".

As for the foreseeable future global trends, Zahn (2021) argues that GVC will undergo a significant transformation and reconfiguration in this decade, outlining the five fundamental driving forces: "a) economic governance re-alignment, b) technology and the new industrial revolution, c) the sustainability endeavour, d) corporate accountability, and e) resilience-oriented restructuring" (Zahn 2021: 206). Some of the transformations are already underway and supported by current policies in many parts of the world, including the EU, such as those directed at enhancing resilience to exogenous shocks through digitalisation and introducing more energy and climate-sustainable production practices. It is certain that COVID-19 did not cause but only triggered faster transformation and impact of identified drivers.

3. Empirical assessment of COVID-19 effects on GVC in Croatia - firm level analysis

Regarding most of the available international data and participation indices, Croatia stands very low on GVC ladder. However, the situation has somewhat improved since it acceded to the EU, along with the significant increase in Croatian exports, according to the work of Orsini and Perić (2021). Kersan-Škabić (2017), in her paper about participation in GVC, also demonstrated that Croatia is, positioned at the very bottom of the EU and elaborated two main reasons for the such position: (1) the economic structure and (2) late accession to the EU. In the new geopolitical situation, however, the low participation in GVC could be an advantage rather than a disadvantage, at least in the short-term. Namely, the international exogenous shocks caused by COVID-19 and recent conflict in Ukraine so far did not hit Croatia as hard as, for instance, Germany or Italy, which are highly positioned in GVC flows. More precisely, in 2020, the first pandemic year, relative to 2019, Croatia increased its forward component while decreasing its backward component. Generally, Croatia and other NMS have a larger share of backward than forward participation, which could mean that they have a better position in the GVC due to the higher foreign content of exports and thus improving their place in the downstream part of the value chain (Vidaković Peruško, Kovač, and Jošić 2018). The work of Vidaković Peruško, Kovač, and Jošić (2018) also showed that Croatia's integration

in GVCs was relatively unchanged in the pre-COVID period.

As for the participation of Croatia in service sector exports and in-service support to manufacturing exports, Kersan-Škabić (2022b) analyses of OECD TiVA data for 2005-2016 demonstrate a high share of domestic value added in export of services in total gross exports (51%) because of tourism as a dominant services sector. On the other side, the services total value-added participation into manufacturing exports is, together with Greece, among lowest in the EU, i.e. below 30% in 2016 (Kersan-Škabić 2022b). That is pointing towards lesser developed "servisication" of manufacturing sector, i.e various types of services which directly support and ease exports of manufacturing production such as ICT, finance and insurance, transportation and storage services, and public administration services. Building on the existing knowledge for aggregate data, we proceed with more detailed analysis of GVC participation with available data at the firm-level.

3.1. Data

In order to offer additional firm-level analysis of the pandemic effects, in this paper we focus solely on Croatia, the newest EU member state. Croatia is included in the latest Covid-19 specific surveys conducted by the World Bank (3 rounds up to now for Croatia). The main advantage of these surveys is reflected in the fact that they follow up on recently conducted regular Enterprise Surveys (ES) allowing a comparison to pre-COVID period (Waldkirch 2021), as they can be merged by using the firm's id number.

Firstly, the table below provides the main average findings about the effects of Covid-19 on the Croatian firms included in the survey. Business owners and top managers of total of 404 firms were interviewed between November 2018 and November 2019 as part of the standard ES. The same firms were again contacted in September 2020 (Round 1), December 2020 and January 2021 (Round 2) and in May and June 2021 (Round 3).

The data show that Croatian firms faced many challenges related to COVID-19's effects on their performance: average monthly sales dropped, the firms had to decrease the number of full-time workers, and the national sales component of total sales increased relative to the export (direct and indirect). In addition, however, an increase in the share of firms that started or increased online business is observed. Finally, there is a large share of firms that received national or local support/subsidies in surpassing the adverse effects of the pandemic.

Stojčić (2020), using the same database (Round 1), but focusing on the manufacturing sector, showed that the Covid-19 pandemic negatively affected companies' operations, with adverse effects being more noticeable amongst export-oriented firms. Vujanovic et al. (2021) argue that COVID-19 brought also disruptions of investment flows halting the process of positive FDI spillovers on knowledge transfer and technology absorption processes in domestic firms as well as increased difficulties in accessing external funding, especially for SMEs.

Table 1. The effects of Covid-19 on the Croatian firms in various domains

	Round 1	Round 2	Round 3
% of firms that have ever temporarily closed during COVID-19 outbreak	29.7	34.5	33.1
% of firms started or increased online business (%)	12.6	14.9	18.6
Average change in monthly sales compared to one year ago (%)	-16.5	-18.7	5.4
% change of permanent full-time workers since ES	-3.9	-3.2	-2.8
% of firms that received national or local government assistance	60.6	63.3	65.7
Proportion of monthly sales that are domestic sales (%)	89.6	92	91.8
Proportion of monthly sales exported directly (%)	9.4	7.3	7.3
Proportion of monthly sales exported indirectly (%)	1.0	0.7	0.9

Source: Authors compilation based on the Enterprise Surveys Follow-Up on COVID-19 (https://www.enterprisesurveys.org/en/enterprisesurveys)

This paper focuses on the GVC firms, for which, when it comes to the firm-level data, there is no unique measure in the literature and various approaches can be found. Previous research offers many possibilities for classifying GVC and non-GVC firms using survey data. Precisely, some analysts identify GVC firms as traders who have a quality certification (Del Prete, Giovannetti, and Marvasi 2017; Reddy et al. 2021); some stress the condition of participation in GVCs of firms exporting and importing at the same time being the two-way traders (e.g. Winkler and Rigo 2021; Baldwin and Yan 2014; Orlic 2016). Others take into consideration importing foreign intermediate goods or exporting products where import and export take both direct and indirect forms (see, e.g. Ehab and Zaki 2021; Urata 2021; Reddy, Chundakkadan and Sasidharan 2021; Orlic 2016). While in indirect export, a firm may produce items that are used in the goods exported by other firms, direct export is more difficult due to the high fixed costs of finding importers and building networks in foreign countries. Some authors even classify GVC firms as firms with a share of direct exports larger than 40% (Wignaraja 2013) or larger than 10% (Gopalan, Reddy, and Sasidharan2022).

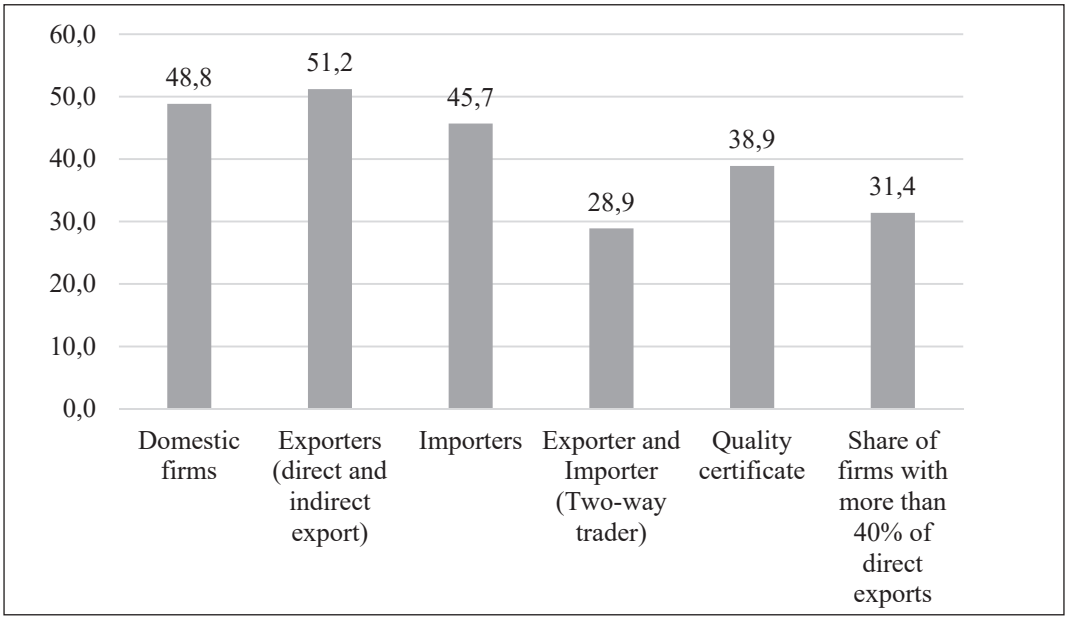
Figure 1 shows the shares of GVC firms in Croatia if classified according to the above-mentioned approaches. In doing so, we combine the regular Enterprise Survey 2019 as a baseline and Enterprise Survey Follow-Up on COVID-19 (Round 1, Round 2 and Round 3). We build our GVC groups of firms based on the survey information on both direct and indirect exports, through the following question [*In the last completed month, …, what percentage of this establishment's sales were: -National sales; -Indirect exports (sold domestically to a third party that exports products); -Direct exports].* Also, for building a group of two-way traders, we added a question [*Were any of the material inputs or supplies purchased in the fiscal year* **…** *imported directly?].* Finally, to include the international quality certification dimension, we utilise the following question: *[Does this establishment have an internationally-recognized quality certification?].*

Further, figure 2 and figure 3 shows the general shares of firms that experienced a decrease in direct and indirect exports since the regular ES2019 (our baseline). The data point out that a fall in direct exports was more dramatic in manufacturing than in services, while the opposite holds for indirect exports.

Also, regarding ownership, firms with foreign ownership experienced a larger drop in exports that domestic ones.

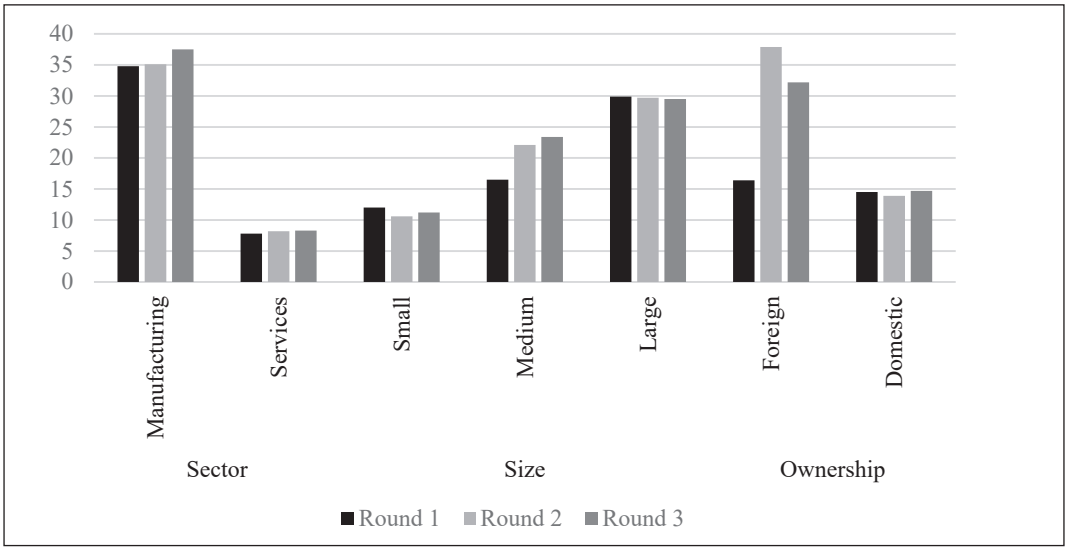
In following section, we analyse in more detail for which firms the probability of a decrease in exports (both direct and indirect) is larger, using the data from all three rounds of ES Follow-Up Surveys, as well as information from the baseline, ES2019 survey. We put special focus on two GVC groups of firms as defined above, i.e. the two-way traders and exporters only.

Figure 1. Firms (%) in a GVC according to different definitions



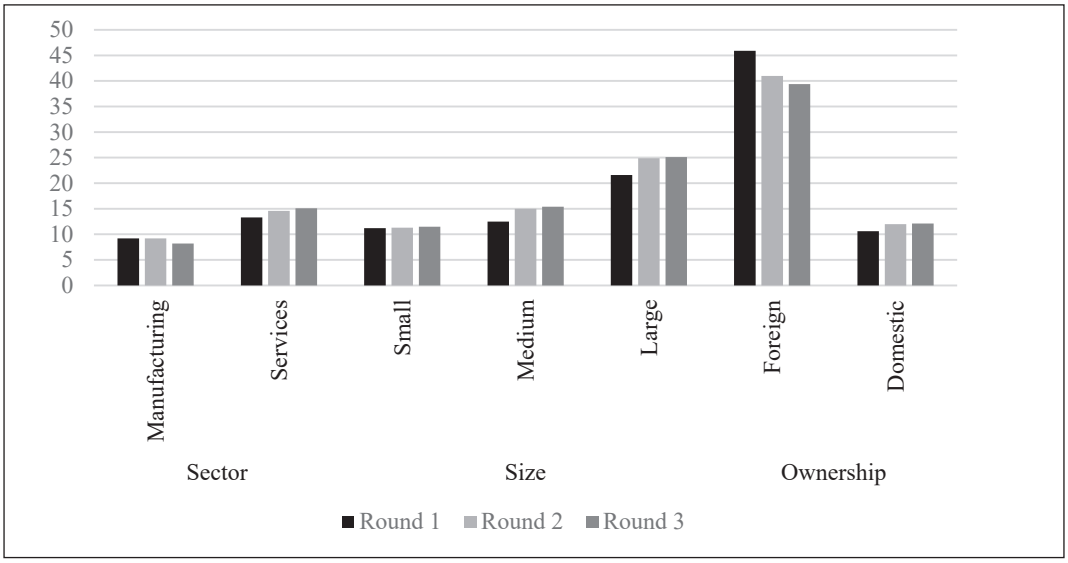
Source: Authors compilation based on the ES 2019.
(https://www.enterprisesurveys.org/en/enterprisesurveys)

Figure 2. The proportion of firms that decreased direct exports since ES (in %, by firm characteristics and sector)



Source: Authors compilation based on the Enterprise Surveys Follow-Up on COVID-19 (https://www.enterprisesurveys.org/en/enterprisesurveys)

Figure 3. The proportion of firms that decreased indirect exports since ES (in %, by firm characteristics and sector)



Source: Authors compilation based on the Enterprise Surveys Follow-Up on COVID-19 (https://www.enterprisesurveys.org/en/enterprisesurveys)

3.2. Methodology

Previous studies have found numerous characteristics of the firms that participate in GVCs by undertaking various econometric approaches, regressing a firm's GVC participation on a number of independent variables (i.e. firm characteristics). We adopt the same approach but with a difference of analysing the characteristics of firms that decreased indirect and direct exports in the COVID-19 period.

Our final sample consists of 175 companies classified as exporters (both direct and indirect export) and 104 firms classified as two-way traders. We dropped the firms that are permanently closed and those with blank spaces in the answers on the question [*Currently is this establishment open, temporarily closed (suspended services or production), or permanently closed*]).

Regarding the methodology, the paper uses a logistic regression model, the goal of which is to describe the relationship between the dependent

variable (response or outcome variable) and a set of independent (predictor or explanatory) variables. Logistic regression allows us to predict the values of a binary variable that takes only two values, 0 or 1, depending on a set of explanatory variables that can be both continuous or categorical. More specifically, the model estimates probabilities of GVC firm's decrease in exports (direct and indirect) relative to the sector, size, demand for the firm's product or service, use of foreign technology, innovation, the primary market in which the firm is selling its main product and firms age.

The model can be written as follows:

$$change\_EX=\beta_1+\beta_2\,(sector)+\beta_3\,(size)+\beta_4\,(tech)+\beta_5\,(inno)+\beta_6\,(demand)+\beta_7\,(market)+\beta_8\,(age)+\varepsilon$$

where *change_EX* is a binary dependent variable indicating whether a firm decreased the exports (value 1) or not (value 0) in relation to the pre-Covid period. The variables *sector, size, tech, inno, demand, market and age* are predictor variables, and they are in more detail described in table 2.

Variables *tech, inno, demand, market* and *age* are constructed using the baseline ES2019 survey, and the information for variables *change_EX*, *sector* and *size* are obtained from Enterprise Survey Follow-Up on COVID-19 (Round 1, Round 2 and Round 3).

3.3. Results and discussion

The table below presents results from the logistic regression model on the main determinants of probabilities of a decrease in indirect and direct export relative to the pre-COVID period. Since logistic regression coefficients are difficult to interpret, the results are translated into the predicted probabilities calculating the marginal effects. Two models were estimated depending on the definition of GVC participation. Model diagnostic is provided in Appendix 1.

The results show that, for the GVC firms defined as two-way traders, the following variables are statistically significant: *sector, tech* and *demand*. Regarding the first model, the obtained results show that the probability of firms recording a fall in exports in relation to the pre-COVID period increases for the manufacturing sector and for firms that recorded a decrease in demand for its products and services. Conversely, the probability of a decline in exports falls for firms using a technology licensed from a foreign-owned company. For the GVC firms defined as exporters, the following variables are statistically significant: *sector, size, inno* and *demand*. For model 2, the results show that the probability of firms decreasing the indirect and direct exports in relation to the pre-COVID period increases for the manufacturing sector and for firms that recorded a decrease in demand for its products and services. Also, the probability of decreasing exports is larger for firms that introduced new or improved products or services. Conversely, the probability of a decrease in exports falls for small firms relative to large ones. Thus, a GVC firm's performance depends on a set of the firm's characteristics, which is line for example with Orlic (2016) research on firms in South Eastern Europe.

The results are also in line with Waldkirch (2021), who also showed that manufacturing sectors globally saw an immediate decline in share of exports, while in services this holds only for transport services (see also Ayadi et al. 2021). Also, from the aspect of variable capturing size, the results can be interpreted in

Table 2. Description of Predictor Variables

Variable	Description
sector	Dummy variable, takes the value 1 for manufacturing sector, and 0 otherwise
size	Dummy variable, takes the value 1 for small firms, and 0 otherwise
tech	Dummy variable, takes the value 1 if firm is using a technology licensed from a foreign-owned company, excluding office software, and 0 otherwise.
inno	Dummy variable, takes value 1 if, during the last three years, the firm introduced new or improved products or services, and 0 otherwise
demand	Dummy variable, takes the value 1 if the demand for its products and services decreased, and 0 otherwise
market	Dummy variable, takes value 1 if, the main market in which this firm sold its main product is international market and 0 otherwise
age	Firms age, continuous variable

Table 3. Results of the logistic regression, average marginal effects.

VARIABLES	(1) Average Marginal Effects (two-way traders)	(2) Average Marginal Effects (all exporters)
sector	0.178** (0.076)	0.188*** (0.048)
size	-0.122 (0.089)	-0.123* (0.066)
tech	-0.164* (0.092)	-0.066 (0.080)
inno	0.105 (0.070)	0.137*** (0.052)
demand	0.559*** (0.103)	0.622*** (0.111)
market	0.024 (0.071)	0.034 (0.056)
age	0.001 (0.002)	0.001 (0.002)
Hosmer-Lemeshow chi2(8) Prob > chi2	2.62 0.96	2.88 0.94
Observations	104	175

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Own calculation (in Stata).

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

line with research of Gopalan, Reddy and Sasidharan (2022) who highlight that larger firms are those that participate more in GVCs relative to small ones, and in our analysis the size was statistically significant only in stricter definition of GVC firms as two-way traders.

We see two potential future research avenues for Croatia. The first one is to check whether and when the manufacturing sector started to recover in Croatia, as the literature review presented in Section 2 pointed that the recovery in GVC already took place globally in 2021. The second one, related to the innovation variable is worth exploring in more details, as by some authors it has been shown that firm GVC participation would increase with firms moving from incremental (a product new only to the firm and not to the market) to radical (a product that is new to the firm and the market) innovation (see Reddy, Chundakkadan, and Sasidharan 2021). According to these authors, climbing up the innovation ladder could be crucial for GVC participation and consequently for the resilience during the crises as such caused by the Covid-19. Just for the illustration, in a case of Croatian firms and data from ES2019, the majority of firms introduced an improved products or services new to the firm, but not to the market.

4. Conclusions and policy implications

The presented analyses have revealed several determining trends and factors that affect the post-COVID-19 GVC participation of the EU NMS, with a focus on the Croatian enterprise sector. In the first part of the paper, the text summarises existing literature that developed in two streams depending on the data used (i.e. macro and micro) dealing with the COVID-19 effects but also with major megatrends, which are shaping and transforming the current GVC landscape. Most of the literature explored expects further reconfiguring and "resilience-oriented restructuring" of the

current GVCs to ensure development sustainability at micro and macro levels.

About replying to the RQ1 and RQ2, the main contribution of our analysis is that we focused on the position of Croatia and the participation of its export enterprise sector in the GVC ladder after the outbreak of COVID-19. Such analyses are still rather rare given the availability of systemic data.

Econometric analysis is performed for the two groups of GVC firms, derived according to the existing definitions from the literature dealing with firm data – two-way traders (Model1) and all exporters (Model 2). Regarding the first model, the obtained results show that the probability of firms recording a fall in exports in relation to the pre-COVID period, increases for the manufacturing sector, and for firms that recorded a decrease of demand for its products and services. On the other side, the probability of a decrease in exports falls for firms using a technology licensed from a foreign-owned company.

For the model 2, the results show that the probability of firms decreasing the indirect and direct exports in relation to the pre-COVID period, increases for the manufacturing sector, and for firms that recorded a decrease of demand for its products and services. Also, the probability of decreasing exports is larger for firms that introduced new or improved products or services. On the other side, the probability of a decrease in exports falls for small firms, relative to large ones.

As for the policy implications, some of the current GVC transformation trends may work in favour of upgrading GVC's position and international trade of Croatian exporting firms' production networks. More intense GVC regionalisation towards the EU would undoubtedly be one of them. In 2021, according to data from the Croatian Bureau of Statistics, the level of trade with the EU countries intensified, especially for manufacturing exports, as well as for imports of intermediate products on which Croatian export is highly dependent. However, one area that requires the immediate attention of policymakers is better positioning of producer services (such as business and professional services, financial services, and insurance services) in GVC trade flows in the future.

Further research avenues worth exploring would involve more detailed sectorial analyses and how the specific Croatian business sectors manage the dichotomy of emerging policy directions, i.e. "the trend of de-globalisation and mainstreaming of sustainability", as Zahn (2021: 219) formulated it. For instance, it would be exciting to explore how leading technological sectors such as ICT or the energy industry, which have significant spill-over effects on other business sectors, participate in GVC on the European Union level and what would be the future position of the Croatian enterprise sector regarding the driving transformation policies that dominantly affect the GVC in the EU such as digitalisation and greening of the economy. Another exciting area of research would be exploring innovation's effect on GVC participation in Croatia, before and after Covid-19.

References

Ayadi, R., Giovannetti, G., Marvasi, E., Vannelli, G. and Zaki, C. 2022. Demand and supply exposure through global value chains: Euro-Mediterranean countries during COVID. World Economy 45 (3): 637–656. https://doi.org/10.1111/twec.13156

Baldwin, J. R. and Yan, B. 2014. Global value chains and the productivity of Canadian manufacturing firms. Statistics Canada= Statistique Canada, Catalogue no.11F0027M, no. 090.https://www150.statcan.gc.ca/n1/pub/11f0027m/11f0027m2014090-eng.htm (accessed January 5, 2023)

Borin, A., Mancini, M. and Taglioni, D. 2021. Measuring exposure to risk in global value chains. Policy Research Working Paper, 9785.

Brenton, P., Ferrantino, M. J. and Maliszewska, M. 2022. Reshaping Global Value Chains in Light of COVID-19. https://openknowledge.worldbank.org/handle/10986/37032 (accessed on 19 January 2023).

Coveri, A., Cozza, C., Nascia, L. and Zanfei, A. 2020. Supply chain contagion and the role of industrial policy. Journal of Industrial and Business Economics 47 (3): 467-482. https://doi.org/10.1007/s40812-020-00167-6

Del Prete, D., Giovannetti, G. and Marvasi, E. 2017. Global value chains participation and productivity gains for North African firms. Review of World Economics 153 (4): 675-701.

Ehab, M. and Zaki, C. R. 2021. Global value chains and service liberalization: do they matter for skill-upgrading?. Applied Economics 53 (12): 1342-1360.

Enterprise Survey 2019. https://www.enterprisesurveys.org/en/enterprisesurveys

Enterprise Survey Follow-Up on COVID-19 (Round 1, 2 and 3). https://www.enterprisesurveys.org/en/enterprisesurveys

Espitia, A., Mattoo, A., Rocha, N., Ruta, M. and Winkler, D. 2022. Pandemic trade: COVID-19, remote work and global value chains. World Economy 45 (2): 561–589. https://doi.org/10.1111/twec.13117

Evenett, S. 2022. Beware the Misleading Narrative on Globalization's Retreat, Institute for Management Development, Switzerland. https://www.wita.org/

blogs/misleading-narrative-globalizations-retreat/ (accessed on 19 January 2023).

Fernandes, A. M., Kee, H. L. and Winkler, D. 2021. Determinants of Global Value Chain Participation: Cross-Country Evidence. SSRN Electronic Journal, March. https://doi.org/10.2139/ssrn.3598755

Freeland, C. 2022. Speech of Canada's Deputy Prime Minister at Brookings Institution, Washington D.C. https://deputypm.canada.ca/en/news/speeches/2022/10/11/remarks-deputy-prime-minister-brookings-institution-washington-dc (accessed on 19 January, 2023)

Giglioli, S., Giovannetti, G., Marvasi, E. and Vivoli, A. 2021. The Resilience of Global Value Chains during the Covid-19 pandemic: the case of Italy. DISEI, Università degli Studi di Firenze.

Gopalan, S., Reddy, K. and Sasidharan, S. 2022. Does digitalization spur global value chain participation? Firm-level evidence from emerging markets. *Information Economics and Policy*, 100972.

Gupta, A. 2022. After Covid: The new normal webinar. You Tube. https://www.youtube.com/watch?v=uqBqSIl3ItU&app=desktop (accessed on 18 January 2023)

Kersan-Škabić, I. 2017. Sudjelovanje Republike Hrvatske u globalnim lancima vrijednosti ili obilježja hrvatske vanjske trgovine dodanom vrijednošću /Participation of Republic of Croatia in Global Value Chains or the characteristics of Croatian foreign trade related to the vale added/. Ekonomski pregled 68 (6):591-610.

Kersan-Škabić, I. 2022a. The COVID-19 pandemic and the internationalization of production: A review of the literature. Development Policy Review 40, e12560. https://doi.org/10.1111/dpr.12560

Kersan-Škabić, I. 2022b. Service in Global Value Chains – An Insight into the Current Situation in the EU Member States. Društvena istraživanja 31 (1): 63-87. https://doi.org/10.5559/di.31.1.04

Kolev, G. V. and Obst, T. 2022. Global value chains of the EU member states: Policy options in the current debate, IW-Report, No. 4/2022, Institut der Deutschen Wirtschaft (IW), Köln

Koopman, R. 2022. GVCs and COVID-19: Lessons thus far from trade during a global pandemic. In: Sustainable Global Supply Chains Report 2022, 30-55. Deutsches Institut für Entwicklungspolitik GmbH, Bonn. https://doi.org/10.23661/r1.2022

Koopman, R., Powers, W., Wang, Z. and Wei, S-J. 2010. Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains. Working paper 16420. National Bureau of Economic Research (NBER), London.

Koopman, R., Wang, Z. and Wei, S-J. 2014. Tracing Value-Added and Double Counting in Gross-Exports, American Economic Review 104 (2): 459-494.

Organisation for Economic Co-operation and Development (OECD) 2020. 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/ (accessed on 28 December 2022) http://www.oecd.org/trade/documents/shocks-risks-gvc-insights-oecd-metro-model.pdf (accesed on 18 January 2023)

Orlic, E. 2016. Determinants of global value chain participation in CESEE. In Schwerpunkt außenwirtschaft 2016/2017. Direktinvestitionen: Trends, Erklärungsfaktoren, Barrieren, edited by Ghan, E. and Kronberger, R., 213-228.

Orsini, K. and Perić, A. 2021. Understanding the Croatian Export Boom. European Economy Economic Brief, no.65. European Commission.

Panwar, R., Pinkse, J. and De Marchi, V. 2022. The Future of Global Supply Chains in a Post-COVID-19 World. California Mangement Review 64 (2): 5-23. https://doi.org/10.1177%2F00081256211073355

Peruško, I. V., Kovač, K. and Jošić, M. 2018. Croatia in Global Value Chains (No. 32). The Croatian National Bank, Croatia.

Reddy, K., Chundakkadan, R. and Sasidharan, S. 2021. Firm innovation and global value chain participation. Small Bus Econ 57: 1995–2015. https://doi.org/10.1007/s11187-020-00391-3

Rigo, D. 2021. Global value chains and technology transfer: new evidence from developing countries. Review of World Economics 157 (2): 271-294.

Roscoe, S., Skipworth, H., Aktas, E. and 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

Shepard, B. 2021. The Post-COVID-19 Future for Global Value Chains, UNDP-RBAP Policy Brief. https://www.undp.org/asia-pacific/publications/post-covid-19-future-global-value-chains

Stojcic, N. 2020. The impact of Covid-19 pandemic on the export competitiveness of manufacturing firms in Croatia. *Ekonomska misao i praksa*, 20 (2), 347-365.

Urata, S. and Baek, Y. 2021. Does GVC participation improve firm productivity? A study of three developing Asian countries. ADBI Working Paper Series No. 1245.

Vujanović, N., Stojcic, N. and Hashi, I. 2021. FDI spillovers and firm productivity during crisis: Empirical Evidence from transition economies. Economic Systems 45 (2): 100865. https://doi.org/10.1016/j.ecosys.2021.100865

Waldkirch, A. 2021. Firms around the World during the COVID-19 Pandemic. Journal of Economic Integration 36 (1): 3-19.

WEF 2021. The Resiliency Compass: Navigating Global Value Chain Disruption in an Age of Uncertainty. White Paper, July 2021.

Wignaraja, G., 2013. Can SMEs participate in global production networks? In Global Value Chains in a Changing World, edited by Elms, D.K. and Low, P., 279-312. World Trade Organization, Geneva, Switzerland.

World Bank 2022. Global Economic Prospects, January 2022. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/36519.

Wuri, J., Widodo, T. and Hardi, A. S. 2022. Global Value Chains Participation during the COVID-19 Pandemic: A Dynamic Panel Approach. Economies 10 (5):121.

Zavarská, Z. 2022. Global Value Chains in the Post-pandemic World: How can the Western Balkans Foster the Potential of Nearshoring?. Policy Notes and Reports 58, March.

Zhan, J.X. 2021. GVC transformation and new investment landscape in the 2020s: Driving forces, directions, and a forward-looking research and policy agenda. Journal of International Business Policy 4 (2): 206-220. https://doi.org/10.1057/s42214-020-00088-0

Appendix 1.

Model diagnostic

	Model 1	Model 2
Sensitivity	85%	76.7%
Specificity	81.3%	81.7%
Positive predictive value	73.9%	68.7%
Negative predictive value	89.7%	87%
Correctly classified	82.7%	80%
Area under ROC curve	88.6%	88.3%