

Unpacking the role of firms' internationalization during the Covid-19 pandemic

Abstract: We investigate whether international firms have been shielded or hampered by the pandemic differently with respect to their domestic counterparts, using a sample of 9,555 firms from 18 countries from the Follow-up World Bank Enterprise Surveys. In particular, we contribute to the debate on the repercussions of the Covid-19 on international trade with some stylized facts: first, international manufacturing firms show a lower probability of reporting a reduction in sales with respect to their domestic country-sector counterparts; secondly, the shielding effect of internationalization can come equally from the export or import channel, but being part of a GVC has an important impact. Lastly, international firms have been faster in adapting their business strategies (i.e., increasing business online activities and remote working) to the changing situation and less likely to reduce their temporary workforce.

Key words: Covid19, International trade, GVC, global value chains

JEL classification: C31, F14, F23, F61

1. Introduction

Covid-19 pandemic has changed the world we live in, with effects that are going to shape the future of our societies. Economy has been severely hit especially due to pervasive lockdown measures and disruptions of international supply chains. The pandemic-induced supply and demand shocks, whose magnitude is unprecedented, had a tragic effect on the globalized production process, leaving many policy makers and researchers with the duty of, on one hand, understanding how to recover in the short-term and minimise the costs of the crisis, and, on the other hand, imagining which will be the trajectories in the long-term. Despite the comparison between the Covid-19 and the 2008 financial crises, which have both profoundly shaken the global economy, the future of the globalisation after Covid-19 looks even more uncertain than after the previous crisis.

Already before the Covid-19 outbreak, international relationships were indeed experiencing a very peculiar moment. Since the Great Financial Crisis (GFC) of 2008, GVCs and international trade in general have indeed experienced a drastic slowdown (World Bank, 2020). Other than the recession, several game-changer forces have been playing a fundamental role. First, as maintained by Antràs, (2020), the pace of technological progress, that was one of the keys of the hyper-globalization take-off, remains high but has slowed down compared to the levels reached in the 1980s and 1990s. Second, the advent of new technologies like automation, robotics and 3D printing, might have controversial effects on GVC participation, both negatively (via facilitating re-shoring of firms to high-income countries, as in Rodrik, 2018) and positively (via increasing productivity of high-income countries' firms, increasing in turn their demand for intermediate inputs from low-income countries, as in Artuc et al., 2018; Baldwin, 2018). Third, political and social turmoil such as the US-China trade war (Bellora and Fontagnè, 2020) or Brexit have also played a role in the slowing down of globalization. Fourth, the economic development induced by GVCs integration of labour-intensive countries, China overall, eroded the wage differentials that made profitable the development of GVCs in the last decades.

For all the reasons, and also because we are not over the pandemic yet, trying to disentangle the effect of Covid-19 on the international production process is not straightforward and the debate is very animated. From a theoretical perspective, when complex production processes, in particular global value chains, are hit by an exogenous shock, from the demand side we have the so-called "bullwhip effect" (or Forrester effect), that predicts that a sudden reduction (increase) in the demand for final goods induces suppliers in the value chain to empty their inventories before re-ordering (to start ordering more than usual) and this mechanism intensifies at each stage of the chain, causing in this way an amplification of the initial shock, that is bigger the longer the supply chain¹. Naturally, on the other hand, the more countries a GVC serves as final destination, the less it would suffer from idiosyncratic demand shocks. At the same time, from the supply side, given the complexity of today's international production and the key role of intermediate goods, firm-level or region-level shocks

¹ The bullwhip effect has been extensively studied after the Great Financial Crises, with firm-level evidence by Alessandria et al. (2010) and Altomonte et al. (2012).

can propagate through input-output linkages and cause an international disruption of trade flows; naturally, the more *global* the supply chain is, the more it is exposed to the contamination of foreign shocks. On the other hand, though, the more global and diversified the value chain, the less it is exposed to domestic supply shocks.

Empirically, a rapidly growing literature has provided heterogeneous results on whether more integrated countries have been more impacted by the Covid-19 shock; for instance, Bonadio et al., (2020) through a simulation analysis find that actually, one-third of the total Covid-19-induced GDP contractions comes from the transmission of the foreign lockdowns². Similarly, Berthou and Stumpner (2020) finds that country-sector pairs more integrated into the international market suffered more from the pandemic-induced lockdown measures. Conversely, Giglioli et al., (2021) document that countries more integrated into international production suffered lower GDP losses, especially the “upstream” inputs supplying countries, and that, especially in the second wave, they experienced a more pronounced rebound relative to less integrated countries.

At the sectoral level, Giovannetti et al., (2020) show that, with respect to the Great Financial Crises, GVCs have contributed less to the transmission of the shock (also because, conversely to the 2008 crises, the pandemic has hit harder services, or in general sectors less integrated in the international market). With the same data source that we use, but with a sector-level gravity model, Espitia et al., (2021) find that sectors that adopted faster remote working contracted less during the pandemic. Moreover, they find that operating in GVCs increased firms’ vulnerability to shocks suffered by trading partners, but at the same time, it also reduced their vulnerability to domestic shocks.

At the firm level, the evidence is scarce but growing; for instance, Giglioli et al. (2021) find that international Italian firms experienced lower reductions in sales compared to their domestic counterparts, especially during the second wave of the pandemic. Again for Italy, Brancati and Brancati, (2020) document a stronger shock for international firms that recently introduced product innovations. De Lucio et al. (2021), using Spanish firm-level data, find that among firms operating in the manufacturing sector, the negative effect of the pandemic was lower if firms participated in GVCs. Building on a cross-country analysis, Borino et al., (2020) find instead that international firms are affected by the Covid-19 crisis more than domestic firms due to their exposure to both domestic and foreign lockdowns; at the same time though, they are less likely to lay off workers and file for bankruptcy and are more likely to adopt countermeasures that continue production such as telework.

This article intends to contribute to this debate exploiting cross-country national representative surveys on the impact of the pandemic conducted by the World Bank Enterprises Surveys. On a sample of 9,555 firms from 18 countries we find that international firms have been less impacted by the pandemic with respect to domestic counterparts. In particular, our results are the following: first, international manufacturing firms had

² However, they also find that eliminating the dependence from foreign inputs (e.g., renationalisation of international supply chains) would bring no benefit to the supply chains.

a lower probability of reporting a reduction in sales higher than their domestic country-sector counterparts, while we detect no statistical difference between international and domestic firms in services and in lower-middle income countries; secondly, the shielding effect of internationalization does not come differently from the export or import channel, while being part of a GVC brings substantial results. Lastly, international firms have been also faster in adapting their business strategies (e.g., increasing business online activities and remote working) to the changing situation. The article proceeds as follows: in the following section we present the data that we use, with some descriptive statistics, and the methodology adopted. In the third section we present the results we obtained; conclusions follow.

2. Data and methodology

2.1 Data

The data used in this study come from the World Bank Enterprise Surveys (WBES) project. This project collects information on firm performances, employment, international status, access to finance and many other firm characteristics, for firms operating in the non-agricultural, non-extractive private sectors. Sample coverage is nationally representative, and the project uses standardized questionnaires, so that surveys are comparable across years and countries. We extract information on the impact of Covid-19 from *ad hoc* designed waves of WBES - the Follow-up Surveys - constructed during the pandemic outbreak for more than 30 countries³. These waves include all the enterprises interviewed in the last available standard Enterprise Survey and report detailed information on firms' response to Covid-19 such as the impact on sales and workforce, and change in business strategies (e.g., business online, remote working, changes in production). Using the common firm identifier, we can merge pre- and post-Covid-19 survey waves to link pre-Covid-19 firms' characteristics with post-Covid-19 response to the shock.

To our knowledge, this is one of the very first open access, cross-country, firm-level dataset that offers the opportunity to investigate the impact of the pandemic on the private sector for different countries. Moreover, thanks to the pre- Covid-19 baseline surveys, we can distinguish firms according to their international status in terms of both trade and ownership. Therefore, the coverage and the structure of the data, along with the (plausible) exogeneity of the pandemic shock, allows us to detect the role of internationalisation in transmitting the shock as well as the differential impact on firms according to their foreign exposure.

In order to robust our empirical analysis, we clean our sample along two directions: firstly, to avoid measurement errors for firms' characteristic, we drop all firms in countries that have their baseline survey before 2019; by doing so, we are able to conduct a proper before-and-after analysis, in a short-window identification strategy, on the impact of the pandemic (in Figure A1 in the Appendix we report countries included and excluded in our dataset). Secondly, to ensure the plausible exogeneity of the shock, we decide to include in our estimation sample only those firms that have the follow-up data collected before the end of

³ The follow-up surveys were conducted using mainly computer-assisted telephone interviewing (CATI).

September 2020. That date, in all countries that we include in the sample, is prior to the beginning of the second wave of the Covid-19⁴ and therefore, by focusing only on the impact of the first wave, we can consider the Covid-19 shock as unexpected and likely exogenous. Another concern regarding the timing of the interview may be the fact that for different countries the survey is conducted at a different intensity of the outbreak wave: to control for these differences between countries we include in the analysis fixed effects at the country level. The timing of the interview is not varying within countries – i.e., about all firms in each country are interviewed in the same month.

Our final sample comprises 9,555 firms from 18 countries. In what follows we report some descriptive statistics. Table 1 reports countries in our estimation sample, grouped by geographical zones, with the respective number of firms and classified according to their income group⁵.

Table 1: Countries in our dataset

Mediterranean countries	N. of firms		N. of firms
Cyprus H	171	Georgia UM	514
Italy H	453	Hungary H	630
Jordan UM	564	Moldova LM	286
Morocco LM	873	Mongolia LM	314
Portugal H	698	Poland H	1,005
		Romania H	532
EEA-CA		Russia UM	1,191
Albania UM	347	Slovenia H	249
Bulgaria UM	559		
Croatia H	351	SSA countries	
Czech R. H	255	Zambia LM	563
		Total	9,555

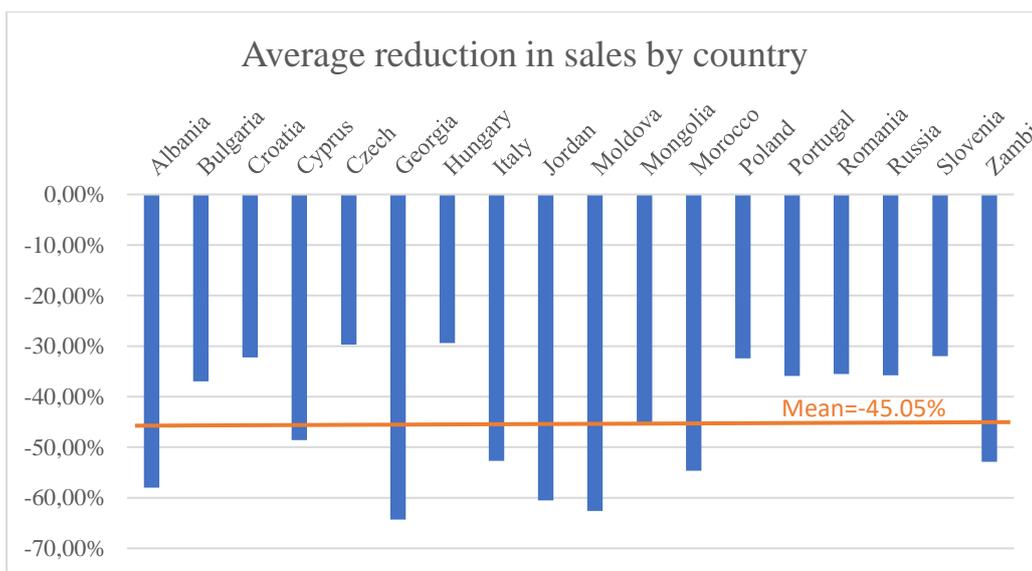
As for the impact of the pandemic, Figure 1 shows the pervasiveness and the magnitude of the shock. All countries included in our sample have experienced catastrophic reductions in sales, with the mean reduction in sales around -45.05% (the orange line in Figure 1). Interestingly, the pandemic seems to have hit harder lower-middle income countries with respect to other income groups: the average change in sales for this subset

⁴ For all countries included in the sample, the second wave started from around October 2020 onwards (Figure A2 in the Appendix).

⁵ We follow the World Bank 2021 income classification: H stands for high-income countries, UM for upper-middle income countries and LM for lower-middle income countries (World Bank, 2021).

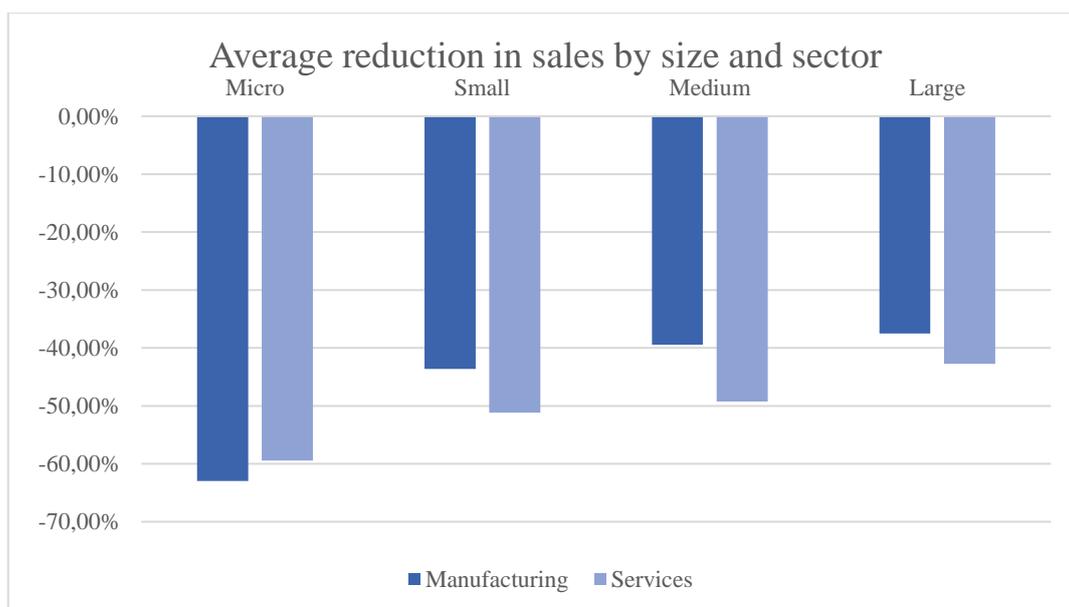
of countries is -45.19%, compared to a -34.90% for upper-middle income countries and -18.97% for high income countries (an evidence in line with Karalashvili and Viganola, (2021) and with Olczyk and Kuc-Czarnecka, (2021)). Moreover, from Figure 2, we can see how conversely to the GFC (Giovannetti et al., 2020), the Covid19 crises appears to have hit services— except for micro enterprises – harder than manufacturing⁶; plus, we can also see how much size matters: the smaller the firm’s size, the higher the losses during the pandemic.

Figure 1: Average reduction in sales by country



Source: Authors’ elaboration on WBES data.

Figure 2: Average reduction in sales by size and sector



Source: Authors’ elaboration on WBES data.

⁶ As also shown in Table A1, where for instance the sector that reports the higher losses is Hotel and Restaurants, with an average reduction of -59.38%.

Note: For firm size, we follow the World Bank categorisation: micro firms have 1-4 employees, small 5-19, medium 20-99 and large have 100+ employees.

Adopting a firm-level perspective, Table 2 presents the differences between domestic and international firms concerning pre-Covid-19 characteristics (panel A) and Covid-19 response (panel B). We define as international all firms that either export, import or are affiliate (i.e., with at least 10% of foreign ownership). From panel A, we can see that the so-called internalization premia envisaged by the literature are respected (Antràs and Chor, 2021). Being international is associated with better performances: first, international firms are significantly larger and concentrated in the upper part of the size distribution, whereas domestic firms tend to be mostly small (with from 5 to 19 employees); secondly, international firms are also significantly more productive than domestic ones.

In Panel B, we report firms' response to the Covid-19 shock. International firms responded slightly better to the pandemic outbreak: a higher percentage of domestic firms were forced to exit the market (5.77%) than their international counterparts (3.79%) after the first wave. Looking at the percentage of firms reporting a reduction in sales, we find a small difference, despite not statistically significant, between domestic and international firms: overall this seems to suggest that the pandemic shock has been extremely pervasive for both domestic and international firms. However, focusing on average turnover losses, we can see that domestic firms experienced significantly higher losses (-53.11% vs. -49.49%); the same applies when we look at the percentage of domestic and international firms that experienced a reduction in sales that is bigger than their sector-country median (64.60% vs. 59.96%). Also, a higher percentage of domestic firms report to have experienced a decrease in their supply of inputs because of Covid-19, while we detect no relevant differences in the decrease of demand for firms' products. Lastly, international firms report to have started (or increased) adaptive strategies (as business online activities and remote working) significantly more than domestic firms.

Table 2: Descriptive statistics of the estimation sample

	Domestic	International	Difference
Panel A:			
Internationalization premia			
Dimension			
- Micro (1-4)	2.31%	1.45%	-0.86**
- Small (5-19)	56.41%	39.08%	-17.33***
- Medium (20-99)	28.83%	34.48%	5.65***
- Large (100+)	12.46%	24.99%	12.53***
Total	100%	100%	
Total employment (ln)	2.90	3.48	0.58***
Revenue per worker (ln)	10.94	11.41	0.43***
Panel B:			
Response to Covid-19			
% of firms permanently closed	5.77%	3.79%	-1.98%**

% of firms with turnover losses	70.66%	69.97%	-1,07%
Average turnover losses	-53.11%	-49.49%	-3.61% ***
% of firms with turnover losses wrt the country-sector	64.60%	59.96%	-4,64% ***
% of firms decreasing supply of inputs	61.74%	56.42%	-5.32% ***
% of firms with decreased demand	66.41%	64.22%	-2.19%
% of firms adopting smart working	23.25%	35.07%	11.82% ***
% of firms adopting business online	22.53%	25.59%	3.06% ***
Total 9,555	3,475	6,080	

Note: *, **, *** indicate when the difference in outcomes between the two groups is statistically significant respectively at 10%, 5% and 1%.

2.2 Methodology

Building on this, we design our empirical strategy. Our aim is to investigate the role of internationalization in the Covid-19 crises and the possible channels through which it acts. In a first step, we perform a preliminary analysis using the following Logit specification:

$$Red_i^{ck} = \alpha + \beta International_i + \gamma_s + \delta_c + \pi_k + \varepsilon_i \quad (1)$$

where the outcome variable, Red_i^{ck} , is a dummy that takes the value of 1 if firm i reported a reduction in sales bigger than its country-sector (ck) median. We adopt this definition for our outcome variable and not just whether a firm experience a reduction in sales for two reasons: first, as shown in Table 2, the pandemic shock has been extremely pervasive (e.g., the median change in sales of our working sample due to Covid-19 is -40%); second, given the heterogeneity of the countries in our sample as well as of the heterogeneous impact on sectors, linking our outcome variable to the country-sector result allows us to really compare international and domestic firms that compete in the same domestic market.

The main explanatory variable, $International_i$, is a dummy that takes the value of 1 if the firm is either an exporter, an importer, both an exporter and an importer or an affiliate. Moreover, we add firm's size⁷, γ_s , plus country-, δ_c , and sector-, π_k , fixed effects to control for possible observable and unobservable omitted variables as well as to tackle remaining endogeneity issues. Estimation is conducted using heteroskedastic robust standard errors (White, 1980).

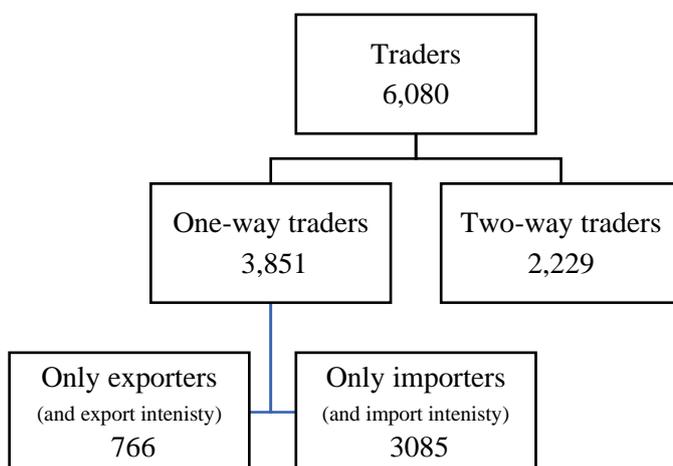
In the subsequent specifications, we look at the impact of different international statuses. First, we differentiate the impact of being a trader in the international market and of being an affiliate of a multinational;

⁷ Firms are classified according to the definition used in WBES, where firms are micro if they have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if they have 100+ employees.

we do this by introducing the dummy variables $Trader_i$ and $Affiliate_i$, that take the value of 1 if a firm import, export or both, and if a firm has at least 10% of foreign ownership, respectively.

Then, in order to discover potential heterogeneities, we further disentangle $Trader_i$ in several ways. At the first step, we decompose $Trader_i$ between $OneWay_Trader_i$ - i.e., exporter *or* importer - and $TwoWay_Trader_i$ - i.e., firms that *both* export and import at the same time. In this way we test whether deeper connection and dependency from the international market hampered or benefitted firms' performances. We further decompose $OneWay_Trader_i$ looking at the specific role of importing, $Only_Importer_i$, vs exporting, $Only_Exporter_i$. We conduct the last estimation also looking at the intensive margin of trade, using the percentage of firms' import and export over total input and sales respectively. We report the decomposition just described in Figure 3.

Figure 3: Different margins of trade (I)

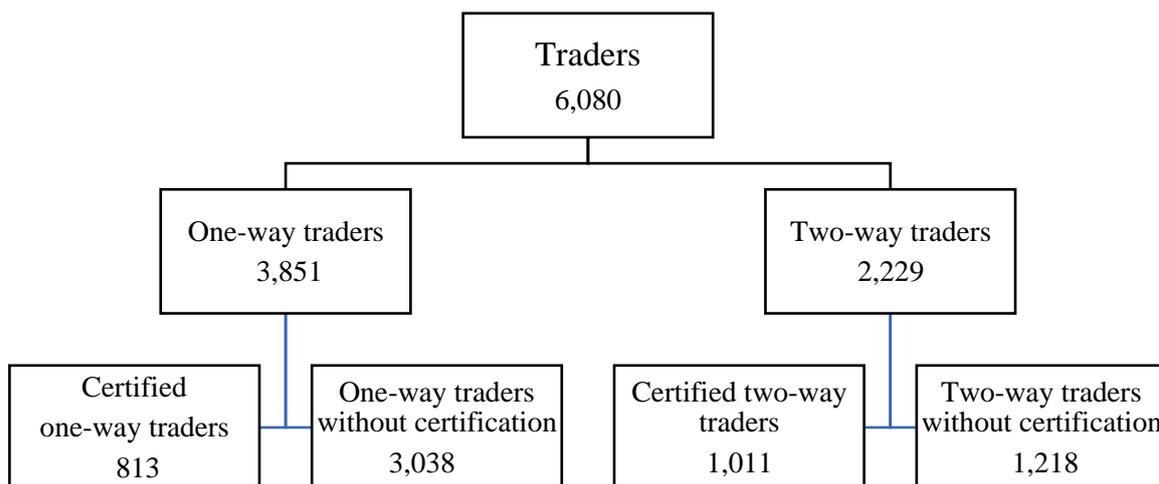


To address the impact of possible alternative internationalisation modes, we test whether participation to GVCs mattered in the Covid-19 pandemic. At the firm level, there is not a universal definition of GVC participation (Taglioni and Winkler, 2016; Antràs and Chor, 2021). For sure, what is emerged is that nowadays non-tariff measures (NTMs) have the potential to affect trade and to define the players in the international market (for example, think about the excluding power of sanitary and phytosanitary measures (SPSs) and technical barriers to trade (TBTs), that many firms can find too costly to comply with, especially if NTMs differ widely from country to country⁸). Moreover, in 2020 NTMs were on the rise because the pandemic, mainly for sanitary and safety reasons, and this trend is not likely to stop in the next years (Yamashita et al., 2021). Given the high costs of adapting production to meet the international quality standards and of the bureaucratic procedures to obtain a certification, especially in low-income countries, certification might proxy firms' sunk fixed costs incurred to enter GVCs and therefore be a signal for firms' willingness to participate to global production networks. Therefore, for the relevance that technical standards have in GVCs,

⁸ For a comprehensive taxonomy of non-tariff measures, see UNCTAD (2019).

we use internationally-recognized quality certifications as a proxy for firms' participation in GVCs (see also Del Prete et al. (2017)), and we further decompose previous trade statuses according to the adoption of certifications. The decomposition is represented in Figure 4⁹.

Figure 4: Different margins of trade (II)



3. Results

3.1 Baseline results

Baseline results are reported in Table 3. What emerges seems to confirm what found in the descriptive evidence; indeed, as we can grasp from column 1, where we insert both country- and sector-level fixed effects¹⁰, being an international firm is associated with a significantly lower probability of reporting a reduction in sales with respect to domestic firms in the same country-sector pair. In column 2 we differentiate the impact of internationalization between being a trader and being part of a multinational. As we can see, the average effect of internationalization in column 1 is mainly driven by traders, while being an affiliate has no (additional) impact. In column 3 and 4 we split the general sample into firms operating into manufacturing (column 3) and services (column 4) sectors: interestingly, the general result is driven by manufacturing firms, while for services there are no significant differences between international and domestic firms¹¹. A fact that

⁹ In Table A2 in the Appendix, we report how many manufacturing and service firms fall in each of our categories of internationalization.

¹⁰ Sectors are defined at the 2-digit level of the ISIC 3.1 classification.

¹¹ To give a clearer idea of the difference in terms of change in sales between international and domestic firms, we calculated also the odds ratio from logit regressions. Results are reported in Table A3 in the Appendix. What emerges is that the odds of reporting a reduction in sales higher than the country-sector median are 1.14 times as large as the odds for an international firms of reporting such a loss. The odds increase if we look only to the manufacturing subsample;

can be probably linked to the sectoral-specific participation to trade (indeed manufacturing firms are generally more involved in the international production than services), but also because services (especially those that require vis-à-vis interactions, e.g., tourism and restaurants) have been particularly hit by mobility restrictions and lockdown measures. We suppose that for firms in services the impact has been so devastating that not even being part of an international network has shielded firms from the shock¹². Given this evidence, for all the further analysis, we limit our sample to only manufacturing firms.

Table 3: Baseline results

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}	(4) Red_i^{ck}
International	-0.1292** (0.0513)			
Trader		-0.1278** (0.0512)	-0.2056*** (0.0736)	-0.0381 (0.0730)
Affiliate		-0.0241 (0.0817)	0.0032 (0.1075)	-0.0431 (0.1283)
Constant	0.8413*** (0.2267)	0.8405*** (0.2267)	0.8461** (0.4129)	1.9777*** (0.4600)
Observations	8,680	8,680	4,680	4,000
Controls	size c k	size c k	size c k	size c k
Std. Err	Robust	Robust	Robust	Robust
Sectors	M + S	M + S	M	S
Waves	First	First	First	First
Model	Logit	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sector M+S indicates that the sample used in the regression includes both manufacturing and service firms, M manufacturing only, S services only.

Before unpacking the effects of our main explanatory variables, we disaggregate the effect of the trader status on the distribution of changes in sales. We do this dividing the distribution of our outcome variable (i.e., changes in sales within each country-sector) in three quantiles¹³; we create three new outcome dummies variables, that take the value of 1 if firm i reported a reduction in sales bigger than its quantile-country-sector median (for consistency with the specification of the baseline outcome variable), then we run quantile regressions with the baseline specification. Results are reported in Table A5 in the Appendix; as we can see, interestingly, trading in the international market lowered the probabilities of reporting moderate losses (from

indeed, a domestic firm that operates in the manufacturing sector have its odds ratio of reporting a loss that are 1.23 times larger than those of an international manufacturing firm.

¹² As a robustness check, we perform our baseline regressions also using a linear probability model, instead of a logit. Results are coherent with our baseline specification and are reported in Table A4 in the Appendix.

¹³ The first quantile (extremely high losses) ranges from -100% to -50%, the second (moderate losses) from -49% to -0%, and the last one (increase) goes from 1% to +300%. Each country-sector-quantile triplet contains on average 35 observations.

-50% to 0%), it increased it for extremely high losses, while it did not make any difference for increase in sales.

Moreover, given the high heterogeneity of countries within our dataset, we also decompose the baseline result by looking at how firms in countries in different income groups perform during the pandemic. Results are reported in Table A6 in the Appendix: the evidence found above holds both for high-income countries and for upper-middle income countries; however, traders in lower-middle income countries did not perform better than their domestic counterparts (a result that is partly in line with Olczyk and Kuc-Czarnecka, 2021, that find that the pandemic impacted more heavily firms in developing economies than those in developed countries and that the authors impute to lower labour productivity, capital intensity and degree of digitalization).

3.2 Unpacking the role of internationalization

What emerges from Table 3 is that, during the first wave of Covid-19, for manufacturing firms trade is associated with a lower reduction in sales as compared to the firms' sector-country median. We unpack this first evidence by differentiating for manufacturing between one-way traders (i.e., only exporters and only importers) and two-way traders (*both* importers and exporters at the same time) in Table 4. We find that the two forms of internationalization report a lower probability of a reduction in sales compared to their domestic counterparts. Comparing the numerical value of the two coefficients, we detect no significant differences between the two forms of participation. In column 3 we further unpack the one-way trader category into only exporters and only importers, in order to try to understand if the protection from the shock for traders comes more from the demand or the supply side. Both coefficients are negative and significant, meaning that, both foreign supply and demand have helped in reducing turnover losses but also in this case, we detect no relevant differences in terms of magnitude between the two mechanisms. Lastly, in column 4 we investigate the role of the intensity of exporting or importing: high intensity exporter and high intensity importer measure respectively the share of exports over total sales and the share of foreign input over total inputs¹⁴. We find that the more firms were involved and exposed to the international arena (i.e., the more they export and import), the less they suffered a reduction in sales during the first wave of the pandemic. This seems to confirm not only that during the Covid-19 shock exposure to the international markets have benefitted firms, but also that being less dependent from the domestic market helped as well.

¹⁴ The high intensity exporter (high intensity importer) variable is the interaction of the dummy variables for only exporters (only importers) times the share of exports over total sales (share of foreign input over total inputs).

Table 4: Unpacking internationalization – Export and import

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}	(4) Red_i^{ck}
One way trader		-0.2190*** (0.0796)		
Two-way trader		-0.1833** (0.0898)	-0.1836** (0.0898)	-0.1712** (0.0861)
Trader	-0.2054*** (0.0733)			
Export only			-0.2236** (0.1119)	
Import only			-0.2167** (0.0884)	
High intensity exporter				-0.0041* (0.0023)
High intensity importer				-0.0028* (0.0015)
Constant	0.8459** (0.4128)	0.8425** (0.4130)	0.8425** (0.4130)	0.9035** (0.4246)
Observations	4,680	4,680	4,680	4,516
Controls	size c k	size c k	size c k	size c k
Std. Err	Robust	Robust	Robust	Robust
Sectors	M	M	M	M
Waves	First	First	First	First
Model	Logit	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sample is restricted to only manufacturing firms.

We further assess the role of different internationalisation strategies by testing the impact of participating to GVCs. As mentioned above, we adopt as a proxy for GVCs participation whether firms that trade have an internationally recognized quality certification, which, especially in the manufacturing sector, should signal the ability of firms to meet international standards required to enter globalized production networks. If we apply this definition and divide traders according to certification, what emerges (in column 2) is that the average result seems to be driven by traders with an internationally recognized certification; indeed, only this group of firms report significantly lower probability of reporting a reduction in sales, whereas the coefficient for traders without certification is not significant. This evidence is supported for both one-way and two-way traders (column 3). Therefore, it seems that being part of a GVC helps firms also in extremes case like the one produced by the pandemic outbreak. This result may depend by the fact that, for the (tendentially) capital good-intensive nature of GVCs, the pandemic may have hit firms in GVCs less, because Covid-19 (and lockdown measures) hit harder industries that require face-to-face interactions, that usually are less internationalized (as in Giovannetti et al., 2021). But it can also be, as in de Lucio et al. (2021), that international trade between

firms in GVCs resisted better to the pandemic outbreak, because of the stickiness of inter-firm relationships of firms in GVCs. Unfortunately, for now we cannot test this hypothesis for data availability constraints.

Table 5: Unpacking internationalization – Participation to GVC

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}
Trader	-0.2054*** (0.0733)		
Trader certified		-0.3715*** (0.0928)	
Trader non certified		-0.1181 (0.0783)	
Certified one way trader			-0.4890*** (0.1179)
Noncertified one-way trader			-0.1101 (0.0873)
Certified two-way trader			-0.2906*** (0.1075)
Noncertified two-way trader			-0.1158 (0.1051)
Constant	0.8459** (0.4128)	0.8330** (0.4127)	0.8332** (0.4137)
Observations	4,680	4,680	4,680
Controls	size c k	size c k	size c k
Std. Err	Robust	Robust	Robust
Sectors	M	M	M
Waves	First	First	First
Model	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sample is restricted to only manufacturing firms.

3.3 Reaction strategies to the crises

Lastly, we know from the existing literature that firms that operate in the international market are likely to be more competitive and productive, more dynamic and reactive; we maintain that these characteristics could be due to the fact that they are faster than domestic firms in adapting and reacting to changes and in particular to extreme events. In order to test this hypothesis, besides differences in turnover losses, we also check whether there are differences between international and domestic firms in terms of adaptation of their business strategies in response to the pandemic. Specifically, we check whether traders start or increase business online activities and remote working for their workforce after the pandemic outbreak and whether they are more likely or not in bringing substantial changes in their workforce (always controlling for the same set of fixed effects,

given that the feasibility of strategies as remote working highly depends on the sector in which firms operate)¹⁵. As we can see from Table 6, firms integrated in the international markets responded significantly stronger than domestic ones to the changing situation; indeed, they significantly started (or increase) business online activities (Column 1) and remote working (Column 2). Last but not least, internationalized firms have been less prone than their domestic counterparts to reduce their temporary workforce as a reaction to Covid-19 (Column 3).

Table 6: Change in strategy

VARIABLES	(1) Business online	(2) Smart working	(3) Reduction in temporary workers
trader	0.2337*** (0.0617)	0.4291*** (0.0576)	-0.0201** (0.0096)
Constant	-2.6840*** (0.2943)	-3.4148*** (0.3115)	0.6161*** (0.0454)
Observations	8,968	8,959	8,336
R-squared			0.1630
Controls	size c k	size c k	size c k
Std. Err	robust	robust	robust
Sectors	Both	Both	Both
Waves	First	First	First
Model	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sample is restricted to only manufacturing firms.

4. Conclusions

Using firm-level data from 18 countries from the Follow-Up World Bank Enterprise Surveys, we investigate how the first wave of the pandemic (March-September 2020) has impacted international trade. Some stylized facts emerge: first, international manufacturing firms show a lower probability of reporting turnover losses higher than their domestic country-sector counterparts, while we detect no difference for services and in lower-middle income countries. Secondly, unpacking the different ways through which firms can operate in the international market, we find that both the import and the export channel shield firms from the shock, but with no statistically significant difference, while being part of a GVC (a status proxied by being

¹⁵ We did not include in the analysis a focus on the reduction of permanent workers because in many countries governments implemented some measures to avoid firms to fire their permanent workers.

a trader with an internationally recognized high-quality certification) brings substantial results. Lastly, international firms are more likely to adapt their business strategies (e.g., starting or increasing business online activities and remote working) to the changing situation and substantially less likely to reduce their temporary workforce. Despite more research is needed, especially on the underlying mechanisms, our work is one of the first firm-level, cross-country studies on the effect on the pandemic on international firms; our results contribute to the debate bringing evidence against nationalistic views, pointing to the centrality and robustness of the international production networks, as they appear to have suffered less than firms operating only in the domestic markets, probably also due the of international firms' higher reactivity to shocks.

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6. Appendix

Figure A1: Countries in our dataset

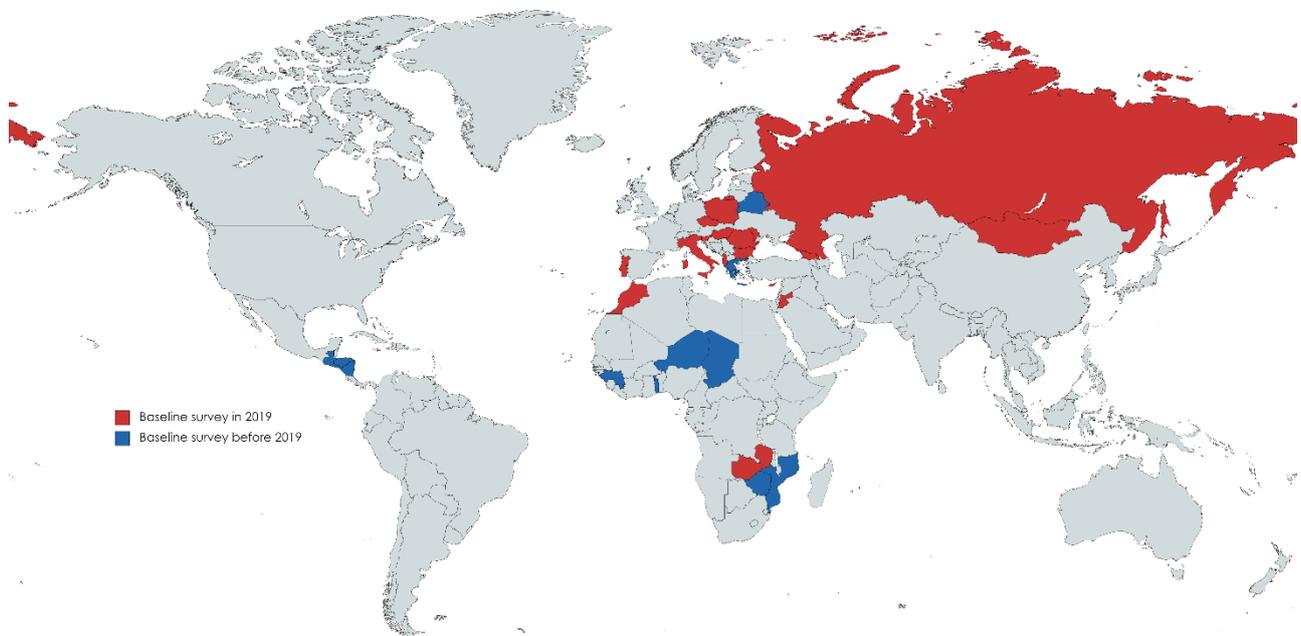
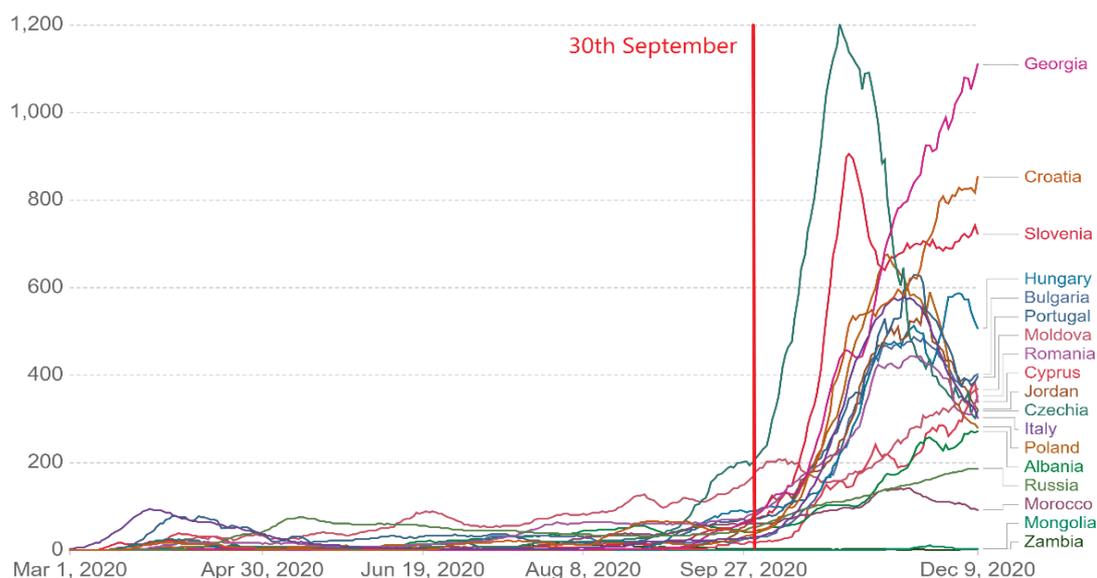


Figure A2: Covid-19 cases by country



Source: Johns Hopkins University CSSE Covid-19 Data.

Note: In Figure A2, we report daily new confirmed Covid-19 cases per million people until December 2020 (what is shown is the rolling 7-day average). As we can see, for all the countries in our dataset, the second wave of the pandemic appears to start from October 2020 onwards.

Table A1: Average change in sales across sectors

	N	Mean (%)	Min	Max
Air transport	6	-50.00	-90	0
Computer and related activities	125	-23.78	-100	80
Construction	700	-35.86	-100	83
Hotels and restaurants	487	-59.38	-100	50
Land transport; transport via pipelines	224	-36.08	-100	30
Manufacture of basic metals	61	-34.02	-100	15
Manufacture of chemicals and chemical prod.	143	-14.90	-100	300
Manufacture of coke, refined petroleum	8	-35.00	-100	0
Manufacture of electrical machinery and	93	-24.67	-100	30
Manufacture of fabricated metal product	683	-22.56	-100	50
Manufacture of food products and beverage	1171	-21.74	-100	100
Manufacture of furniture; manufacturing	241	-30.38	-100	30
Manufacture of machinery and equipment	625	-20.59	-100	100
Manufacture of medical, precision	45	-17.27	-99	200
Manufacture of motor vehicles, trailers	58	-23.05	-80	50
Manufacture of office, accounting and c	6	-12.00	-30	10
Manufacture of other non-metallic minerals	291	-26.42	-100	50
Manufacture of other transport equipment	31	-26.45	-100	20
Manufacture of paper and paper products	51	-29.25	-100	10
Manufacture of radio, television and computer	18	-17.39	-58	0
Manufacture of rubber and plastics prod.	228	-19.10	-100	100
Manufacture of textiles	80	-38.53	-100	20

Manufacture of tobacco products	4	-51.25	-100	0
Manufacture of wearing apparel; dressing	546	-38.30	-100	90
Manufacture of wood and of products of wood	123	-29.46	-100	50
Post and telecommunications	26	-29.88	-100	40
Publishing, printing and reproduction of media	144	-38.13	-100	100
Recycling	48	-17.38	-100	20
Retail trade, except of motor vehicles	1401	-28.73	-100	300
Sale, maintenance and repair of motor vehicles	302	-34.76	-100	30
Supporting and auxiliary transport activities	64	-49.59	-100	25
Tanning and dressing of leather	69	-42.62	-100	100
Water transport	9	-40.00	-100	0
Wholesale trade and commission trade	627	-26.99	-100	100
Total	8738	-29.66	-100	300

Table A2: Manufacturing and service firms within each category

	Manufacturing	Services
Domestic	1,647	1,707
International	3,460	2,741
Trader	2,676	3,404
One-way traders	1,725	2,126
Only exporters	549	217
Only importers	1,176	1,909
Certified one-way	472	341
Non-certified one-way	1,220	1,728
Two-way traders	1,679	550
Certified two-way	869	142
Non-certified two-way	772	386

Table A3: Baseline regressions (odds ratio)

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}	(4) Red_i^{ck}
international	0.8785** (0.0448)			
Trader		0.8800** (0.0451)	0.8141*** (0.0599)	0.9626 (0.0703)

Affiliate		0.9761 (0.0797)	1.0032 (0.1078)	0.9578 (0.1229)
Constant	2.3193*** (0.5258)	2.3175*** (0.5254)	2.3305** (0.9623)	7.2261*** (3.3242)
Observations	8,680	8,680	4,680	4,000
Controls	size c k	size c k	size c k	size c k
Std. Err	robust	robust	robust	robust
Sectors	M + S	M + S	M	S
Waves	First	First	First	First
Model	Logit	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sector M+S indicates that the sample used in the regression includes both manufacturing and service firms, M manufacturing only, S services only.

Table A4: Baseline regressions with linear probability model

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}	(4) Red_i^{ck}
International	-0.0295** (0.0116)			
Affiliate		-0.0060 (0.0196)	-0.0005 (0.0254)	-0.0101 (0.0305)
Constant	0.6987*** (0.0527)	0.6986*** (0.0527)	0.6953*** (0.0981)	0.9147*** (0.0796)
Observations	8,680	8,680	4,680	4,000
R-squared	0.0275	0.0276	0.0432	0.0313
Controls	size c k	size c k	size c k	size c k
Std. Err	robust	robust	robust	robust
Sectors	M + S	M + S	M	S
Waves	First	First	First	First
Model	LPM	LPM	LPM	LPM

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sector M+S indicates that the sample used in the regression includes both manufacturing and service firms, M manufacturing only, S services only.

Table A5: Quantile regressions

VARIABLES	(1) Extremely high losses (-100%; -50%)	(2) Moderate losses (-49%; 0%)	(3) Increase in sales (+1%; +300%)
Trader	0.3105** (0.1522)	-0.1609* (0.0968)	-0.1230 (0.3024)
Constant	1.6002** (0.7442)	-0.2184 (0.5908)	1.3723 (1.1318)
Observations	1,131	3,200	306
Quantiles	1	2	3
Controls	size c k	size c k	size c k
Std. Err	Robust	Robust	Robust
Sectors	M	M	M
Waves	First	First	First
Model	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sample is restricted to only manufacturing firms.

Table A6: Countries' income groups

VARIABLES	(1) Red_i^{ck}	(2) Red_i^{ck}	(3) Red_i^{ck}
Trader	-0.1473 (0.1834)	-0.2838** (0.1244)	-0.1847* (0.1079)
Constant	0.6908 (0.6835)	1.2303** (0.6038)	0.1511 (0.6639)
Observations	663	1,550	2,465
Controls	size c k	size c k	size c k
Std. Err	robust	robust	robust
Sectors	M	M	M
Income	LM	UM	H
Waves	First	First	First
Model	Logit	Logit	Logit

Controls include categories for firms' size: micro if firms have less than 5 employees, small with 5-19 employees, medium with 20-99 employees and large if firms have 100+ employees, plus country and sector fixed effects. Sample is restricted to only manufacturing firms.