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Abstract

This paper analyzes the initial impact and recovery of globally engaged firms from the COVID-19 crisis. It uses rich survey data of nearly 65,000 firm-year observations in 45 countries spanning three waves of data collection. The findings are organized in a series of stylized facts, which suggest that although the pandemic had an immediate adverse impact on most firms, the globally engaged ones are recovering faster, possibly due to their higher capabilities. Among globally engaged firms, those directly involved with international markets show better recovery than the ones that were indirectly involved. These results mask wide variation by firm traits, sectoral attributes, and country characteristics. At the core of the recovery of globally engaged firms is their heightened response to the crisis by finding novel ways to adapt supply chains even in the presence of lockdowns and uncertainty. These firms swiftly digitalized, introduced new products and changed their markets and sources of inputs. Over and above their capabilities, global engagement cushions firms against shocks. Policymakers could therefore facilitate global linkages by providing information on potential markets and products, by making production flexible in terms of facilitating remote work, reducing the rigidity of contracts; and incentivizing financial institutions to issue instruments that reduce uncertainty risk.

JEL-Codes: D220, F140, L200, L250, O100.

Keywords: Covid-19, crisis, firms, recovery, trade, exporters, global value chains.

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1. Introduction

During the COVID-19 pandemic, firms have been hit through multiple channels, including disruptions in global supply chains, depressed demand, liquidity problems, and uncertainty. Globally engaged firms, in particular, became the center of attention with the immediate decline in global trade after the outbreak of the pandemic (Brenton et al., 2022). But global trade bounced back sharply (Meijerink et al., 2020) unlike the more protracted ‘U-shaped’ recovery pattern in firm sales and other outcomes documented in Cirera et al. (2021a).¹ The difference in the pattern of recovery for trade relative to sales and other economic outcomes at the firm-level raises two questions. *First*, do globally engaged firms experience a different path of recovery relative to other firms? *Second*, what explains such differences in performance, if any? Using three rounds of Business Pulse Surveys (BPS) data from 45 countries covering both globally engaged firms and domestically-oriented firms and customs data from 20 countries covering only the universe of globally engaged firms, this paper presents novel stylized facts on the impact of the COVID-19 pandemic and subsequent recovery for globally engaged firms as well as on their adjustment mechanisms.

Globally engaged firms, broadly defined as those that participate in international trade (directly or indirectly), are special for several reasons. They are known to be larger, more productive, and pay higher wages than domestically-oriented firms. Since firms with stronger capabilities, such as management practices or technology, tend to cope better than others during periods of turmoil (Grover and Karplus, 2021), it is crucial to understand if such capabilities pay off in the face of massive global demand and supply shocks. These dimensions are important from a policy perspective more so because global firms contribute substantially to aggregate fluctuations and the propagation of foreign shocks to the domestic economy (Cravino and Levchenko, 2017; Di Giovanni et al., 2014, 2018).

In a world of global value chains (GVCs), firms whose inputs and products cross borders multiple times may be particularly vulnerable to shocks during a worldwide downturn (Vannoorenberghe, 2012; Kurz and Senses, 2016) because of, for example, currency risk, risk of non-payment, and shipping risk (Eppinger et al., 2018). However, access to international markets could also make firms more resilient to shocks by helping diversify sources of demand (Esposito, 2022; Borin et al., 2021). Given these two opposing forces, the response of globally engaged firms to downturns may not be uniform and deserves an empirical investigation. Our work highlights the following six stylized facts.

First evidence from both BPS and quarterly customs data suggests that the COVID-19 pandemic had a strong immediate negative impact on average firm-level exports and imports but these recovered partially in the rest of 2020. The adverse effects are more pronounced for GVC firms defined as those that participate in both exports and imports, relative to firms engaged only in exports or only in imports. Customs data reveals that the strongest negative impact on firm exports and imports was experienced in the second quarter of 2020, relative to the same quarter of 2019. The declines in firm exports and imports are more persistent for GVC firms, continuing in the last two quarters of 2020.

¹Global trade volumes fell by 8.2% in 2020 and are estimated to have grown by 9.5% in 2021 (World Bank, 2022).

GVC firms also exhibit larger and more persistent declines in the numbers of traded products and partner countries than non-GVC firms.

Second, while most firms suffered from an immediate decline in sales with the onset of the COVID-19 shock, globally engaged firms are recovering faster than domestically-oriented firms. This resilience of globally engaged firms is apparent not only in sales, but also in other firm outcomes such as financial fragility and is contingent on the type of global engagement (direct or indirect). The higher resilience and faster recovery of globally engaged firms may be attributed to their stronger capabilities. Our results show that firms with higher pre-pandemic productivity, better management practices, or higher digital readiness self-select into direct or indirect global engagement.

Third, in the initial phase of the COVID-19 crisis, firms with direct global engagement (exporters) have a higher probability of adjusting employment on the intensive margin with reductions in salary, benefits, and hours than domestically-oriented firms, but this pattern reversed in the recovery phase. By contrast, firms with indirect global engagement make larger employment adjustments on both intensive and extensive (lay-offs) margins than other firms, but only in the recovery phase.

Fourth, there is wide heterogeneity in the impact of the pandemic on globally engaged firms: those with higher pre-pandemic digital readiness and located in high-income countries experienced a faster recovery, while firm size and country-level severity of the initial lockdowns in response to the pandemic did not matter. Surprisingly, the immediate adverse impact of the pandemic was sharper for better-managed exporters, perhaps because practices such as just-in-time production or lean manufacturing create potential vulnerabilities in times of global shocks yet such capabilities also help a quicker recovery. Globally engaged firms' ability to cope with the pandemic was also contingent on the characteristics of their trading partners. This effect is visible only in the initial phase perhaps because a large share of firms with direct engagement responded to the pandemic by switching partners in the recovery phase.

There are only weak differences across sectors, with globally engaged firms in manufacturing and services, especially in heavy industrial manufacturing and knowledge-intensive services, showing a faster recovery than in agriculture. Nonetheless, several attributes of sectors attest to the anecdotal evidence highlighted in popular media. Exporters in sectors with greater flexibility to work in remote settings were less impacted initially and recovered quickly. By comparison, exporters in sectors with higher rigidity in production (higher content of durable goods, contract intensity, or GVC intensity) suffered more, at least in the initial phase of the pandemic. Interestingly, manufacturing exporters in GVC-intensive sectors recovered quickly perhaps because the practices used within supply chains (just-in-time production or lean manufacturing) or the stronger capabilities associated with exporting may have helped the recovery of firms within a short period of time.

Fifth, globally engaged firms adjusted to the pandemic by significantly increasing their use of digital technology and through product innovation, although this adjustment is highly heterogeneous among such firms. While advancement in digitalization did not vary by firm size, the probability to innovate by pivoting the product mix increased with firm size. Moreover, both digitalization and

product innovation were the highest for globally engaged firms in the services sector, especially knowledge-intensive services, followed by manufacturing driven mainly by food and beverages and textiles, apparel, and other related sectors.

Sixth, during the recovery phase, globally engaged firms had better access to support programs than domestically-oriented firms but this access varied by the type of engagement, with the most global firms exhibiting the highest probability of accessing public support. Public support for globally engaged firms was higher in manufacturing and in countries with lower severity of the initial lockdowns in response to the pandemic.

While the objective of our paper is to provide a set of descriptive stylized facts on the impact on and response of globally engaged firms during the COVID-19 pandemic that should not be interpreted as causal, it is useful to point to potential endogeneity concerns. One of the mechanisms we identify for the stronger resilience of globally engaged firms to the COVID-19 pandemic, relative to domestically-oriented firms, is their better capabilities. Firms may have better capabilities as a result of their global engagement but more importantly stronger firm capabilities, in the form of structured management practices, technological sophistication and so on, are known to allow them to engage in trade and GVC participation. While global engagement makes firms more resilient, the direction of causality is not always easy to disentangle. Since we have no valid instrument for firms' global engagement, we present our stylized facts as robust correlations, obtained within sectors and countries and controlling for differences in firm characteristics.

Our study makes several contributions to the emerging literature on the impact of the COVID-19 pandemic on globally engaged firms described in Section 2. *First*, while existing studies examine the direct disruptive effects of the pandemic on trade at an aggregate level or on a limited sample of exporting firms, ours is one of the first that provides extensive evidence on globally engaged firms based on a large sample of nearly 65,000 firm-observations in 45 developing countries. *Second*, our work shows not only the initial impact of the pandemic but also documents the differences in recovery patterns of globally engaged firms, comparing them with domestically-oriented firms, using three rounds of BPS data with nearly 27,000 panel firms. *Third*, while samples in the BPS data are not stratified by global integration status, our results are validated using customs data from the Exporter Dynamics Database (EDD), which covers the universe of exporters and importers in a large sample of countries. *Fourth* the initial impact and recovery are measured for a range of performance metrics of firms, including not only total sales but also financial fragility, employment, trade outcomes (exports and imports, trading partners), as well as digitalization, product innovation, and access to public support. *Finally*, our work highlights the critical heterogeneity in the response of globally engaged firms by their internal and external traits, the attributes of the sector that they operate in, and the characteristics of the country of their location.

The rest of the paper is organized as follows. Section 2 discusses the related literature and Section 3 describes the data and methodology. Using the BPS data, Section 4 presents evidence that globally engaged firms are indeed more capable, which sets them apart during the COVID-19 crisis period.

Section 5 presents the six stylized facts on the initial impact and recovery of globally engaged firms during the COVID-19 pandemic. Section 5 concludes with policy recommendations.

2. Related Literature

The shock to GVCs and globally engaged firms associated with the pandemic was unique in scope and depth. In contrast to the ‘Great Trade Collapse’ during the global financial crisis (GFC) that was primarily due to a demand shock induced by a financial crisis (Giovanni and Levchenko, 2009; Eaton et al., 2016), the chain reaction effect of global lockdowns imposed to contain the COVID-19 virus had adverse effects on demand, supply, and logistics networks around the world (Brenton et al., 2022). More broadly, the impact of the pandemic may transmit to firms through four main channels (Freund and Mora, 2020): supply (e.g., reduced worker participation due to illness or mobility restrictions); demand (changes in patterns and extent of consumption); financial conditions (e.g., deterioration of credit conditions for banks) and uncertainty due to increased volatility. These channels are magnified for globally engaged firms because global production networks were severely disrupted by the current pandemic crisis. Once a globally engaged firm is affected due to changes in demand conditions, this creates a domino effect on other linked firms, especially if they are not sufficiently diversified. International trade involves higher risk than domestic trade, namely exchange rate risk, default risk, and liquidity problems, hence, globally engaged firms are likely to be particularly vulnerable to financial market frictions and overall uncertainty.

Evidence from the GFC suggests that trade declines in financial crises are due to a reduction in demand, particularly for durable goods (Giovanni and Levchenko, 2009; Eaton et al., 2016) and early evidence for the pandemic indicates that depressed demand was the most frequently reported firm concern initially (Dai et al., 2021; Balleer et al., 2020). Nonetheless, financial channels are also at play. Evidence from past financial crises shows that worsened access to credit and trade finance play a role in reducing trade (Ahn et al., 2011; Amiti and Weinstein, 2011; Chor and Manova, 2012; Crozet et al., 2022). In particular, protecting international transactions from uncertainty and financial risks, through letters of credit for instance, is more difficult during recessions. However, the impact of a crisis on firm exports depends on the main channel of transmission. The GFC had a particularly adverse impact on exports of products heavily reliant on letters of credit which were in short supply by financially distressed banks (Crozet et al., 2022). In contrast, such exports were more resilient in the early stages of the pandemic because banks were not financially distressed and such financing was not in short supply. Securing letters of credit helped exporters cope with the heightened uncertainty by reducing their exposure to risk (Demir and Javorcik, 2020; Crozet et al., 2022).

In the context of the current pandemic, emerging evidence using customs data shows a significant decline in firms’ exports, particularly to destination countries with strict initial lockdown measures. The negative impacts on exports were strong in the first semester of 2020 but followed by partial recovery, indicating some adaptation by globally engaged firms (see Bricongne et al. (2021) and Lafrogne-Roussier et al. (2021) for France, Pimenta et al. (2021) for Portugal, and de Lucio et al. (2020) for Spain). The body of evidence from the ‘Great Trade Collapse’ during the GFC suggests

that the adjustment occurred almost entirely at the intensive margin, through a decline in trade volumes of globally engaged firms with their participation in global markets along with the numbers of destination or sourcing markets per firm remaining stable (see Behrens et al. (2013) for Belgium and Bricongne et al. (2012) for France). Our paper adds to the literature by providing evidence on trade adjustments at the intensive and extensive margins by firms initially and in the pandemic recovery phase based on both BPS data and customs data for large samples of firms in developing countries. While the COVID-19 pandemic is a unique crisis, the evidence that we provide can be useful in preparing policy makers for complex events that affect firms through combined demand, supply, and uncertainty shocks.

The effect of shocks on trade outcomes is, however, not uniform across firms, sectors, and countries. For instance, in face of the GFC smaller firms in France were more likely to exit the international market and experience a large decline in their number of export destinations (Bricongne et al., 2012). French firms importing inputs from China suffered shortages due to the COVID-19 pandemic that disrupted their production and translated into a stronger decline of their exports until June 2020 (Lafrogne-Roussier et al., 2021). Services trade was much more resilient to the GFC than goods trade, for several reasons: services trade demand is less cyclical, less dependent on external finance, and less subject to protectionist measures (Borchert and Mattoo, 2010; Ariu, 2016). However, in the current pandemic, trade of services sectors requiring physical proximity (travel, transport, and construction) experienced substantial declines, while trade of financial, telecommunications, computer and information services was resilient or even thrived (WTO, 2021; World Bank, 2021). Sector characteristics related to the inputs used in production (e.g., whether inputs are imported and in particular from China and the intensity of unskilled labor use) are shown to drive the negative effect of the COVID-19 shock on exports (Bas et al., 2022). Country characteristics pertaining to the severity of the domestic shock (see Almunia et al. (2021) for Spain) and the extent of credit constraints (see Paravisini et al. (2015) for Peru) also seem to have mattered for firms' trade adjustments during the GFC. A novel contribution of our paper is that it uncovers the effect of the pandemic on GVC firms relative to other globally engaged firms.

A growing set of studies using trade data at the aggregate and product level emphasize the benefits of global connectedness and trade in promoting resilience during the COVID-19 crisis (Miroudot, 2020; Espitia et al., 2022). Emerging firm-level evidence from the current pandemic also suggests that exporters and firms in GVCs are more resilient than domestic firms (Hyun et al., 2020; Brucal et al., 2021). Hyun et al. (2020) examine the limited set of 7,832 publicly listed firms in 71 countries focusing on their stock market performance in response to the COVID-19 shock, while Brucal et al. (2021) use the first round of the BPS data for about 50 countries covering more than 100,000 firms but only emphasize the responses of firms in South Asia. The study closest to ours is Borino et al. (2021) who use cross-sectional data for a small sample of 4,433 firms in 133 countries to illustrate that globally engaged firms were more strongly affected by the early stages of the pandemic, experiencing more difficulties accessing inputs and logistic services (to manage supply chains) and selling outputs but have taken more resilient actions than domestically-oriented firms, such as working remotely, sourcing from new suppliers, developing new products, or temporarily loaning employees to other

firms (such as manufacturers of personal protective equipment, who need workers). This evidence corroborates the findings from the GFC, in that although globally engaged firms are intrinsically more sensitive to trade shocks (Claessens et al., 2012), they managed to save more jobs, stay more productive and were more likely to survive than non-exporters (Eppinger et al., 2018). Our study enriches this literature by providing clear evidence of stronger resilience of globally engaged firms in the form of faster recovery of their sales and improvement in financial position.

Several mechanisms can be hypothesized for why globally engaged firms may have been more resilient to the COVID-19 pandemic. *First*, globally engaged firms benefit from a more diversified portfolio of markets beyond the domestic market which allows them to buffer negative shocks (Esposito, 2022; Hyun et al., 2020; Borin et al., 2021). *Second*, globally engaged firms have better capabilities such as better management practices (Grover and Torre, 2019; Tanaka, 2020) and stronger technology adoption (Bustos, 2011) and are more productive (Melitz, 2003), which helps them cope with negative shocks (though causality likely runs both ways). Our study confirms these patterns for firms in the BPS data. Emerging evidence reveals that better management practices lead firms to more sound decisions during the COVID-19 crisis (Grover and Karplus, 2021) and multinationals have turned to digital technologies during the pandemic to optimize capacity and improve logistics (Saurav et al., 2021).

Nevertheless, most globally engaged firms have less market power in global trade and their products are more easily substitutable across competitors worldwide, making them more susceptible to negative shocks (Hyun et al., 2020). In this regard, public policy support can play a key role in helping such firms mitigate the adverse impacts of recessions and economic shocks and contribute to a more robust recovery. Export promotion policies helped firms in Belgium and Peru weather the GFC (Van Biesebroeck et al., 2016): supported firms were more likely to survive in the international market and to continue exporting to destination countries hit by the GFC. Support from government credit guarantees in Germany helped firms sustain their exports after the GFC, as the guarantees lifted liquidity constraints and cushioned increases in the cost of credit (Felbermayr et al., 2012). While an emerging set of studies is examining the set of policy measures that governments have relied on to help firms and households face the pandemic (e.g., Chetty et al., 2020; Kozeniauskas et al., 2020; Baldwin and Weder, 2020; Cirera et al., 2021a; Guerrero-Amezaga et al., 2022), we contribute to this literature by examining the differential access by globally engaged firms.

3. Data and Methodology

3.1 Data

To understand the impact of the COVID-19 pandemic on the performance of firms across countries, the World Bank, conducted Business Pulse Surveys (BPS) and the Enterprise Surveys (WBES) - henceforth designated as 'BPS data' for simplicity - in three waves: May-September 2020, October 2020-March 2021, and April-October 2021. The survey questionnaire includes modules on firm characteristics and outcomes, including exports, since the onset of COVID-19. Other trade outcomes

such as imports and GVC participation are included only in the latest wave.² Not all countries implemented all waves of data collection. Since our goal is to capture both the immediate impact of COVID-19 and the recovery, we consider only those countries that have implemented at least two rounds of data collection, using the wave 1 questionnaire *and* either of waves 2 or 3. Since the severity of COVID-19 does not follow a systematic pattern across countries, and the evolution of cases has been rather randomly distributed in terms of the timing, we combine countries that implemented wave 2 or 3 of the questionnaire and label the period as the latest round.

The analyses in this paper rely on two main BPS samples: the *full* sample of firms in 45 countries where data on the exporting status of the firm in 2019 is collected and the *restricted* sample of 11 countries where the trade module was implemented in wave 3 and more in-depth measures of global engagement can be constructed. The sample of 45 countries includes 44,059 firms in the first round and 43,156 in the latest round while the sample of 11 countries with trade module information includes 12,882 firms.³ Appendix Table A1 shows the number of observations for each country included in the sample.

To confirm the robustness of the results on trade outcomes in BPS data, we rely on firm-level monthly export and import customs data sets for the 2019-2020 period for 20 countries collected as part of the expansion of the *Exporter Dynamics Database* (Fernandes et al., 2016). See Appendix B for the number of observations per country with customs data, as well as a brief data cleaning description.⁴

The severity of the pandemic across countries and over time is captured using data from Google mobility reports around transit stations (Google, 2021). For countries without available data, we impute the severity based on the Oxford Government Response Tracker index (Hale et al., 2021). Following Cirera et al. (2021a), an indicator of the severity of the crisis is constructed as a weighted average of the severity over 30-day periods since the start of the pandemic until the date of the survey.

For sectoral heterogeneity analysis, we classify sectors according to six attributes pertaining to the flexibility for remote work, prevalence of durable goods in output, GVC intensity, contract intensity, external financial dependence, and reliance on letters of credit. We identify sectors for which an attribute is high through an indicator variable that takes the value of 1 for the fourth quartile of the given attribute as defined in Appendix A.3. For country heterogeneity analysis, we rely on the google mobility data to understand the initial severity of the lockdown, the income classification from the World Bank, and a GVC taxonomy developed in World Bank (2020) based on the extent of GVC participation, the goods and services exported, and measures of innovation, that differentiates

²For the BPS round 1 and 2 questionnaires, see Apedo-Amah et al. (2020) and Cirera et al. (2021a), for the trade module introduced in wave 3 see Appendix D. For most countries, the sampling frame was based on censuses from Statistics Agencies, Ministries of Finance or Economy, or business listings from Business Associations, and typically only included businesses that could be found in some registers or listings. The WBES COVID-19 follow-up surveys, by design, cover only formal firms.

³The panel of firms surveyed both in the first and the latest round includes 27,110 firms. Due to the smaller coverage, this panel is used only in robustness checks.

⁴A set of seven countries have customs data and BPS data: El Salvador, Georgia, Kenya, Sri Lanka, Senegal, South Africa, and Zambia.

across four types of country GVC participation: commodities, limited manufacturing, advanced manufacturing and services, and innovative activities.

3.2 Methodology

Estimation Methodology

To use the BPS data for assessing the impact of COVID-19 on firm performance in the initial phase and the recovery phase, we estimate the following equation:

$$Y_{ict} = \alpha + \beta_1 Engagement_i + \beta_2 Engagement_i * LR + \beta_3 X_i + \beta_4 X_i * LR + \beta_6 \pi_c + \beta_7 \pi_c * LR + \beta_8 Shock_{ct} + \beta_9 Shock_{ct} * LR + \beta_{10} LR + \epsilon_{ict} \quad (1)$$

where Y_{ict} is one of a list of outcomes for firm i in country c at the time of the survey t : change in total sales (in the domestic and foreign markets), an indicator of financial fragility (probability of falling into arrears), indicators for changes in employment at the intensive or extensive margin, indicators for increasing the use of digital technology and for engaging in product innovation, and an indicator for accessing public support.⁵ The vector of controls X_i includes pre-pandemic firm size categories, sector fixed effects, and an indicator for the firm being covered in the BPS panel, π_c designates country fixed effects, $Shock_{ct}$ captures the severity of the lockdown in the country at the time of the survey, LR is an indicator for the latest survey round, and ϵ_{ict} is an independent and identically distributed error term. By including the interaction between each variable or vector of variables and LR , our specification allows for changes in the coefficients between the pandemic's initial phase (first survey round) and the recovery phase (latest survey round). Our main regressor of interest is $Engagement_i$ which is one of the firm global engagement measures defined below.

To assess whether globally engaged firms experience a differential adjustment in a given outcome we estimate the margins (or marginal effects) for the measure of global engagement, keeping the distribution of firm size, sector, and country constant across the two survey rounds to ensure that our results are not driven by differences in sample composition.⁶ For visual clarity, we show the estimated marginal effects from each regression in a figure, along with the corresponding confidence intervals at the 95% confidence level. Since sampling weights are not consistently available across countries, we control for variations in sample size by estimating Equation (1) by weighted least squares, using as weights the inverse of the number of observations in each country. The results presented in Section 5 rely on pooled cross-section analysis including the full sample of firms covered in each of the survey rounds, unless specified. In unreported results we replicate all analyses using only firms in the BPS panel, that is, those that are observed in both survey rounds. Restricting the sample to panel firms allows us to evaluate if attrition and replacement firms might affect the results obtained. Overall, results are consistent across the pooled cross-section and the panel samples. The panel results are available upon request.⁷

⁵Change in total sales is the reported percentage change in the 30 days prior to the survey relative to the same period of 2019. Increasing the use of digital technology is an indicator for firms that started using or increased the use of internet, online social media, specialized apps, or digital platforms in response to the COVID-19 outbreak.

⁶For information about predictive margins see Williams (2012).

⁷Cirera et al. (2021a) deal extensively with firm attrition in the panel, a methodological challenge in the use of BPS

The analysis using the customs data, which helps validate the results from BPS data, estimates a simpler version of Equation (1) described in Appendix B. The results of this estimation are represented graphically, as before showing marginal effects along with 95% confidence intervals. There are two important differences across the BPS and the customs data analyses. *First*, monthly customs outcomes are aggregated and the analysis is conducted with data at the country-firm-quarterly level. *Second*, since the customs data comprise only trading firms, only trade-related outcomes from BPS data are compared using the customs data. Further, when drawing comparisons with the customs data, we restrict the sample of BPS data to include only exporters or importers.

To capture the global engagement of firms, we construct several measures using the BPS data. Two standard measures are indicator variables, one for whether the firm exports and one for whether the firm imports before the pandemic in 2019. These two measures capture firms' direct engagement in global markets. Another measure is an indicator variable for firms that both export *and* import, that are designated as GVC firms. The final and more novel measure captures firms' indirect engagement in global markets through an indicator variable for whether the firm sold to domestic exporters or multinationals in 2019 but did not directly export or import. We refer to these firms as suppliers of GVC firms. Since these four measures may not be mutually exclusive, we also construct four mutually exclusive categories of global engagement to contrast with firms that had no engagement at all: only indirect engagement; only direct engagement (export or import); both indirect and direct engagement (with direct engagement being measured with either export or import), and finally firms that are indirectly engaged and are also a GVC firm in 2019. Except for the indicator variable for firms that export, other measures of global engagement are only available for the countries surveyed in round 3 including the trade module. Hence, the analysis using these measures is based on a restricted sample. Appendix Table A2 shows summary statistics on the firm global engagement measures (and on other firm-level variables used in the analysis). For the customs data we define GVC firms as those engaged in both exports and imports.

4. Capabilities of Globally Engaged Firms

It is widely known that global integration is associated with superior firm capabilities, as evidenced in their larger size, higher productivity (Melitz, 2003; Wagner, 2007), better management practices (Grover and Torre, 2019; Tanaka, 2020; Bloom et al., 2021) and technological readiness (Bustos, 2011).⁸ Self-selection of more capable firms into global trade could possibly explain their resilience and recovery from crises (Duchek, 2014; Ahn et al., 2018).

Before delving into the impact of the COVID-19 pandemic on globally engaged firms, we provide evidence based on the BPS data that better firm capabilities are, in fact, associated with patterns of global engagement. To this end, we regress an indicator for pre-pandemic firm export status on measures of firm capabilities (see Appendix A.4 for details). The fact that globally engaged firms

data. They show that results remain robust to re-weighting the sample using the inverse of the probability method in (Wooldridge, 2002) or the bounds approach (see Kling et al., 2007; Blattman et al., 2020).

⁸There is also evidence of 'learning-by-exporting', whereby global engagement increases firms' technical efficiency (Atkin et al., 2017).

are larger in size and have higher productivity is evident in the BPS data (Figure 1, panels a and b). For example, a firm in the top tercile of labor productivity has a 28% probability of being an exporter, while for firms in the middle and low terciles, the exporting probability is 26% and 23%, respectively. These productivity differences across firms are driven by better management practices and technological capabilities (Syverson, 2011; Bloom et al., 2013; Kogan et al., 2017), a fact that is also borne out in the BPS data (see Appendix Figure C1) and hence a testimony to its quality.

The BPS data also show clear and robust correlations between global engagement and internal firm capabilities. Management practices shape firms' global engagement: a firm with a low management score has an 8% probability of being an exporter, while that probability for firms with medium and high management scores is 10% and 14%, respectively (Figure 1, panel c).⁹ This finding is consistent with existing literature on global engagement and management, which suggests that better-managed firms have superior export performance (Bloom et al., 2021). Since this analysis is not causal, our correlations may also indicate that global engagement encourages firms to become better managed (Caliendo and Rossi-Hansberg, 2012; Chen and Steinwender, 2020; Chakraborty and Raveh, 2018).¹⁰

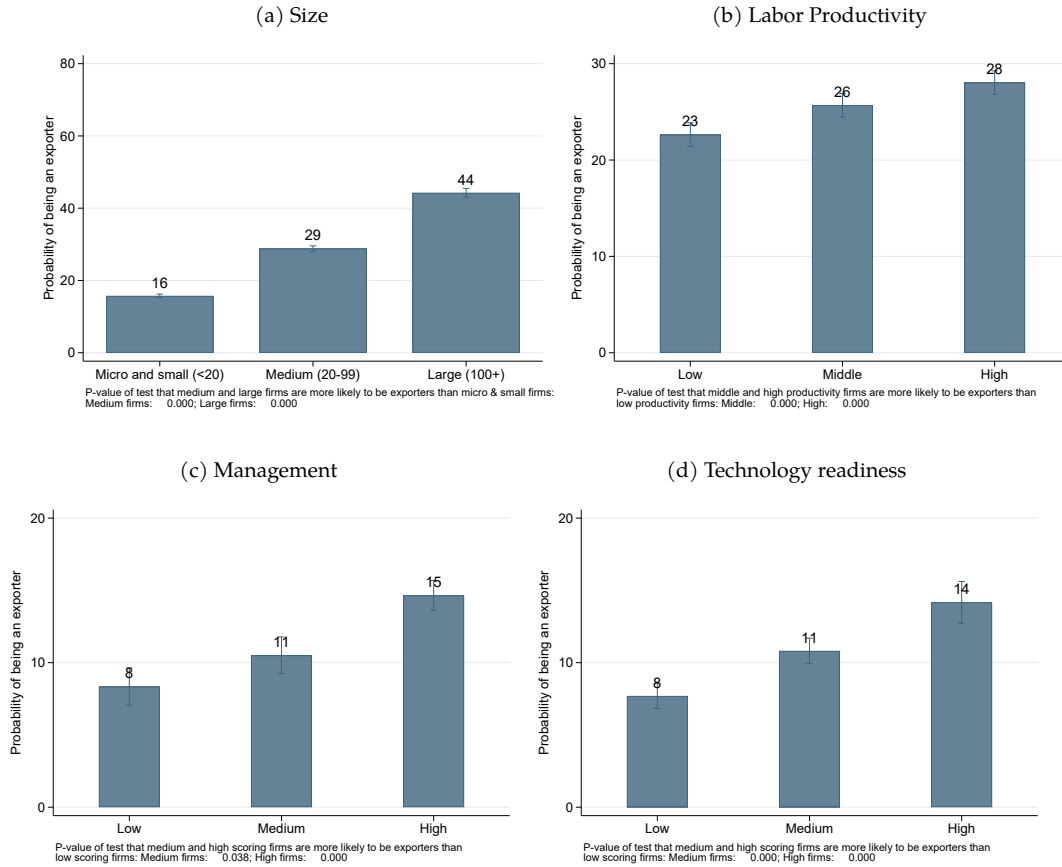
Digital readiness is also associated with firms' global engagement: a firm with high digital readiness has a 14% probability of being an exporter, which is 4 percentage-points higher than a firm with medium digital readiness, and double than a firm with low digital readiness (Figure 1, panel d).¹¹ This is in line with the literature on the link between innovation, technology, and trade (Damijan and Kostevc, 2015; Akcigit et al., 2018) but our results are only correlations and not causal effects. The correlations between global engagement and firm size, productivity, management capability, and digital readiness are also verified for alternative measures of engagement: importers, firms with indirect engagement and GVC firms (see Appendix Figures C2 and C3, C4).

⁹The BPS questionnaire inquires about three management practices in the firm before the pandemic: comparing sales to a target at least once per month; advertising at least once every 6 months; and basing staff promotions on performance and ability. We classify firms into three groups based on the number of management practices that they implement: low, medium, and high.

¹⁰Bloom et al. (2021) find that management practices have a larger beneficial effect on exports than on domestic sales, possibly because export products are of higher quality or more complexity, where the pay-offs to better management could be higher.

¹¹The BPS questionnaire asks about pre-pandemic digital readiness in terms of use of digital platform for sales; social media or big data for marketing and product development; software for customer or supply relationship management or for enterprise resource planning. We classify firms into three groups based on the number of digital readiness practices that they implement: low, medium, and high.

Figure 1: Attributes of globally engaged firms (exporters)



Notes: The sample includes 33,336 firms in 47 countries in panel a, 17,949 firms in 33 countries in panel b; 10,939 firms in 10 countries in panel c and 13,794 firms in 13 countries in panel d.

5. The Impact of COVID-19 on Globally Engaged Firms: Some Stylized Facts

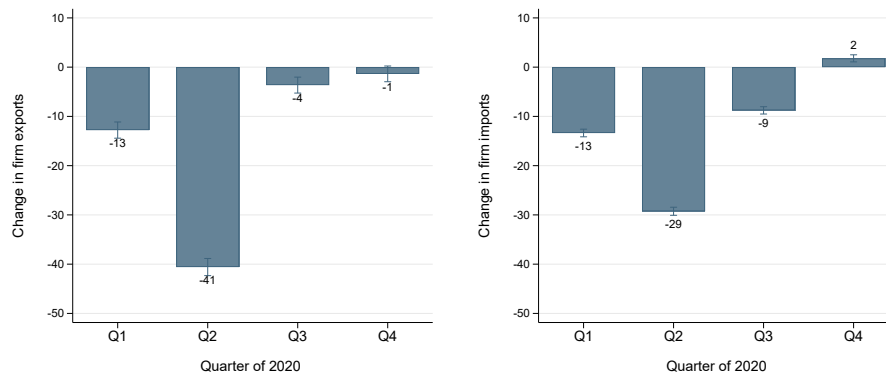
5.1 Trade Outcomes

Analysis based on the customs data and the BPS data with the sub-sample of globally engaged firms only brings forth two main findings. *First*, the pandemic led to a strong decline in quarterly firm-level exports and imports in the first six months of 2020 but the negative impacts dramatically weakened in the rest of 2020, indicating modest adaptation of globally engaged firms, especially exporters, to the pandemic (Bricongne et al., 2012; de Lucio et al., 2020; Pimenta et al., 2021). Firm exports and imports in customs data declined by 41% and 29% in the second quarter (Q2 2020) relative to that of 2019 (Figure 2, panel a). These trade outcomes had already declined in the very early stages of the pandemic (Q1 2020) that began to adversely affect China, a key global destination and source country for trade. Firms were also affected by the pandemic through a substantial decline in their number of products and partner countries in the second quarter of 2020 (Appendix Figure C5, panels a and b). These negative impacts dampen during the rest of 2020 (Q3 and Q4 2020) relative to corresponding values in 2019. Consistent with the analyses of the customs data, the BPS data also confirms a sharp decline in firm exports (as a share of sales) and imports (as share of

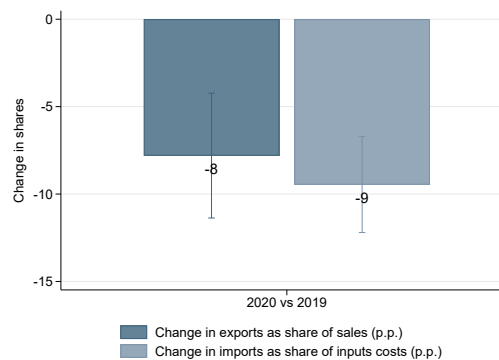
input costs) due to the pandemic (Figure 2, panel b) for the year 2020 as a whole relative to 2019.

Figure 2: Change in firm trade outcomes

(a) Customs data: Change in value of exports and imports



(b) BPS data: Change in share of exports and imports

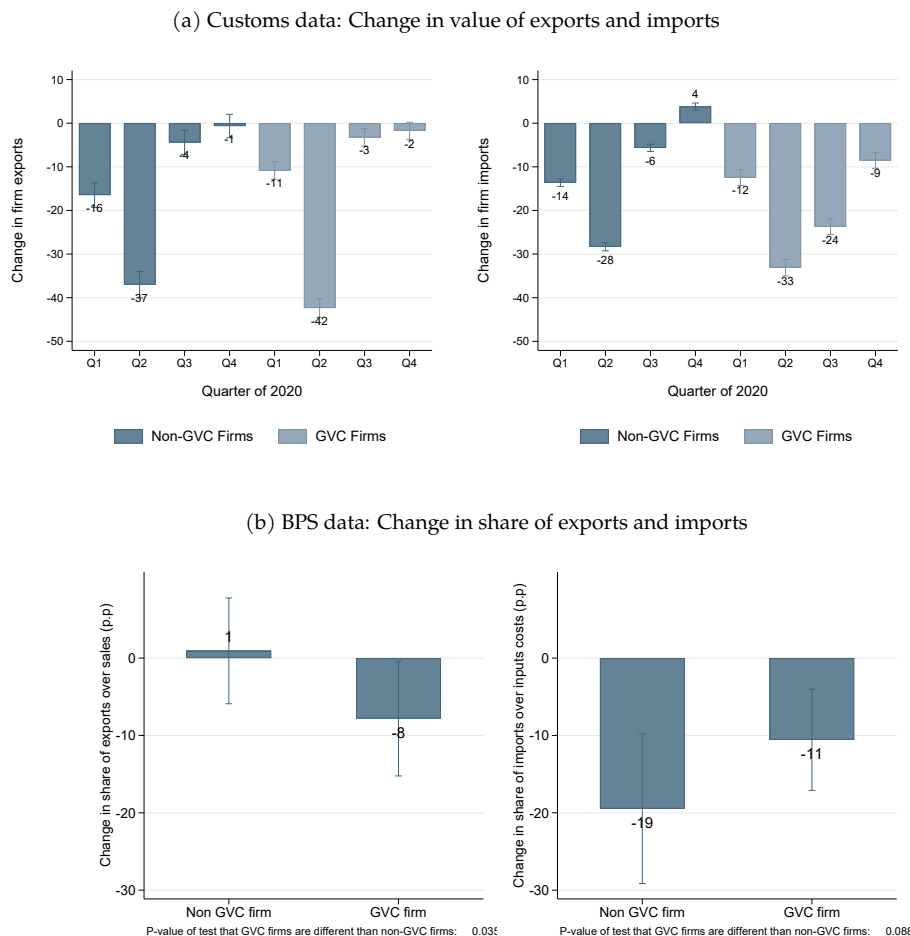


Notes: The sample includes in panel a 153,079 firm-quarter observations in the left plot and 579,221 firm-quarter observations in the right plot in 20 countries and in panel b 617 exporting firms in the left bar and 1,024 importing firms in the right bar in 13 countries.

Second, the pandemic had a more adverse effect on firms participating in GVCs (Figure 3, panel a). This is in line with the evidence from Lafrogne-Roussier et al. (2021) on French exporters who were importing inputs from China during the current pandemic. Our data suggest that the declines in firm exports and imports are more persistent for GVC firms, being significant also in the last two quarters of 2020. GVC firms also experience larger and more persistent declines in their numbers of products and partner countries (Figure C6, panels a and b). Evidence based on the latest round of BPS data also show that the average decline in exports as a share of sales was worse for GVC firms in the second half of 2020 and thereafter, relative to 2019 (Figure 3, panel b). GVC firms whose inputs and products cross borders repeatedly have been particularly vulnerable to the COVID-19 pandemic. Firms that participate in GVCs are more affected by sudden drops in demand of products manufactured along a specific value chain as they specialize in different stages of the production process and are often linked by strong and durable trading relationships. As a result, shocks that occur in any part of the GVCs propagate along the value chain, thereby magnifying the impact on

GVC firms.

Figure 3: Change in firm trade outcomes for GVC firms and non-GVC firms



Notes: The sample includes in panel a 153,038 firm-quarter observations in the left plot and 579,123 firm-quarter observations in the right plot in 20 countries and in panel b 617 exporting firms in the left plot and 1,024 importing firms in the right plot in 13 countries.

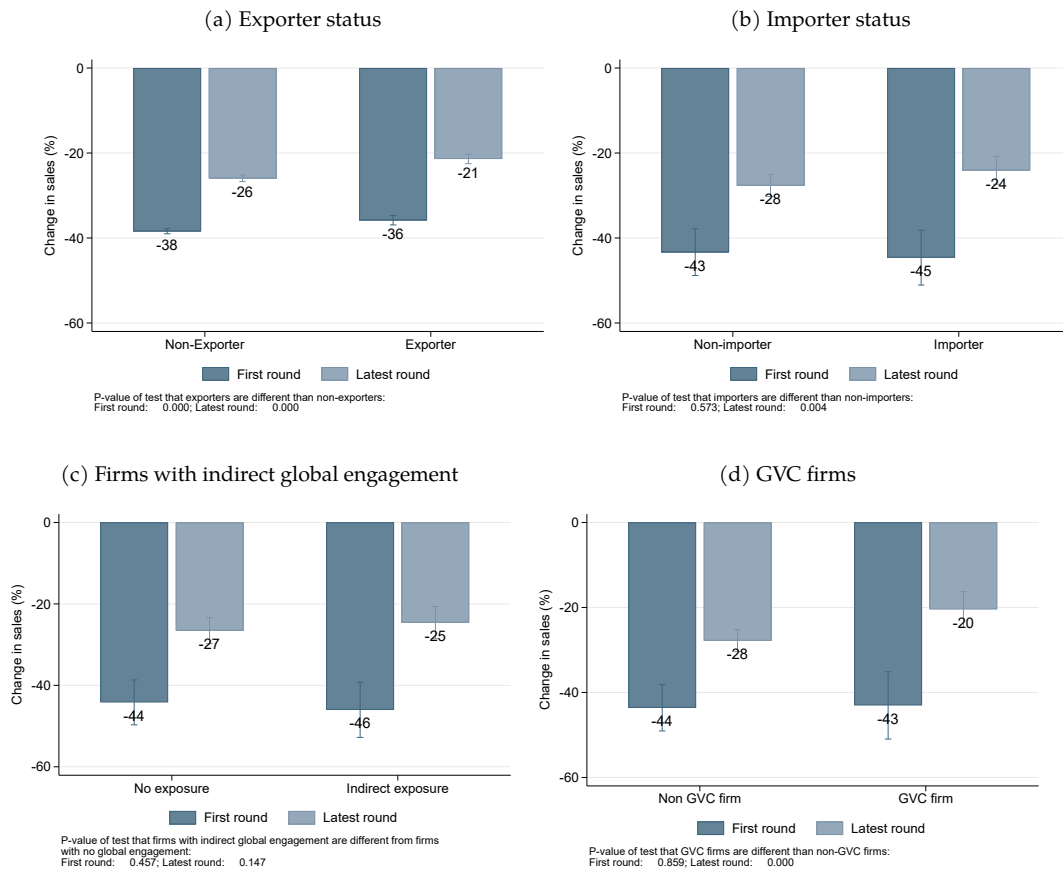
The BPS data neither covers the universe of globally engaged firms nor is stratified by the degree of global engagement of firms. Yet the fact that the results based on BPS data are consistent with those obtained for the universe of globally engaged firms in the customs data gives us confidence that BPS data provides a credible understanding of the impact of the pandemic on globally engaged firms.

5.2 Resilience and Recovery in Firm Performance

Business recovery from the pandemic is shown based on the latest round of the BPS data by (Cirera et al., 2021a), but the extent to which such recovery is felt by firms with global engagement is not known. The following key patterns emerge when comparing recovery for globally engaged firms with that of other firms. *First*, the immediate impact of the pandemic on total sales of globally engaged firms is not significantly different from that on other firms, but globally engaged firms are certainly recovering faster. For example, while non-exporters experienced a decrease in total sales by

38% in the first survey round and 26% in the latest round (both relative to 2019), sales of exporters declined by 36% and 21% in the first and latest rounds, respectively (Figure 4, panel a). This pattern is consistent across various measures of global engagement: importers versus non-importers, firms with links to GVCs versus firms with no global exposure, and GVC firms relative to non-GVC firms (Figure 4, panels b, c and d). This resilience and agile recovery of globally engaged firms is in line with recent evidence, albeit for much smaller samples (e.g., Borino et al., 2021; Hyun et al., 2020). These differences for globally engaged firms remain robust to alternative specifications where we control for pre-pandemic management quality and digital readiness of firms, showing that their resilience goes beyond observable firm capabilities.¹²

Figure 4: Change in sales



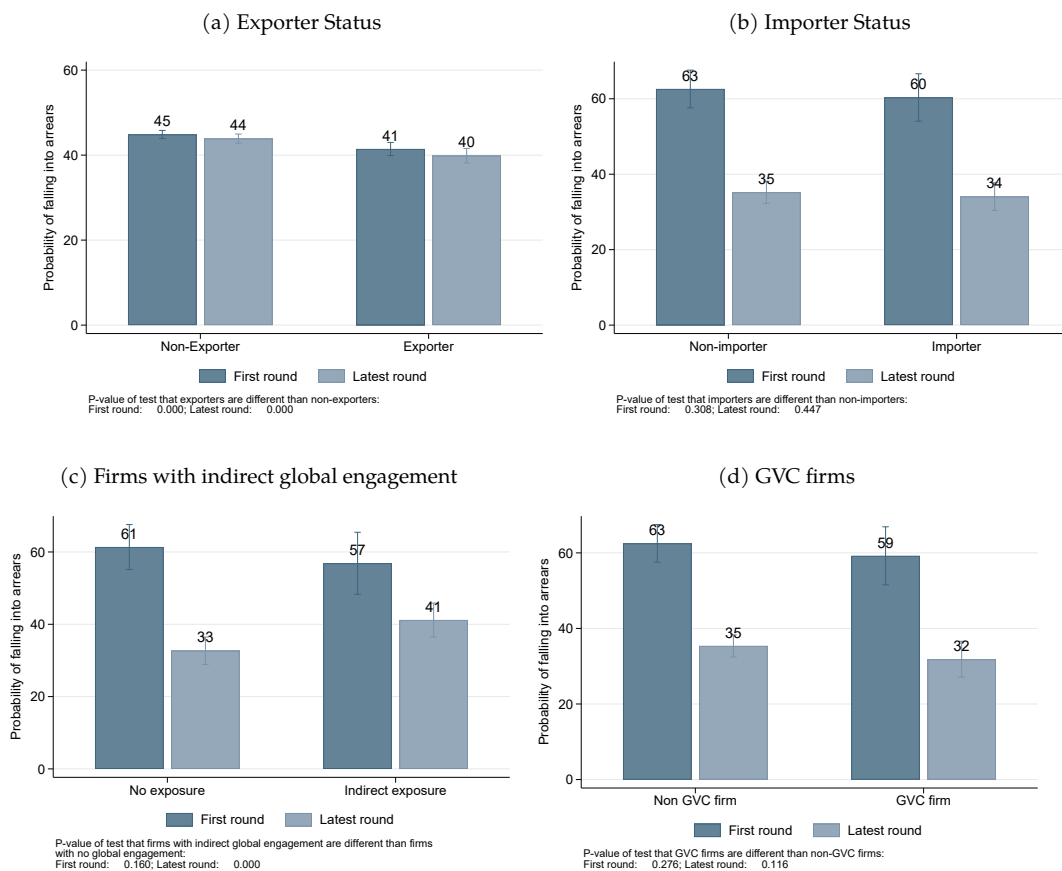
Notes: The sample includes 43,361 firms in 45 countries in panel a and 12,882 firms in 12 countries in panels b, c, and d.

The relative resilience of globally engaged firms is apparent in other firm outcomes such as financial fragility. While non-exporting firms had a 45% probability of falling into arrears in the first round which was almost unchanged in the latest round (44%), this percentage for exporting firms was lower at 41% and 40%, respectively (Figure 5, panel a). These results are consistent across most of

¹²We estimate a variant of Equation (A1) where the vector of controls also includes management practices and digital readiness scores (see C7). Since we are constrained to estimating this specification only for a subset of countries with management and digital readiness information, it is not our preferred specification.

the measures of global engagement (Figure 5, panels b and d), and could possibly also be driven by the exit of fragile firms from participation in global activity or markets. One exception to this pattern concerns the recovery of financial fragility for suppliers of GVC firms, which is slower, thereby suggesting that not all types of global engagement are the same.¹³

Figure 5: Probability of falling into arrears



Notes: The sample includes 37,875 firms in 41 countries in panel a and 13,338 firms in 12 countries in panels b, c, and d.

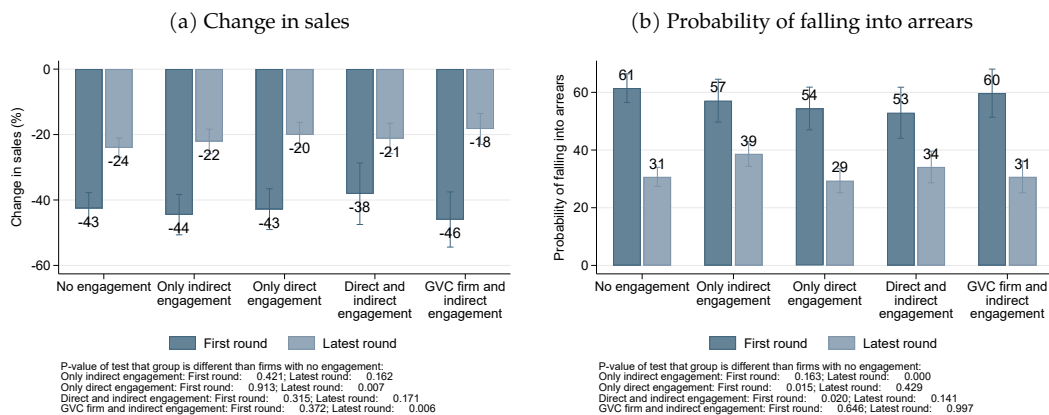
Second, the type of global engagement correlates with firm sales recovery and financial fragility. Using only mutually exclusive categories of global engagement, we note that the decrease in sales in the latest round is always smaller for the most stringent category of globally engaged firms (Figure 6 panel a), while financial fragility is sensitive to whether the engagement is direct or indirect (Figure 6 panel b).¹⁴ This may be because either direct traders are genuinely more resilient due to higher firm capabilities (e.g., Grazzi and Tomasi, 2016; Wang and Gibson, 2018) that help them self-select into direct participation in the first place or that more financially fragile firms exit direct global markets due to credit constraints. The financial fragility of the indirectly engaged firms may be due

¹³See Appendix Figure C8 for results on firm operating status. Results for other outcomes such as expectations about future sales, uncertainty about the future, and so on are available upon request.

¹⁴The intensity of global engagement, measured by the share of exports relative to total sales, does not seem to matter for firm resilience and recovery, as seen in Appendix Figure C9.

to their smaller size, lower market power, and lack of control over global production networks. These firms may see their orders being canceled or contracts not being honored in face of the pandemic. These results are broadly in line with evidence from Cambodia where GVC firms were found to be more resilient (with higher survival rates) in export markets than those that only export (Brenton et al., 2022).

Figure 6: Change in sales and financial fragility of firms by type of global engagement



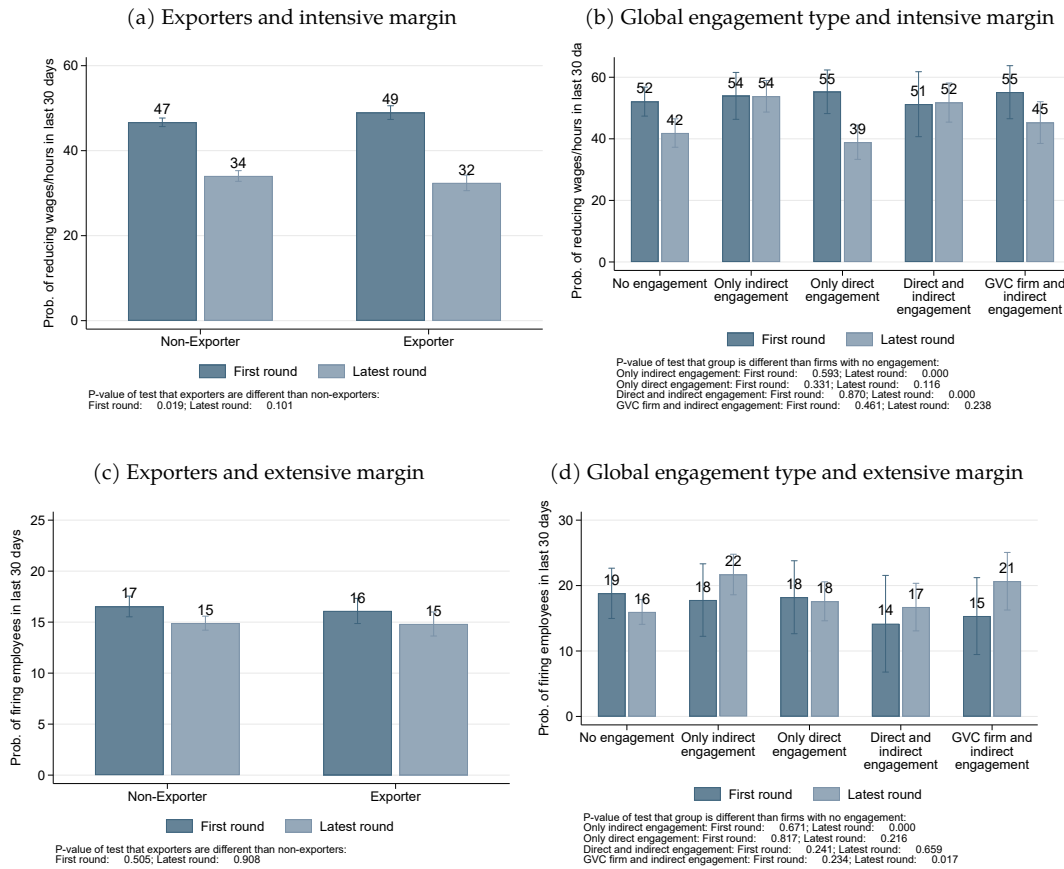
Notes: The sample includes 12,882 and 13,338 firms in 12 countries in panels a and b, respectively.

5.3 Labor Market Adjustments

Globally engaged firms may adjust differently their labor force during recessions compared to other firms. On the one hand, employment in globally engaged firms may be more vulnerable to foreign shocks, while on the other hand, such firms may also be able to diversify into several markets and absorb domestic shocks. The net effect of global engagement on employment volatility and labor market adjustments is thus an open empirical question (see Bernard and Jensen, 1999; Eppinger et al., 2018; Borino et al., 2021; Kurz and Senses, 2016).

In the initial phase of the pandemic, the employment of exporters adjusted more on the intensive margin than that of non-exporters, with significantly larger reductions in salary, benefits, or hours. In the recovery phase this pattern reverses although the differences across exporters and non-exporters are barely significant at the 10% level (Figure 7, panel a). Indirectly engaged firms have significantly higher probability of adjustments in their employment on both the extensive (lay-offs) and intensive margins but only in the recovery phase (Figure 7, panels b and d), when compared with non-engaged firms. Specifically, suppliers to GVC firms have a 54% probability to reduce salaries, benefits or hours against a 42% probability for firms that are not globally engaged (Figure 7, panel b). The results are qualitatively similar for employment adjustments on extensive margins by indirectly engaged firms, with a 6 percentage points higher probability of laying off workers than firms not globally engaged (for which such probability is 16%).

Figure 7: Labor market adjustment



Notes: The sample includes 43,994 firms in 44 countries in panel a and 13,312 firms in 12 countries in panels b, c, and d.

5.4 Heterogeneity in the Impact for Globally Engaged Firms

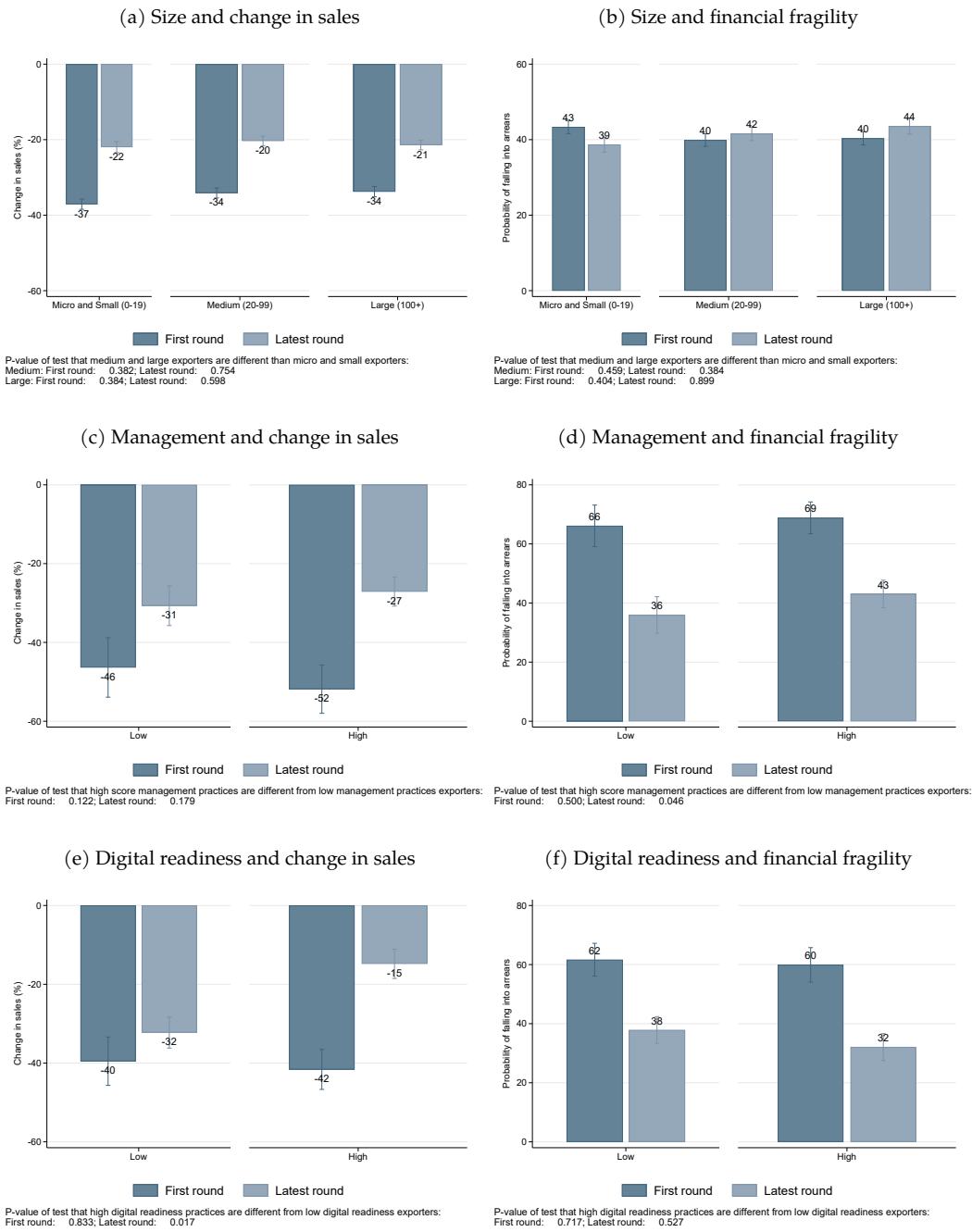
5.4.1 Firm Traits

We uncover two broad patterns regarding heterogeneity in the impact of the pandemic across globally engaged firms (exporters) based on their internal capabilities as well as observable attributes relating to size and trading partners.

First, while better-managed and larger firms have remained relatively resilient to the pandemic (Grover and Karplus, 2021; Cirera et al., 2021a) and experienced a faster recovery, these attributes do not significantly enhance the resilience or the speed of recovery for globally engaged firms (Figure 8, panels a-d), likely because the variability in size and management capability is smaller among these firms (which tend to be larger and have better management). In fact, the immediate impact of the crisis on drop in sales was sharper for the better-managed exporters, and the probability of falling into arrears is higher for the better-managed and larger exporters. It could be the case that firms with better management rely on practices such as lean manufacturing and just-in-time production which makes them more vulnerable to global shocks. By comparison, digital readiness among exporters is correlated with better recovery and lower financial fragility (Figure 8, panels

e and f). This is consistent with anecdotal evidence from Bangladesh where apparel firms that invested in automation before 2020 experienced a lower impact of lockdowns limiting the ability of workers to work in factories (Brenton et al., 2022).

Figure 8: Heterogeneity in impact by traits of globally engaged firms (exporters)

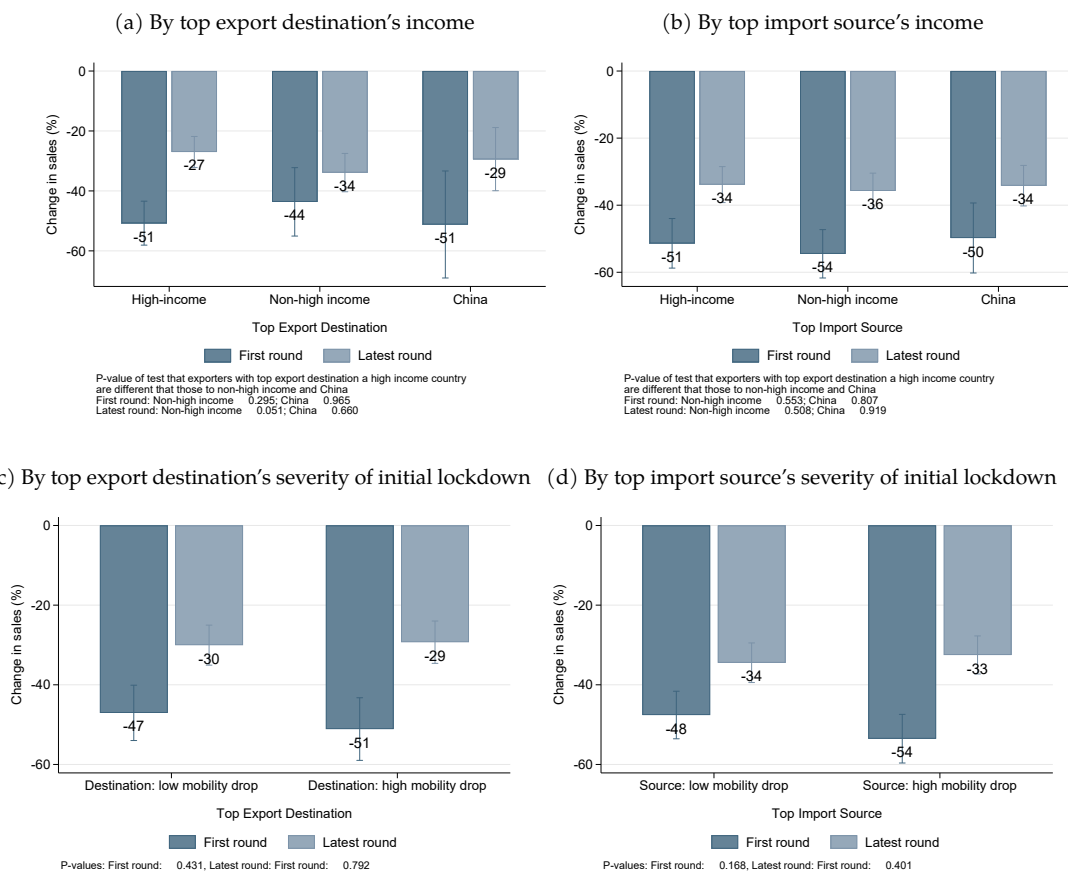


Notes: The sample includes 43,361 firms in 45 countries in panel a, 37,875 firms in 41 in panel b, 12,028 firms in 11 countries in panels c and d, and 14,704 firms in 14 countries in panels e and f.

Second, the characteristics of trading partners do not seem to play a major role in mediating the

impact of the crisis on globally engaged firms. Although this finding is intuitive, given that most countries were impacted by the pandemic, it should, nonetheless, be taken with a grain of salt since our results are based on a small sample including only the trading firms that report their top destination and source countries. Yet, we do find significant differences in the recovery of firms exporting to high-income countries relative to those exporting to non-high-income countries (Figure 9, panel a). In contrast to the recent evidence for French exporters by (Lafrogne-Roussier et al., 2021), firms in the BPS data trading with China were not disproportionately affected. The initial impact and recovery path of such firms are comparable with those trading with other non-high income countries. The severity of the initial lockdown in response to the pandemic in destination and source countries also did not affect the magnitude of globally exposed firms' sales decline in the initial and latest survey rounds (Figure 9, panels c and d).

Figure 9: Impact of trading partner's characteristics on change in sales



Notes: The sample includes 667 exporting firms and 1,195 importing in 13 countries in all panels. In panels c and b countries are split above and below the median severity of their initial lockdown, i.e., in the first survey round.

5.4.2 Sectoral Attributes

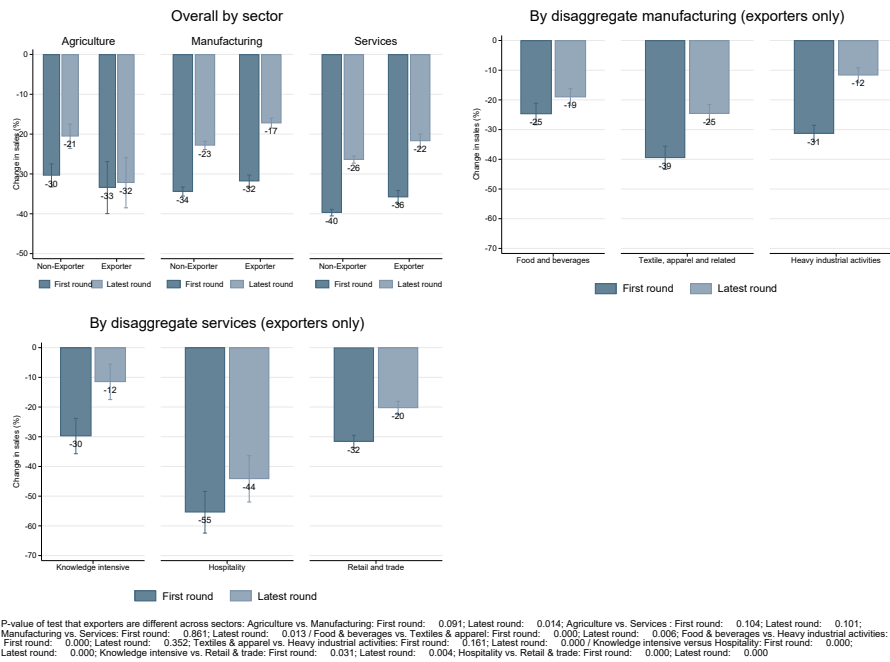
Globally engaged firms in manufacturing and services sectors were better able to cope with the negative external shock caused by the pandemic than those in the agriculture sector. Specifically, the total sales decline in the recovery phase (relative to 2019) for firms in manufacturing was the

lowest at 17%, followed by firms in services at 22% and this was 10 percentage points lower than the decline for firms in agriculture. Within manufacturing and services, recovery has been most remarkable for firms in heavy industrial manufacturing and knowledge-intensive services. Firms in each of these sectors experienced a 12% decline in total sales and the lowest predicted probability of falling into arrears of 27-28% (Figure 10). The recovery has been weakest for hospitality services with a 44% drop in sales and a 52% predicted probability of falling into arrears. The evidence from the BPS data confirms systematically discussions in the popular press on the strong recovery of firms in business services contrasting with the poor performance of those in hospitality services.¹⁵

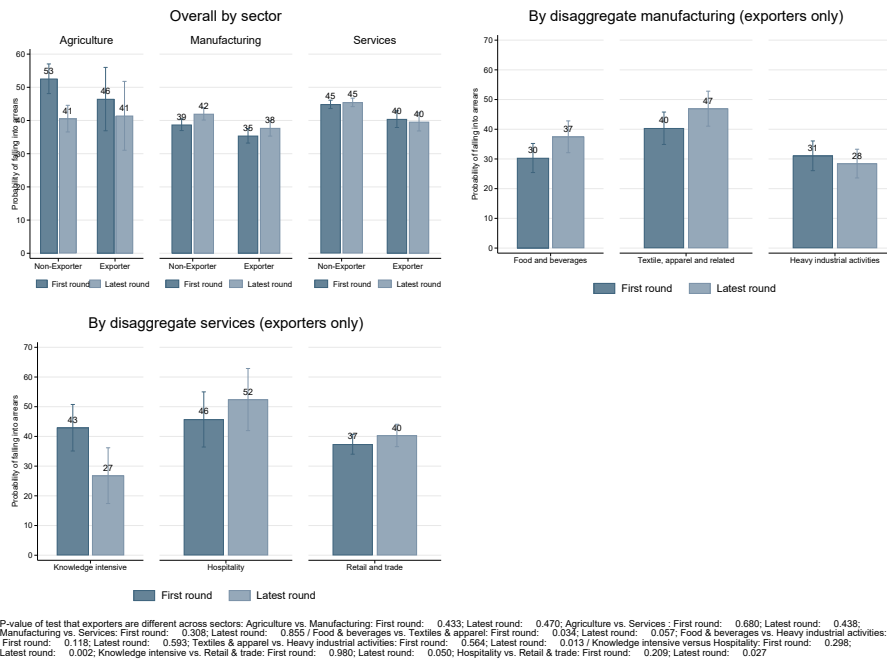
¹⁵See <https://www.ft.com/content/8075a9c5-3c43-48a5-b507-5b8f5904f443>
<https://www.ft.com/content/ac6266ed-3977-4d51-88bf-d60768ee8c7a>
<https://www.economist.com/finance-and-economics/2021/06/05/covids-unequal-effect-on-companies>
<https://www.economist.com/britain/2021/09/02/britains-economic-recovery-from-the-pandemic-is-far-from-smooth>

Figure 10: Heterogeneity by exporters' sector

(a) Change in sales



(b) Probability of falling into arrears



Notes: The sample includes 32,555 firms in 38 countries in panel a and 27,865 firms in 35 countries in panel b.

At an aggregate level, the impact of COVID-19 is shown to vary by sectoral attributes such as the

ability to continue operations in a remote environment, the intensity and type of transport costs, the strength of contractual enforcement, credit risks and so on (Brenton et al., 2022). This pattern of heterogeneous impacts across firms in their ability to cope with the pandemic depending on attributes of the sector is explored with the BPS data. Irrespective of the sectoral attribute, exporters experienced a lower drop in total sales in the initial as well as the recovery phase.

Exporters in sectors with higher flexibility to function in a remote setting had, on average, a decline in sales of 4 percentage points less and a probability of falling into arrears of 2 percentage points less than firms in sectors with less flexibility for remote work (Figure 11, panel a). Exporters in sectors including more durable products were significantly more vulnerable in the early phase of the pandemic but the differences in their sales declines relative to other exporters disappeared as the pandemic evolved, lockdowns and related factory closings stabilized, and the demand for durable goods required for working remotely in the aftermath of the acute phase of the pandemic increased (Espitia et al., 2022) (Figure 11, panel b).

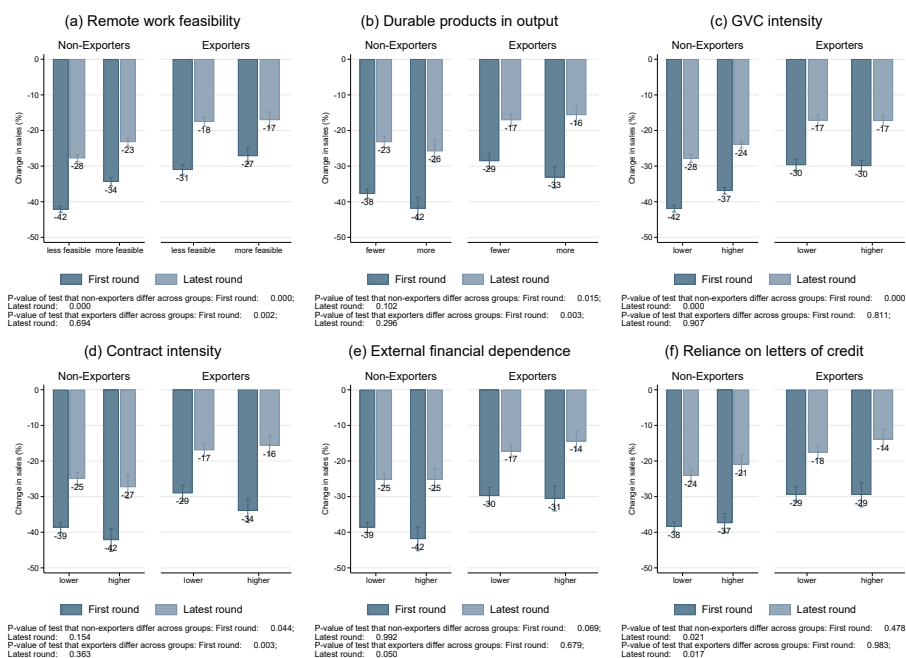
Higher GVC intensity of a sector did not play a role for exporters' sales declines in the pandemic but it did for non-exporters, significantly attenuating their sales declines (Figure 11, panel c). This finding masks variation across sub-sectors though, with higher GVC intensity playing a role for agriculture and manufacturing sectors in the early phase of the pandemic when exporters in these sectors experienced a significantly larger decline in sales than exporters in lower GVC intensity sectors, possibly due to disruptions in supply chains (Appendix Figure C10). These findings are broadly consistent with the fact that trade in complex products organized in GVCs tends to be more sensitive to global downturns than other trade, particularly that of motor vehicles, as observed during the GFC (Ferrantino et al., 2014). The fact that the decline in sales of exporters in the recovery phase does not vary by GVC intensity suggests that practices used within supply chains (just-in-time production or lean manufacturing) or the stronger capabilities associated with exporting help to even out differences in performance within a short period of time. Consistent with this finding is the fact that exporters in sectors more intensive contractual relationships experienced significantly larger sales declines at the beginning of the pandemic, as the stickiness of their links with foreign buyers may have chipped away their flexibility to adapt (Figure 11, panel d).

The dependence on external finance of sectors affected their exporters and non-exporters in different ways. The Rajan and Zingales (1998) measure of dependence on external finance captures the amount of desired investment that cannot be financed through internal cash flows and thus depends on external finance and can capture disruptions in financial markets during the COVID-19 crisis. While non-exporters in sectors with higher dependence on external finance were hit harder by the pandemic in the early phase, exporters in these sectors are actually recovering faster than those with lower dependence on external finance implying that exporters in such sectors were able to leverage their capabilities or networks to close the financial disruptions compared to exporters in other sectors or more generally other firms (Figure 11, panel e).

Another, although uncorrelated, measure of financial needs, the intensity of dependence on letter of

credit or financial insurance against non-payment provides similar results (Figure 11, panel f). The intermediation of financial institutions in securing letters of credit, a crucial tool to reduce risk in international transactions, is vital in the recovery of trading firms. Exporters in sectors more reliant on letters of credit exhibit significantly lower sales declines in the latest BPS round than exporters in other sectors. Since the COVID-19 pandemic is an uncertainty crisis rather than a banking or financial crisis, exporters in sectors that can rely on letters of credit are better able to mitigate the risks (Crozet et al., 2022).¹⁶

Figure 11: Change in sales by sector type



Notes: The sample includes 30,807 firms in panel a, 12,161 firms in panel b, 32,145 firms in panel c, 10,306 firms in panels d and e, and 12,161 firms in panel f, in 38 countries.

5.4.3 Country Characteristics

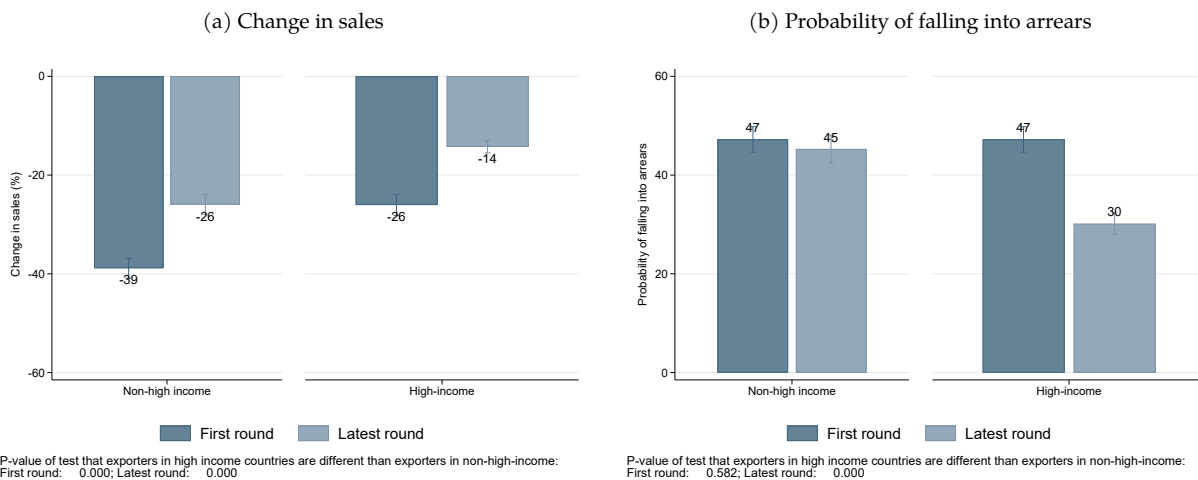
Countries differ in their geographical location, their income - and hence their sophistication in trade and global value chains - but also in how they reacted to the health challenges posed by the COVID-19 crisis. Evidence from BPS data supports three findings.¹⁷ *First*, the decline in sales was smaller and the recovery sharper for exporters in high-income countries relative to their counterparts in non-high-income countries. While exporters in non-high-income countries experienced a drop in sales of 39% initially and 26% later, exporters in high-income countries experienced smaller declines in sales of 26% and 14%, respectively. Qualitatively similar results are found for the probability of falling into arrears (Figure 12). These patterns are mirrored in the country's specialization and

¹⁶See Appendix Figure C11 for results on the probability of falling in arrears.

¹⁷To compute the margins by country characteristics presented in this section, Equation (1) is modified to include an indicator variable for wave 2 of the BPS to account for differences potentially generated by the timing of the survey for firm outcomes referring to changes from the beginning of the pandemic until the time of the survey (e.g., the digitalization question asks whether the firm started using or increased the use of internet, online social media, specialized apps, or digital platforms in response to the COVID-19 outbreak and it allows for more time to digitalize for a firm surveyed in April 2021 than a firm surveyed in October 2020).

comparative advantage in traded products. Firms in countries classified as advanced manufacturing and services according to the GVC taxonomy, exhibit the smallest sales drop in the initial phase and in the recovery phase, and the lowest probabilities of falling into arrears (Appendix Figure C12).

Figure 12: Initial impact and recovery of exporters by country income group

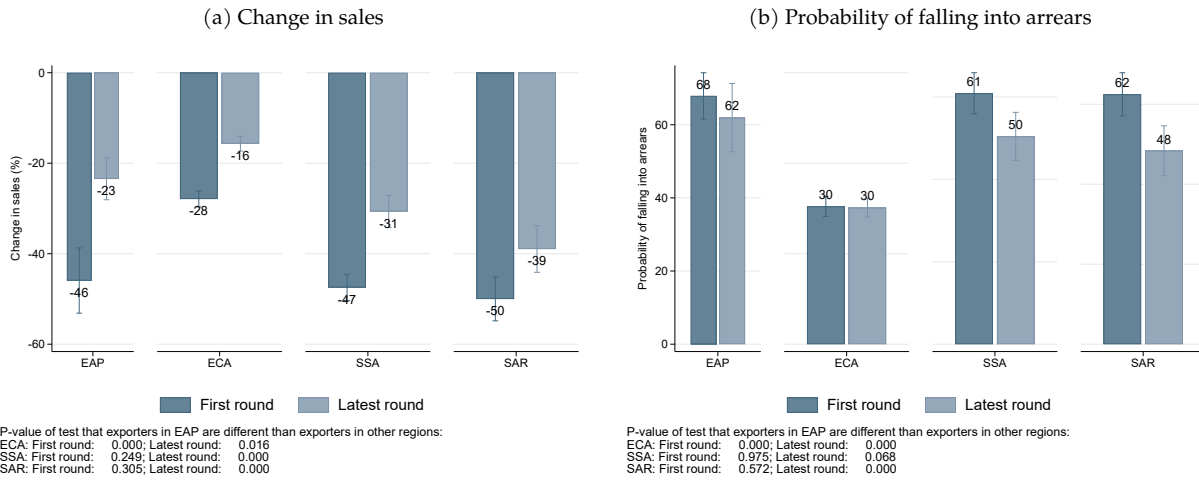


Notes: The sample includes 43,361 firms in 45 countries in panel a and 37,875 firms in 41 countries in panel b.

Second, in terms of regions, exporters in East Asia and Pacific (EAP), Sub-Saharan Africa (SSA), and South Asia (SAR) are comparably adversely impacted by the pandemic, relative to those in Eastern Europe and Asia (ECA). In particular, ECA exhibits the smallest average sales decline for exporters both in the initial period (28%) and in the recovery period (16%) as well as the lowest probability of falling into arrears, about 30%. Nonetheless, the recovery of firms in EAP is catching up with those in ECA (Figure 13).¹⁸

¹⁸Access to public support was generally higher in ECA (given that many advanced countries are included in this group), but the differences are not significant by exporting status. In SAR and SSA exporters have better access public support suggesting that being part of networks could be critical.

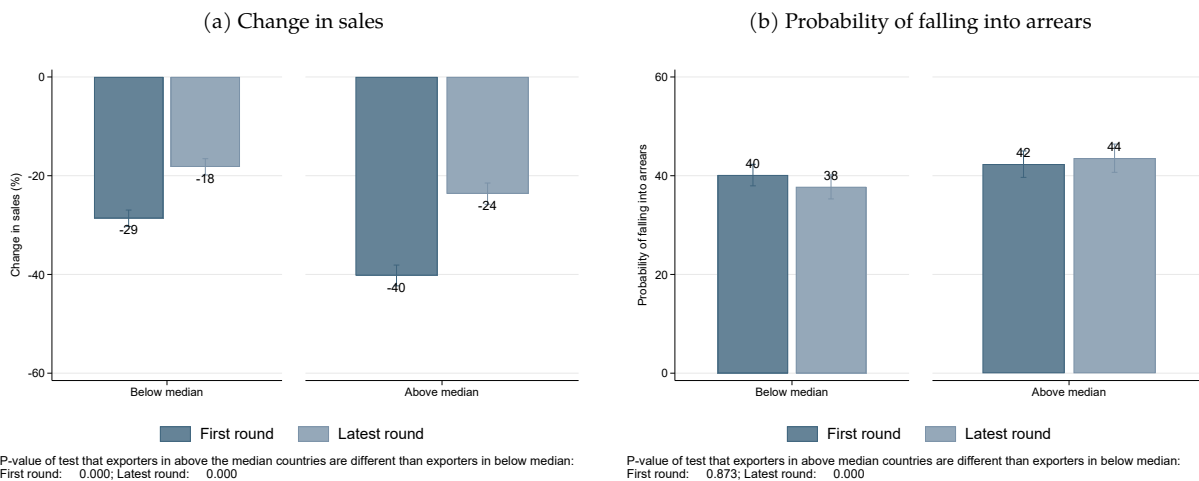
Figure 13: Initial impact and recovery of exporters by region



Notes: The sample includes 43,361 firms in 45 countries in panel a and 37,875 firms in 41 countries in panel b.

Third, at the onset of the pandemic, some economies imposed much more stringent restrictions to stop the spread of the virus, which may have had differential impacts on globally engaged firms across countries. Counter-intuitively, exporters in countries with above median initial stringency of lockdown conditions exhibit a smaller decline in total sales and a lower probability of falling in arrears, but their recovery has been slower (Figure 14). These results are in sharp contrast to Cirera et al. (2021a) who find that the average firm in countries with higher severity of initial lockdown suffered more, although their recovery was comparable. It is possible that exporters are highly agile and react promptly by adjusting their operations, products and markets in response to domestic conditions, as we will next explore in greater detail.

Figure 14: Initial impact and recovery of exporters by severity of country initial lockdown

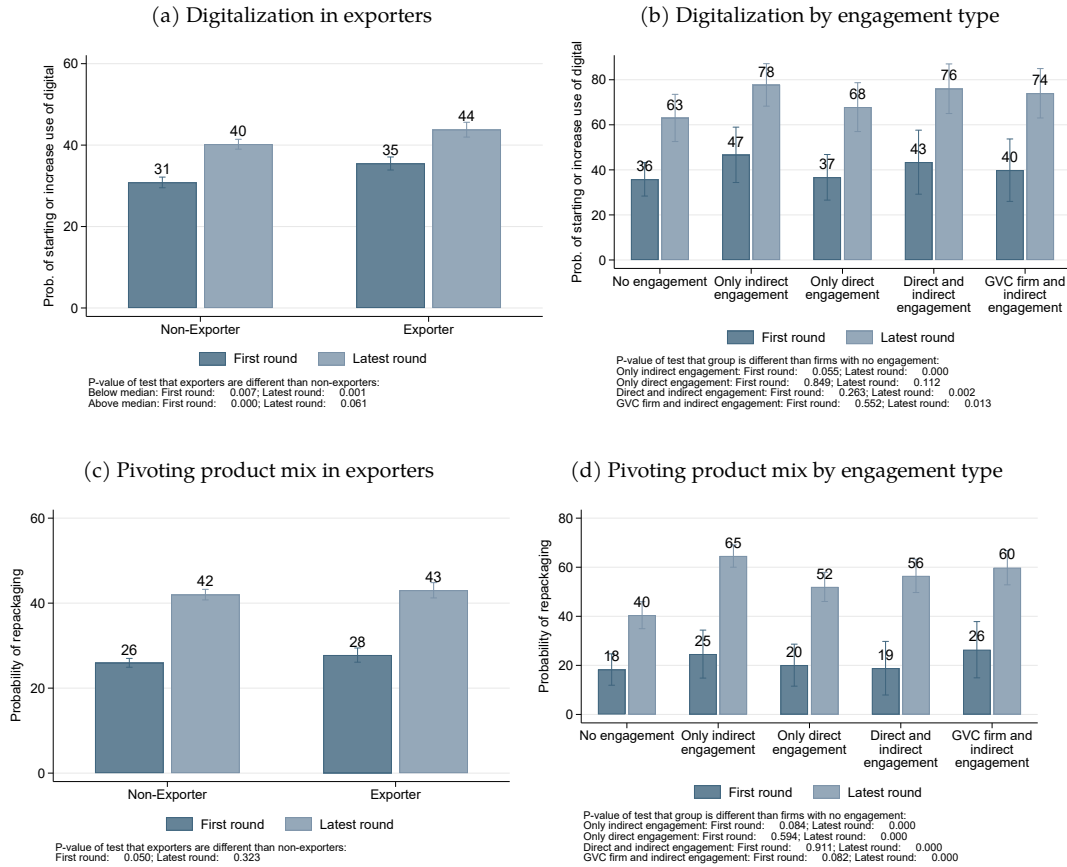


Notes: The sample includes 43,361 firms in 45 countries in panel a and 37,875 firms in 41 countries in panel b.

5.5 Adjustment Mechanisms of Globally Engaged Firms

Adjustments by firms during the pandemic have been a critical part of their coping strategies. Here we document the following three key facts with respect to coping strategies of globally engaged firms. *First*, globally engaged firms heightened their response to the pandemic by ramping up digitalization and product innovation during the recovery phase, although non-engaged firms are also catching up. For example, relative to other firms, exporters were significantly more likely to start or increase the use of digital technologies (4-5 percentage points higher) and pivot their product mix (2 percentage points) (Figure 15, panels a and c). Such differences in adjustment mechanisms are also observed by Borino et al. (2021) who showed that trading firms were more likely to adopt teleworking as a coping mechanism to the COVID-19 crisis relative to non-trading firms. It is important to note that not all global engagement is alike and the type of engagement matters for the probability of adjusting through digitalization and product pivoting. Compared to directly engaged firms, those with indirect engagement are more likely to adjust rapidly during the recovery phase (Figure 15, panels b and d).

Figure 15: Adjustment response to the pandemic

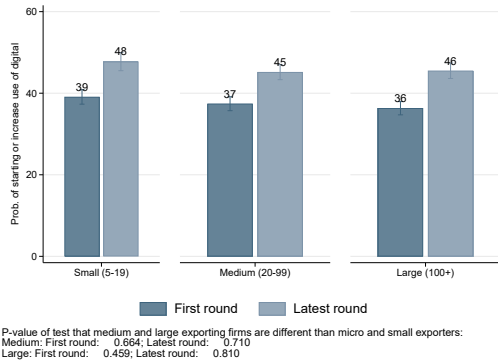


Notes: The sample includes 24,515 firms in 38 countries in panel a, 3,070 firms in 6 countries in panel b, 30,789 firms in 38 countries in panel c, and 9,656 firms in 8 countries in panel d.

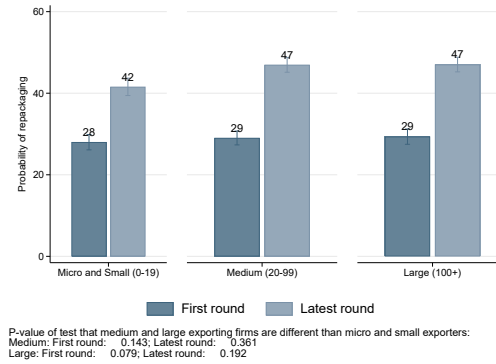
Second, the ability of globally engaged firms to adjust by digitalizing and innovating may vary by firm size, sector, and country characteristics. Contrary to the findings in Riom and Valero (2020) and Cirera et al. (2021a), where on average smaller firms are slow in catching up on digitalization and product innovation, the probability of globally engaged firms to digitalize does not vary by firm size (Figure 16, panel a), though in Riom and Valero (2020) the size differential also disappears once they control for other firm characteristics. The probability to pivot product mix, however, does increase with firm size among globally engaged firms (Figure 16, panel b). There are several possible explanations for this. Less digitalization may not be an option for globally engaged firms at this time of government-imposed physical distancing norms. Given the higher capabilities of globally engaged firms they have an understanding of the need for digitalization during the pandemic, irrespective of size. By comparison, product pivoting may require larger investments that smaller exporting firms cannot afford.

Figure 16: Adjustment response to the pandemic by firm size

(a) Probability of increasing use of digital technologies



(b) Probability of pivoting the product mix

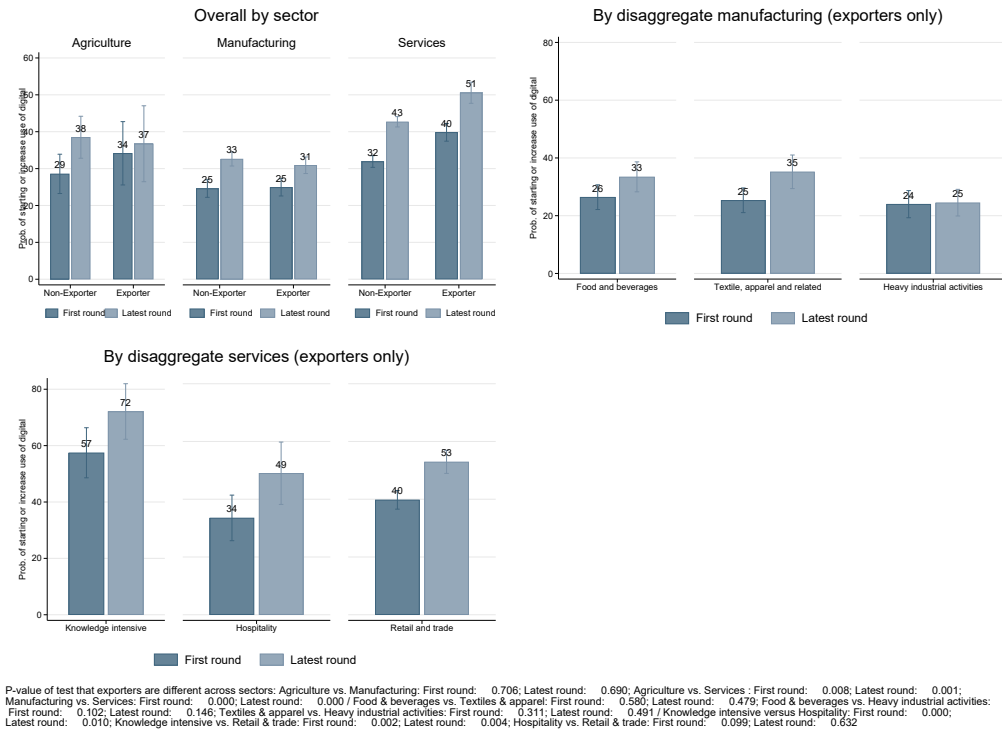


Notes: The sample includes 24,515 firms in 38 countries in panel a, and 30,789 firms in 38 countries in panel b.

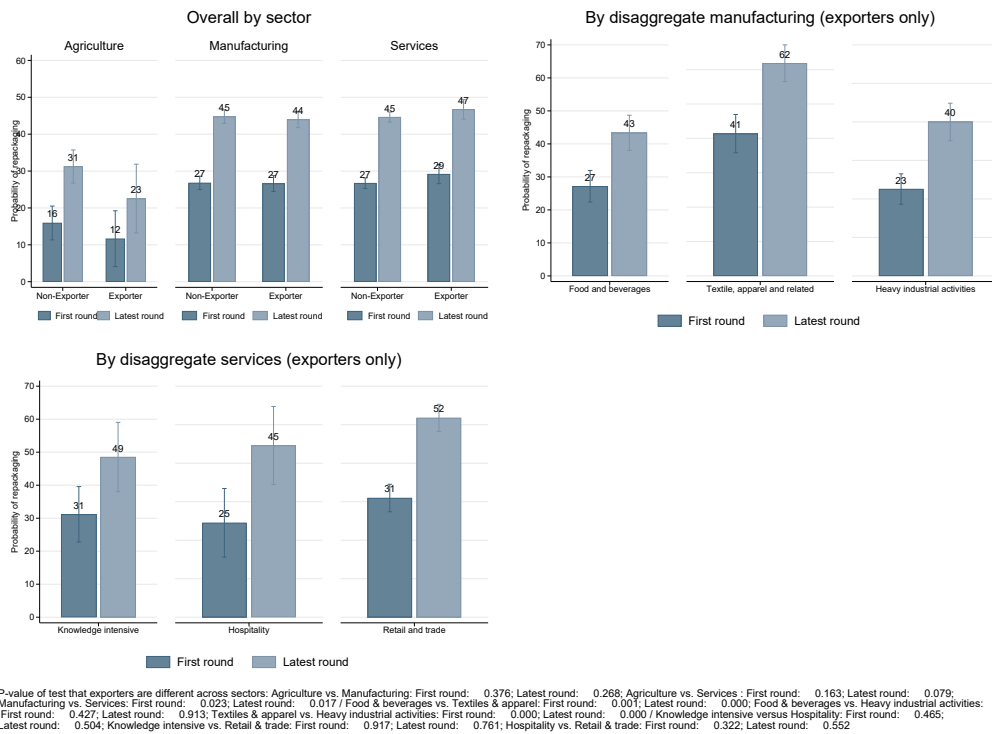
The adjustment of globally engaged firms varies substantially across sectors, with digital adjustments driven mostly by the services sector, and especially knowledge-intensive services exporters, while product pivoting during the pandemic is rampant among exporters in both services and manufacturing. Within manufacturing, globally engaged firms in food and beverages and textile, apparel and other related sectors are much more likely to digitalize and pivot product mix than those in heavy industrial activities (Figure 17).

Figure 17: Adjustment response to the pandemic by sector

(a) Probability of increasing use of digital



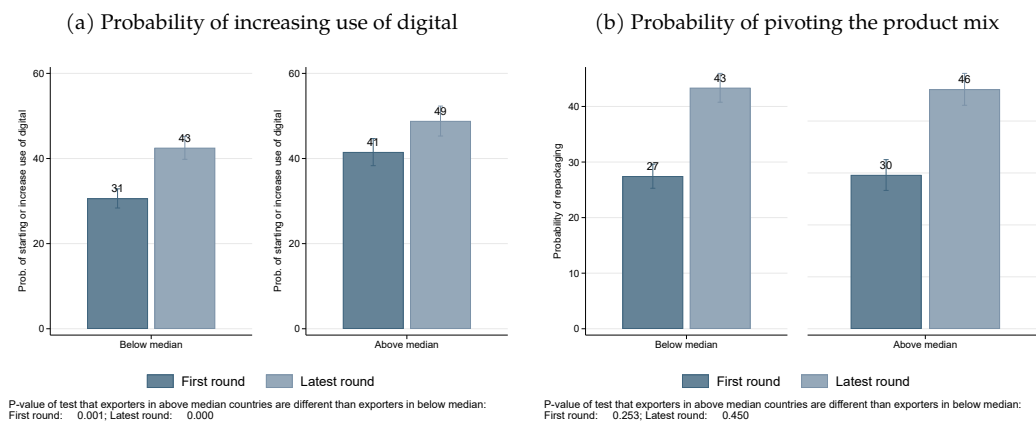
(b) Probability of pivoting the product mix



Notes: The sample includes 18,451 firms in 33 countries in panel a and 23,823 firms in 33 countries in panel b.

Variations in adjustment mechanisms are also driven by country characteristics. Globally engaged firms (exporters) in countries with more severe initial lockdown conditions were naturally pushed harder to digitalize and innovate more by pivoting their product mix compared to those in countries with less severe lockdowns. Although their probability to digitalize and innovate continues to be higher, exporters in other countries are also catching up in the recovery period (Figure 18, panel a). By comparison, exporters in these severely locked down countries were responding by pivoting their product mix in the initial phase relative to those in countries with milder lockdowns. Nonetheless, during the recovery, exporters in all countries are increasingly pivoting products (Figure 18, panel b).

Figure 18: Adjustment by country characteristic by exporters: severity of initial lockdown crisis

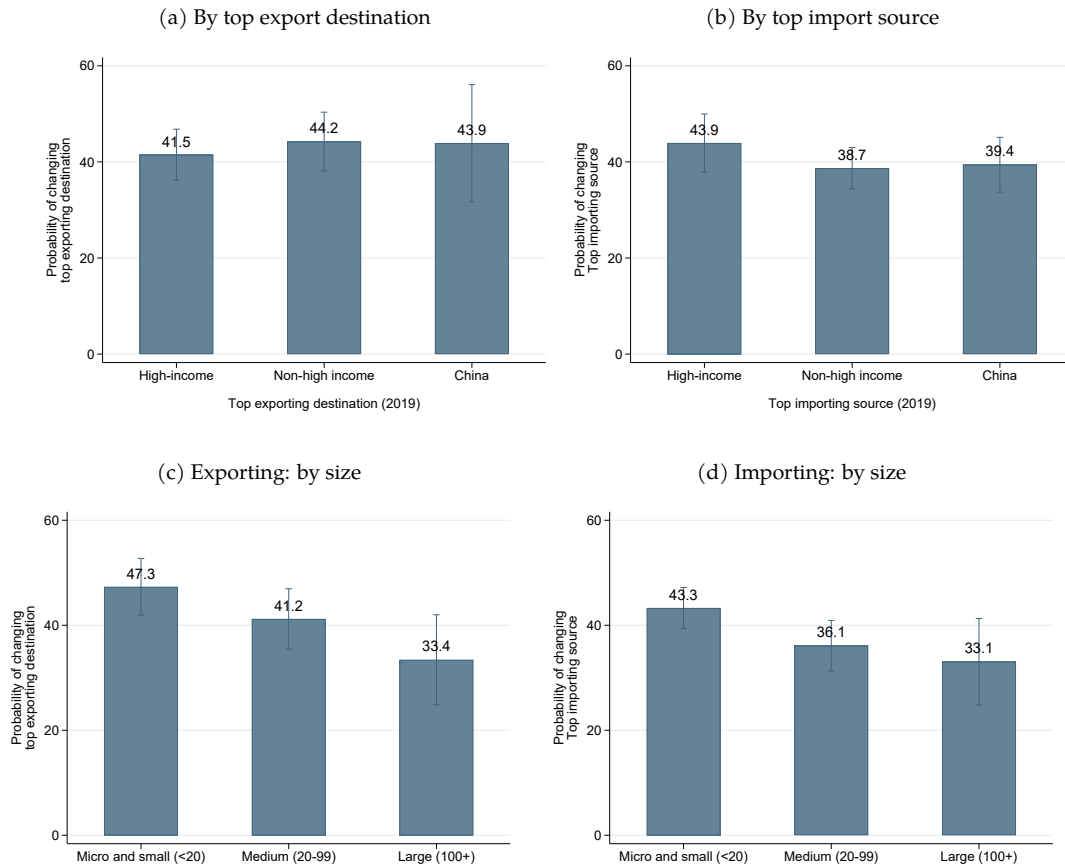


Notes: The sample includes 24,515 firms in 38 countries in panel a, and 30,789 firms in 38 countries in panel b.

Third, the relatively resilient recovery of globally engaged firms may also be due to their ability to swiftly change their markets and input sources. The absence of significant differences in the impact of the pandemic on globally engaged firms across characteristics of the trading partners in the recovery phase (Figure 9) may be due to the fact that the pandemic motivated a substantial share of traders to switch their destination (44%) and source (39%) countries. While there is no systematic switching pattern by trading partner's income or severity of initial lockdown, smaller globally engaged firms are more likely to switch destination or source countries (Figure 19).¹⁹

¹⁹Given the small number of firms reporting these changes, we may be unable to capture some of the nuanced switches by country characteristics.

Figure 19: Probability of changing top export destination



Notes: The sample includes 667 exporting firms in 13 countries in panel a and c, and 1,195 importing firms in 13 countries in panel b and d.

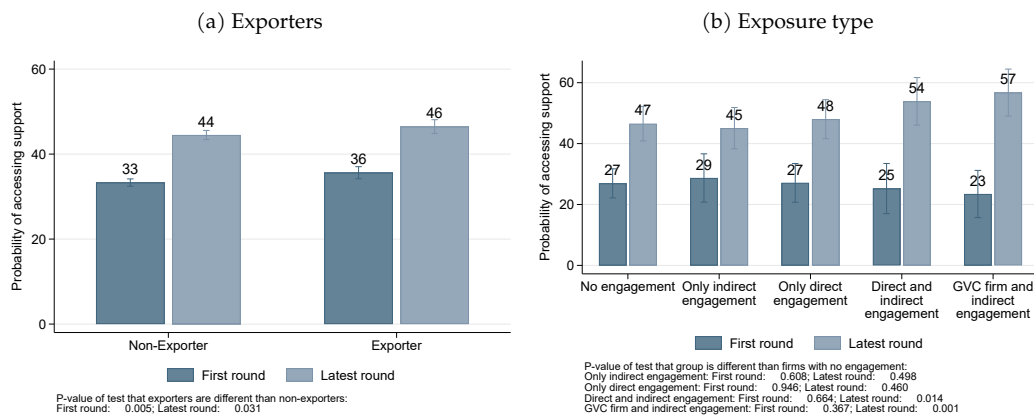
5.6 Access to Public Support

Emerging evidence shows that public policy support in response to the COVID-19 reached only a limited set of firms and countries in the initial phase of the pandemic but had beneficial effects for the firms and countries it did reach (Cirera et al., 2021b). In this section we provide new evidence on whether globally engaged firms benefited more or less from government support relative to domestically-oriented firms and the heterogeneity in access to public support across globally engaged firms. We identify the following facts.

First, during the recovery phase of the COVID-19 crisis, globally engaged firms have better access to support programs, although the relative advantage varies by the type of engagement. While exporters have marginally higher probability of accessing public support (Figure 20, panel a), the most global firms, with direct and indirect engagement exhibit a significantly higher probability of accessing public support – 52-54% – than firms with only direct engagement (44%) or firms with only indirect engagement that are in fact similar to those with no engagement at all (42%) (Figure 20, panel b). Being a direct and indirect global firm probably helps them qualify for more programs and have access to a larger network of domestic and global firms. This is over and above the fact

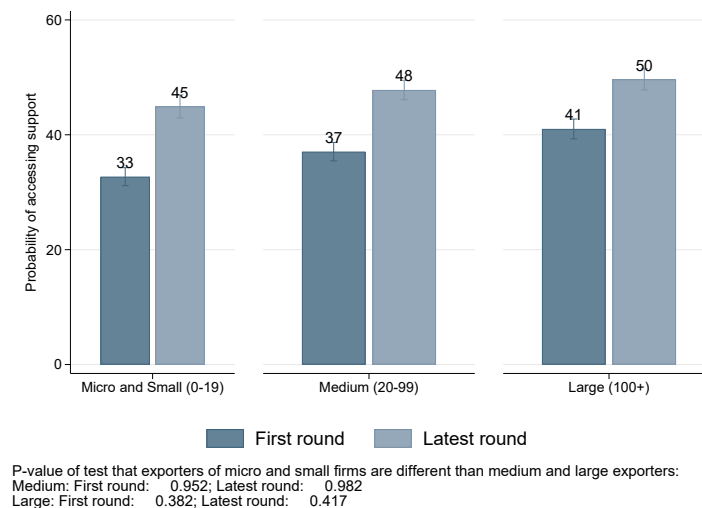
that globally engaged firms are better informed about public policies and able to adequately and comprehensively fill in requests for such support due to their better management capabilities shown in Section 4. The international networks of such firms, namely their foreign buyers and suppliers, may advise them to look for such support. In unreported results we also show that the probability of accessing public support increases with export volume.²⁰

Figure 20: Probability of accessing public support



Notes: The sample includes 38,908 firms in 42 countries in panel a, and 9,435 firms in 10 countries in panel b.

Figure 21: Probability of accessing public support for exporters by size



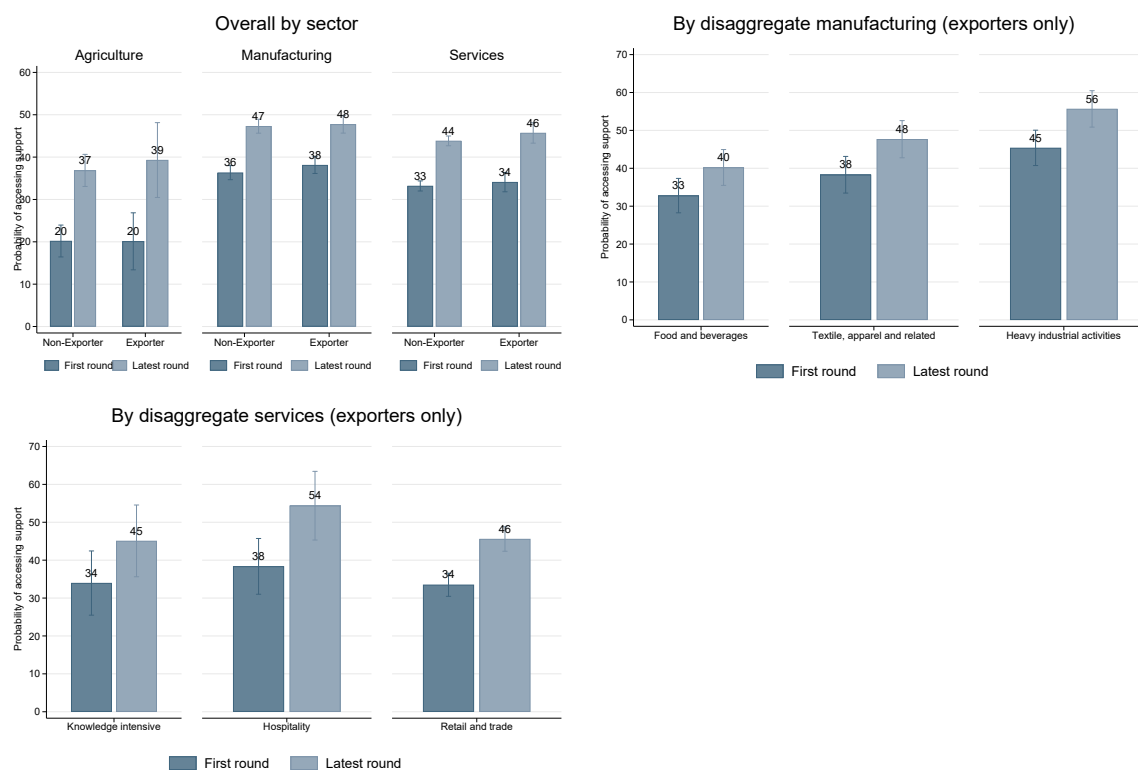
Notes: The sample includes 38,908 firms in 42 countries.

Second, the probability of accessing public support for globally engaged firms is higher in manufac-

²⁰Considering the entire sample of firms, access to public support increased on average between the first and the latest round of the BPS (Cirera et al., 2021a), perhaps due to more support programs being put in place, the information about the support programs being more widespread, and a deterioration in economic conditions faced by firms that may have led them to seek public support.

turing and, surprisingly in countries with lower severity of the initial lockdown. Figure 22 shows striking differences across sectors in the latest round of the BPS, with only 35% of exporters in overall agriculture accessing public support, followed by 44% of exporters in overall services, and 47% of exporters in overall manufacturing. There are also remarkable differences within sub-sectors. Within services, 52% exporters in hospitality services but only 40% of exporters in knowledge-intensive services access such support, the latter possibly due to these firms not needing support as their mostly virtual business activity did not suffer much during the pandemic. Within manufacturing, 40% of exporters in food and beverages access support while 55% do so in heavy industrial activities. Figure 23 shows that exporters are significantly more likely to access public support in countries where the severity of the initial lockdown was milder.

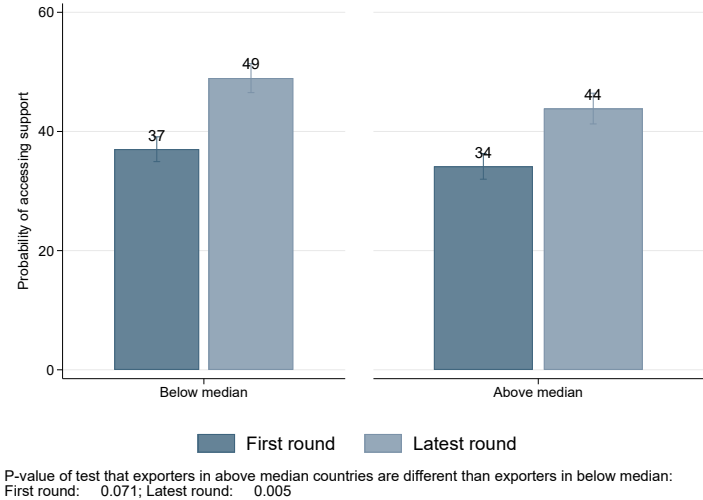
Figure 22: Probability of accessing public support by sector



P-value of test that exporters are different across sectors: Agriculture vs. Manufacturing: First round: 0.840; Latest round: 0.539; Agriculture vs. Services: First round: 0.749; Latest round: 0.742; Manufacturing vs. Services: First round: 0.701; Latest round: 0.372; Food & beverages vs. Textiles & apparel: First round: 0.040; Latest round: 0.018; Food & beverages vs. Heavy industrial activities: First round: 0.009; Latest round: 0.005; Textiles & apparel vs. Heavy industrial activities: First round: 0.593; Latest round: 0.715; Knowledge intensive versus Hospitality: First round: 0.558; Latest round: 0.103; Knowledge intensive vs. Retail & trade: First round: 0.961; Latest round: 0.485; Hospitality vs. Retail & trade: First round: 0.370; Latest round: 0.141

Notes: The sample includes 30,114 firms in 37 countries.

Figure 23: Probability of accessing public support by country type (severity of initial lockdowns)



Notes: The sample includes 38,908 firms in 42 countries.

6. Conclusions and Policy Recommendations

This paper provides novel evidence on the impact of the COVID-19 pandemic and the subsequent recovery for globally engaged firms, as well as on their adjustment mechanisms. This evidence has been grouped into a set of six stylized facts on trade outcomes; changes in sales and financial fragility for these firms; their labor market adjustments; the heterogeneity across attributes pertaining to firm, sector, and country; their response in terms of digitalization, product innovation, and changes in trading partners; and finally their access to public support. In all cases these patterns are compared not only to non-engaged firms but also across different types of global engagement using a rich survey spanning three waves of data collection covering nearly 65,000 firm-year observations across 45 countries. Our analysis from the BPS data shows an immediate negative impact of the COVID-19 pandemic on trade outcomes at the firm-level, which is also confirmed in the customs data. The adverse impact is more pronounced for GVC firms, that is, those that participate in both exports and imports perhaps because shocks in the multiple nodes of global production networks magnify for these firms. The adverse impact of the pandemic on total sales (and other outcomes such as financial fragility) of firms are recovering faster for globally engaged firms, possibly due to their stronger pre-pandemic productivity, management practices and digital readiness relative to non-engaged firms.

While there is wide geographic, and weaker sectoral, heterogeneity in the impact of the pandemic, globally engaged firms were affected similarly across size, source and destination of exports. On the surface it may appear surprising that the immediate impact of the crisis was sharper for better-managed exporters, however, the noticeable recovery for these firms suggests that the very practices such as lean manufacturing and just-in-time production which make them more productive in normal times can create potential vulnerabilities in times of global shocks. Nevertheless, these are

also the firms that are quicker to recover from shocks.

Further findings on the response of globally engaged firms substantiate the firm-level evidence on the benefits of international linkages during the COVID-19 crisis. The inherent capabilities of globally engaged firms, such as better management and digital readiness, drive their agility in adjusting to the crisis. At the core of the recovery is the fact that firms have found innovative ways to adapt their supply chains even in the presence of lockdowns and production shifts, and amid policy uncertainty and new border procedures.²¹ The relatively resilient recovery of globally engaged firms may also be due to their ability to swiftly change their markets and sources of input supply. In addition, public policy support may also be playing a role as globally engaged firms are more likely to access and use it.

Across globally engaged firms, those engaging directly with global markets have a better sales recovery and a lower probability of falling in arrears than those indirectly engaged. The heightened financial fragility of suppliers of GVC firms may be driven by the lack of control over global production networks, their smaller size and lower market power such that these firms may see their orders being canceled or contracts not being honored in face of the pandemic. While they are affected in terms of their financial position, they are still able to cope on their revenues, perhaps by channeling their sales to the domestic market. This is further clarified in the poor adjustment mechanisms for indirectly engaged firms. These firms make significantly larger employment adjustments on both the intensive and extensive margins in the initial and recovery phases, when compared with direct exporters or importers.

Based on our results we have three recommendations for policy makers keen on supporting the vulnerable but viable firms, of which globally engaged firms are a subset:

First, even before crises unfold, policy makers can prepare globally engaged firms for shocks by facilitating the strengthening of their capabilities, either through the diffusion of best practices in management and digital readiness or through trade promotion efforts that may foster firms' diversification of destination markets and source countries. These capabilities can help firms not only recover from the current crisis but also to make them more resilient to future ones. Investment in such capabilities is critical because firms usually over-estimate their competence in the absence of information on best practices, that is, they often "don't know what they don't know" (for an example on intervention pertaining to management capabilities, see Cusolito et al., 2020).

Second, while management and technological capabilities contribute to resilience among firms, global engagement still cushions against shocks in the medium to long term. In fact, our results show that among globally engaged firms, size does not matter for recovery, while the type of global linkages could be crucial. For instance, indirectly engaged firms are perhaps more vulnerable. Yet, their resolve to combat the crisis by extensive digitalization and product innovation, and more so

²¹For example, exporters in Vietnam accelerated the use of e-commerce and digital platforms to reach consumers, especially in the periods of reduced operations and mobility restrictions (Brenton et al., 2022). This digitalization paid off, as Vietnam was one of the few countries whose GDP grew in 2020.

when compared with directly engaged firms suggests that they could benefit from public support in improving their resilience to shocks. This seems even more important, given the finding that these firms' probability to receive support during the crisis is not higher than those that are directly engaged. In tight fiscal environments, policymakers could possibly ration support in favor of the vulnerable globally engaged firms such as those that indirectly integrate with global markets. These firms are a critical part of GVCs and have intangible firm-to-firm relationships which are harder to rebuild post crises. Such targeting should not be based on the size of the firm but on the type of global linkage – thereby supporting the viable and the vulnerable firms.

Third, in the recovery phase, globally engaged firms can be supported through the provision of information on market opportunities both in terms of products as well as buyers. Improving regulations, complementary skills, and infrastructure needed to make operations flexible (e.g., facilitating remote work arrangements and reducing the rigidity in contracts) would help ease the immediate impact of the crisis on globally engaged firms, especially in sectors with certain product or contract specificity. In the short to medium run, providing incentives to financial institutions to reduce the risk exposure of exporters or to help firms secure letters of credit would also reduce uncertainty risk and pave the pathway of recovery.

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Appendices

A. Data and Methodology

A.1 BPS Data: Sample, Summary Statistics, Sectoral Attributes, and Additional Methodology

Table A1: Number of firms in the BPS data sample per country

Country Code	Country	First round	Latest round	Trade module	Country Code	Country	First round	Latest round	Trade module
AFG	Afghanistan	385	664		MNG	Mongolia	284	233	
BGD	Bangladesh	900	840	50	MYS	Malaysia	1,352	1,378	
BGR	Bulgaria	1,456	1,317	230	NIC	Nicaragua	184	189	
BRA	Brazil	1,978	1,046		NPL	Nepal	504	1,456	
CYP	Cyprus	167	172		PAK	Pakistan	1,293	1,131	179
CZE	Czech Rep.	398	396		POL	Poland	2,310	1,514	
EST	Estonia	272	359		PRT	Portugal	743	770	
GEO	Georgia	597	575		PSE	West Bank & Gaza	2,506	2,395	
GHA	Ghana	3,928	3,398		ROU	Romania	1,448	1,051	105
GRC	Greece	530	159		SEN	Senegal	4488	497	
GTM	Guatemala	199	191		SLE	Sierra Leone	480	414	
HND	Honduras	163	159		SLV	El Salvador	391	413	
HRV	Croatia	343	327		SVK	Slovak Rep.	325	301	
HUN	Hungary	619	643		SVN	Slovenia	249	251	
IND	India	715	3,001	190	TJK	Tajikistan	959	992	156
ITA	Italy	420	424		TUN	Tunisia	3,329	2,345	
KEN	Kenya	1,796	1,535		TUR	Turkey	1,424	1,477	
KGZ	Kyrgyz Rep.	995	972	139	TZA	Tanzania	978	983	
LKA	Sri Lanka	500	950	128	UZB	Uzbekistan	937	937	185
LTU	Lithuania	213	346		VNM	Vietnam	494	485	
LVA	Latvia	240	265		XKX	Kosovo	2,083	1,116	224
MAR	Morocco	781	704		ZAF	South Africa	2,022	1,272	160
MDA	Moldova	283	282		ZMB	Zambia	533	531	
MDG	Madagascar	865	1,916						

A.2 Summary Statistics

Table A2: Summary statistics for BPS sample

	Number of firms. (non-missing variable)	Mean (unweighted)	Standard Deviation
<i>Firm global engagement</i>			
Exporter	35,995	18%	0.381
Importer	14,267	10%	0.301
Supplier to GVCs	14,267	12%	0.320
GVC firm	14,267	4%	0.194
<i>Firm global engagement - mutually exclusive categories</i>			
Only indirect engagement	14,267	11%	0.309
Only direct engagement	14,267	9%	0.282
Direct and indirect engagement	14,267	4%	0.201
GVC firm and indirect engagement	14,267	4%	0.189
<i>Firm outcome variables (latest round)</i>			
Change in sales (% relative to 2019)	38,654	-27	36.815
Indicator for falling into arrears	31,358	42%	0.493
Indicator for reducing wages/hours in the last 30 days	39,712	33%	0.471
Indicator for firing employees in the last 30 days	39,321	17%	0.374
Indicator for increasing the use of digital technology	25,228	41%	0.492
Indicator for product innovation (pivoting product mix)	29,598	33%	0.470
Indicator for accessing public support	39,006	39%	0.487
<i>Firm controls</i>			
Micro/small (0-19 workers)	41,873	68%	0.466
Medium (20-99 workers)	41,873	22%	0.413
Large (100 + workers)	41,873	10%	0.301
Agriculture	42,447	5%	0.217
Manufacturing	42,447	31%	0.462
Hospitality	42,447	8%	0.269
Retail	42,447	24%	0.425
Knowledge intensive services	42,447	5%	0.219
Other services	42,447	28%	0.447

A.3 Sectoral Attributes

Our analysis allows for heterogeneity in the impact of COVID-19 on globally engaged firms depending on sectoral attributes. For such analysis, we rely on a more disaggregated sectoral classification than that used for the sector fixed effects included in Equation (A1). The BPS questionnaire includes a question on the firm's main activity. A cleaning and coding algorithm is used to allocate a 4-digit ISIC sector to each firm based on the firm's main activity.²² We consider the following six sectoral attributes and their definitions are provided below:

- *Flexibility for remote work* is measured by a remote labor measure from Espitia et al. (2022) and computed as the percentage of occupations within an ISIC 2-digit sector that can be performed remotely, based on 2017 O*NET data. Sectors in quartile 4 of the measure are classified as having higher feasibility for remote work and others are classified as having lower feasibility for remote work.
- *Durable goods intensity* is from Espitia et al. (2022) and measured by the share of HS 6-digit products in the total number of HS 6-digit products in an ISIC 2-digit sector that are classified as durable and semi-durable consumer products, or cars and transport equipment according to the UN BEC classification. Sectors in quartile 4 of the measure are classified as having more durable products and others are classified as having fewer durable products. This measure is not available for services sectors.
- *GVC intensity* is measured by the strength of backward and/or forward international linkages of each sector. Sectors with high backward GVC participation are those in quartile 4 of the OECD TiVA-based share of imported inputs in the sector's global exports. Sectors with high forward GVC participation are those in quartile 4 of the OECD TiVA-based share of a sector's value added produced and exported by a country and embodied in the exports of the direct importer, based on data from OECD TIVA (aggregated across all countries). If either type of GVC participation is high the sector is classified as having higher GVC intensity and other sectors are classified as having lower GVC intensity. But two important adjustments are made to the measure. Textiles and apparel and machinery equipment are classified as having higher GVC intensity due to their classification as archetypal GVCs following (Ferrantino and Schmidt, 2018; Sturgeon and Memedovic, 2010) despite their backward and forward linkages not being among the highest. Mining and coke and refined petroleum are excluded from the GVC intensity measure because their large forward and backward linkages that would classify them as having higher GVC intensity is purely based their output being upstream and used as primary input by most other sectors but does not rely on durable firm-to-firm linkages that promote access to capital and inputs along supply chains that characterizes relational GVC participation as per World Bank (2020) and Antràs (2020).
- *Contract intensity* is the measure proposed by Nunn (2007) that consists of the proportion of an ISIC 3-digit sector's intermediate inputs that require relationship-specific investments

²²The algorithm has been developed by Giesberts and Eapen (2022) and facilitates a fast, high-quality and, in great part, automatic ISIC assignment to text from multiple languages.

(i.e., those that are differentiated products) based on information from a US input-output table. Sectors in quartile 4 of the measure are classified as having higher contract intensity and others are classified as having lower contract intensity. This measure is not available for services sectors.

- *External financial dependence* is the measure proposed by Rajan and Zingales (1998) defined as the extent of the need for external borrowing to finance investment based on information on US firms in Compustat at the ISIC 3-digit level. Sectors in quartile 4 of the measure are classified as having higher external financial dependence and others are classified as having lower external financial dependence. This measure is not available for services sectors.
- *Reliance on letters of credit* is measured by the average across products in a 4-digit ISIC sector of the product letter of credit reliance proposed by (Crozet et al., 2022) that captures the use of this type of financial instrument that eliminates risk in international transactions. Sectors in quartile 4 of the measure are classified as having higher reliance on letters of credit and others are classified as having lower reliance on letters of credit. This measure is not available for services sectors.

Table A3: Intensity in sectoral attributes: share of intensive versus non-intensive 4-digit ISIC rev. 4 sectors, percent

Sector	Sub-sector	Remote labor intensity		Durable products in output		GVC intensity		Contract intensity		Financial Dependence		Letter of credit	
		less feasible	more feasible	fewer	more	lower	higher	lower	higher	lower	higher	lower	higher
Agriculture	Agriculture	100	0	100	0	100	0	100	0	0	100	93	7
Mining	Mining	100	0	100	0	n.a.	n.a.	100	0	100	0	55	45
Manufacturing	Food, beverage	100	0	100	0	100	0	83	17	100	0	89	11
Manufacturing	Textile, apparel and related	100	0	79	21	0	100	93	7	36	64	57	43
Manufacturing	Heavy industrial activities	100	0	22	78	0	100	13	88	19	81	69	31
Manufacturing	Other manufacturing	96	4	65	35	57	43	79	21	75	25	69	31
Services	Knowledge intensive	29	71	n.a.	n.a.	50	50	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Services	Hospitality	100	0	n.a.	n.a.	100	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Services	Retail and trade	71	29	n.a.	n.a.	0	100	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Services	Other services	87	13	n.a.	n.a.	71	29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

A.4 Additional Methodology

To examine the role of firm capabilities for firm global engagement, we estimate the following equation using only the first round of BPS data:

$$Engagement_{ic} = \alpha + \beta C_i + \gamma X_i + \delta \pi_c + \epsilon_{ic} \quad (A1)$$

where $Engagement_{ic}$ is the indicator for firm export status in 2019, the vector X_i includes an indicator for medium-sized firms, an indicator for large firms and sector fixed effects, π_c designates country fixed effects, and the vector C_i includes either firm size (in which case size is not included in the vector X_i) or alternatively two indicator variables for: (a) firms in the second or third tercile of labor productivity; (b) firms with medium or high number of management practices; or (c) firms with a medium or high number of technology readiness.

B. Customs Data: Cleaning Details, Sample, and Methodology

Some of our analysis relies on transaction-level export and import customs data obtained from customs agencies as part of the expansion to the Exporter Dynamics Database described in Fernandes et al. (2016). The export and import customs data sets cover the universe of, respectively, export and import transactions. We focus on transactions in agricultural, mining, and manufacturing sectors excluding transactions in HS Chapter 27 (hydrocarbons such as oil, petroleum, natural gas, coal, etc.). Each country's export data set provides information at the exporting firm-HS 6-digit product-destination country-day level that we aggregate to the exporting firm-quarter-year level constructing total export value, number of HS-digit products exported, and number of destination markets. Each country's import data set provides information at the importing firm-product-source country-day level that we aggregate to the importing firm-quarter-year level constructing total import value, number of HS 6-digit products imported, and number of sourcing countries.

The raw customs export and import datasets are subjected to uniform reformatting and to a series of cleaning procedures. Firms are identified by their actual names, their tax identification number, or an artificial unique code randomly created by the local customs agency which allows us to create a panel of exporting firms or importing firms for each country. The firm identifier is common across exporting and importing firms. The products are reported based on the 2017 revision of Harmonized System (HS) classification at the 6-digit level. Export values are Freight on Board (FOB) figures and import values are Cost Freight and Insurance (CIF) figures measured in USD converted from local currency to USD when necessary, using exchange rates taken from the IMF's International Financial Statistics. Table B1 below shows the number of firm-quarter-year observations per country in the sample with customs data.

For each country, we construct a data set matching across export and import customs data sets in order to identify which firms both export and import in a given year and are thus classified as GVC firms.

Table B1: Number of firm-quarter observations in the customs data sample per country

Country Code	Country	Export	Import
BEN	Benin	1,452	21,575
CHL	Chile	50,141	1,283,143
COL	Colombia	41,334	135,821
CPV	Cape Verde	138	19,776
DOM	Dominican Rep.	17,479	150,949
GEO	Georgia	13,456	203,504
KEN	Kenya	32,443	137,870
LAO	Lao PDR	5,777	9,554
LKA	Sri Lanka	22,707	78,887
MUS	Mauritius	7,416	54,392
MWI	Malawi	2,538	61,707
PER	Peru	35,798	160,357
PRY	Paraguay	5,673	36,681
SEN	Senegal	6,933	90,036
SLV	El Salvador	11,658	84,398
TLS	East Timor	170	314
UGA	Uganda	4,168	89,040
URY	Uruguay	7,099	56,690
ZAF	South Africa	187,368	255,039
ZMB	Zambia	9,191	66,620

Methodology

We consider a specification that describes the change in firm-level trade outcomes based on the customs data in each quarter of 2020 relative to the same quarter in 2019, as the COVID-19 pandemic evolved during year 2020. First, we estimate the equation below for either all exporting firms or all importing firms:

$$\Delta Y_{ict} = \alpha + \sum_{t=2}^4 \beta_t Quarter_t + I^c + \epsilon_{ict} \quad (B1)$$

where ΔY_{ict} is the change in the outcome of interest of firm i in country c in quarter t of 2020 relative to the same quarter in 2019 and I^c are country fixed effects.

Second, we estimate a variant of the equation above again for either all exporting firms or all importing firms but where the impacts in each quarter are allowed to differ for firms that participate in GVCs:

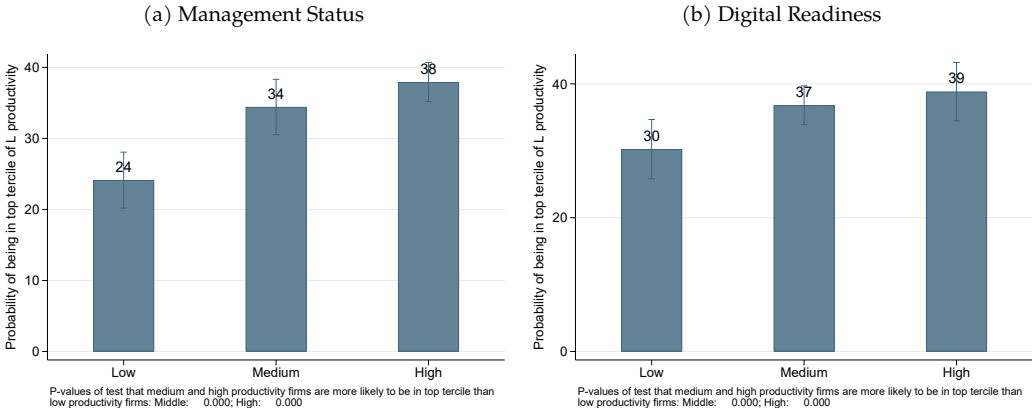
$$\Delta Y_{ict} = \alpha + \sum_{t=2}^4 \beta_t Quarter_t + \sum_{t=2}^4 \gamma_t Quarter_t * GVC firm_i + \gamma GVC firm_i + I^c + \epsilon_{ict} \quad (B2)$$

where ΔY_{ict} and I^c are defined as above and $GVCfirm_i$ is an indicator variable that identifies firms defined as participating in GVCs in 2019.

In the two types of equations above three outcomes are considered for exports - total export value, number of HS 6-digit products exported, and number of destination countries - and three outcomes are considered for imports - total import value, number of HS 6-digit products imported, and number of source countries. The estimation of the equations above is done on customs data for 2020 for the 20 countries listed in Appendix Table B1.

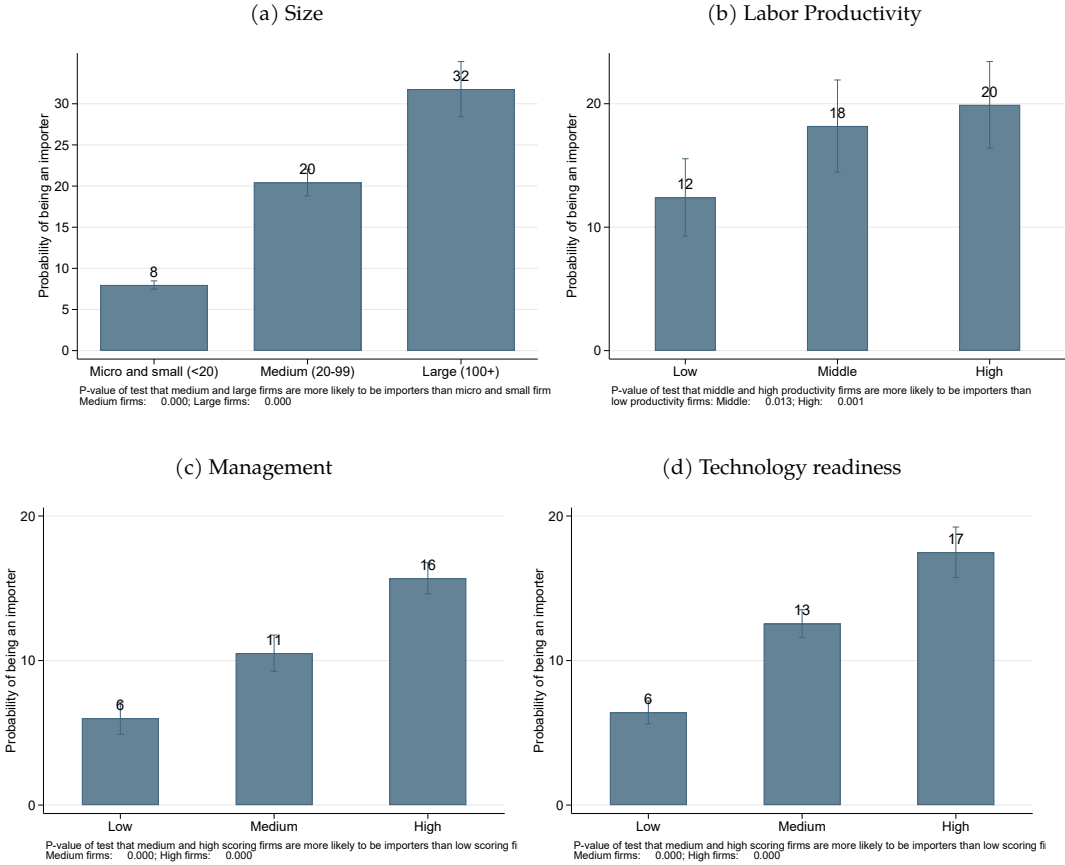
C. Figures

Figure C1: Firm capabilities and productivity



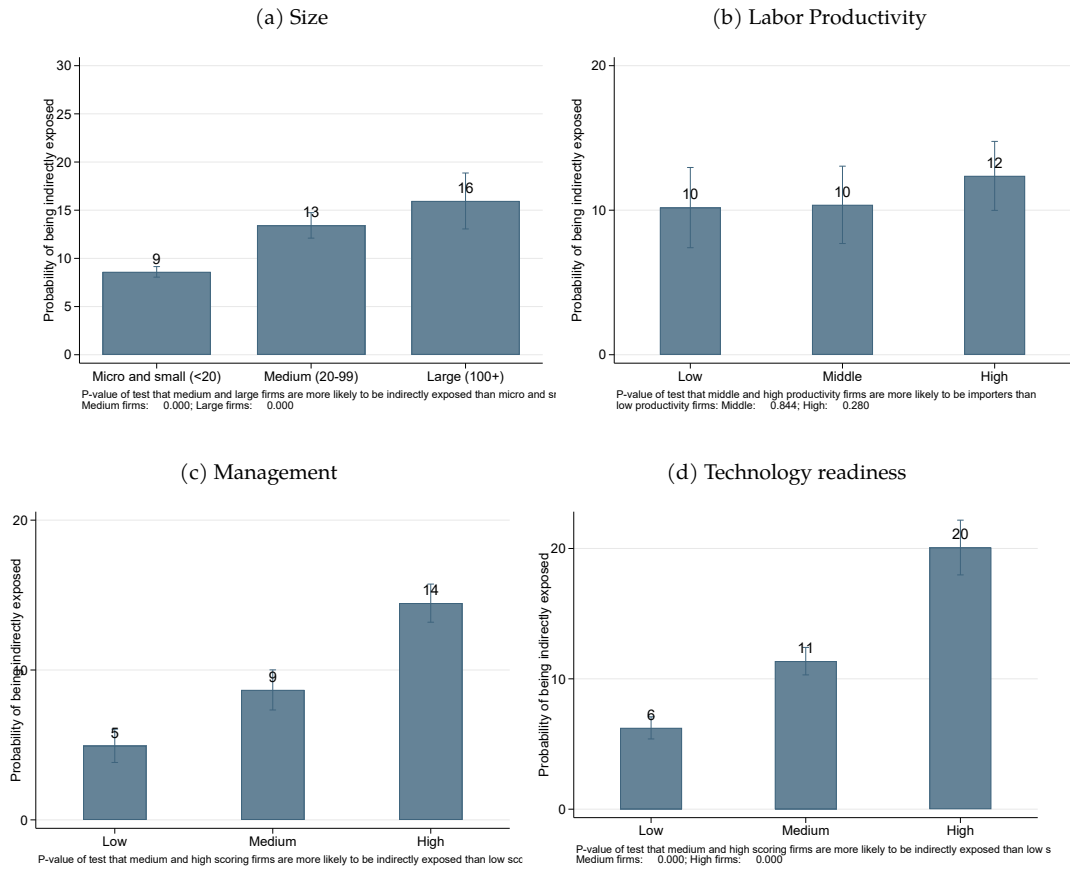
Notes: The sample includes 5,655 firms in 6 countries in panel a and 5,660 firms in 6 countries in panel b.

Figure C2: Capabilities of globally engaged firms: importers



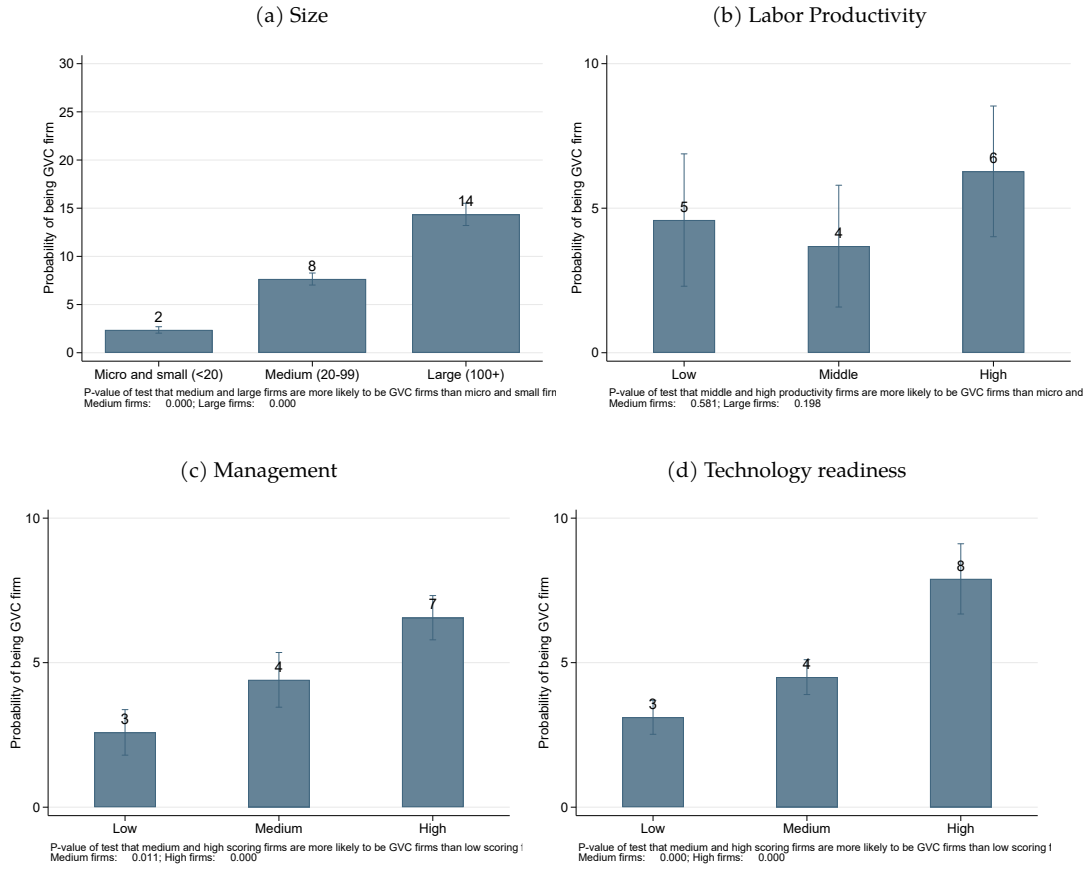
Notes: The sample includes 13,963 firms in 13 countries in panel a, 4,885 firms in 5 countries in panel b; 8,242 firms in 9 countries in panel c and 13,912 firms in 13 countries in panel d.

Figure C3: Capabilities of globally engaged firms: indirectly engaged



Notes: The sample includes 13,963 firms in 13 countries in panel a, 4,885 firms in 5 countries in panel b; 8,242 firms in 9 countries in panel c and 13,912 firms in 13 countries in panel d.

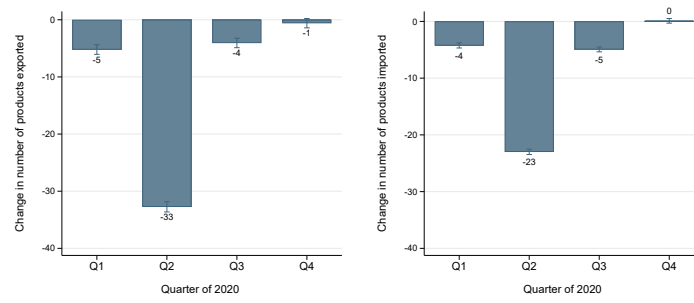
Figure C4: Capabilities of globally engaged firms: GVC firms



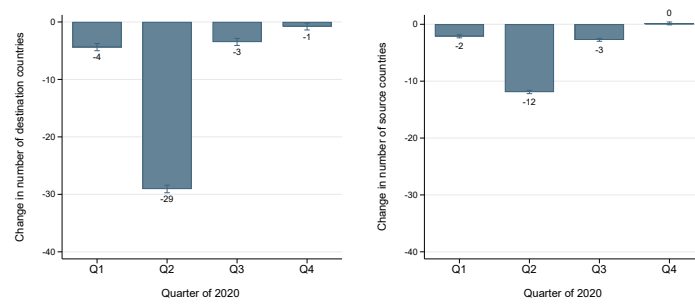
Notes: The sample includes 13,963 firms in 13 countries in panel a, 4,885 firms in 5 countries in panel b; 8,242 firms in 9 countries in panel c and 13,912 firms in 13 countries in panel d.

Figure C5: Change in additional firm trade outcomes

(a) Number of products



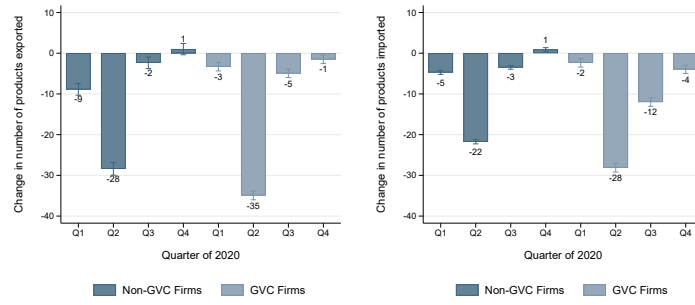
(b) Number of partner countries



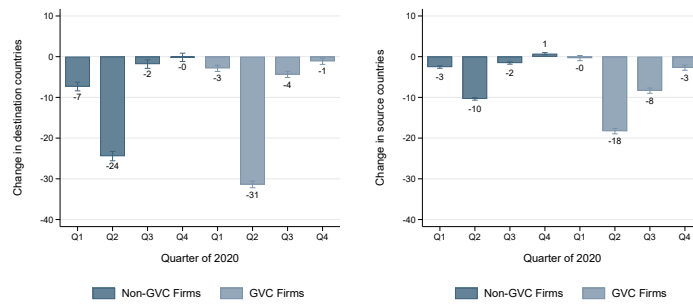
Notes: The sample includes in panels a and b 153,079 firm-quarter observations in the left plot and 579,221 firm-quarter observations in the right plot in 20 countries.

Figure C6: Change in additional firm trade outcomes for GVC firms and non-GVC firms

(a) Number of products



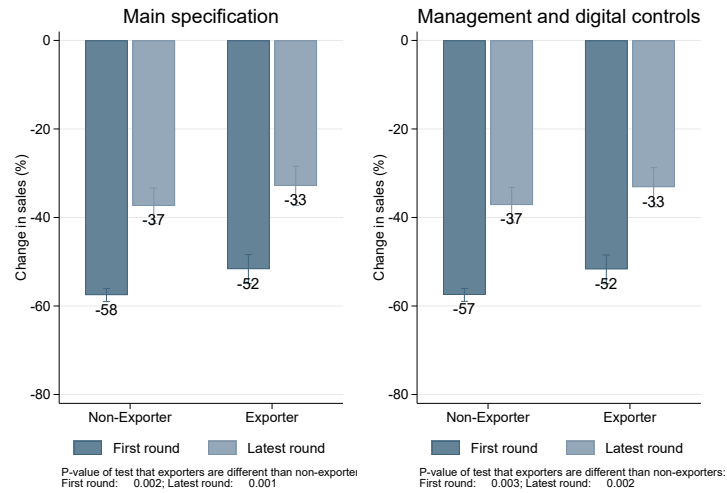
(b) Number of partner countries



Notes: The sample includes in panels a and b 153,038 firm-quarter observations in the left plot and 579,123 firm-quarter observations in the right plot in 20 countries.

Figure C7: Resilience across exporting firms: main specification versus management and digital controls

(a) Change in sales relative to 2019



(b) Probability of falling into arrears

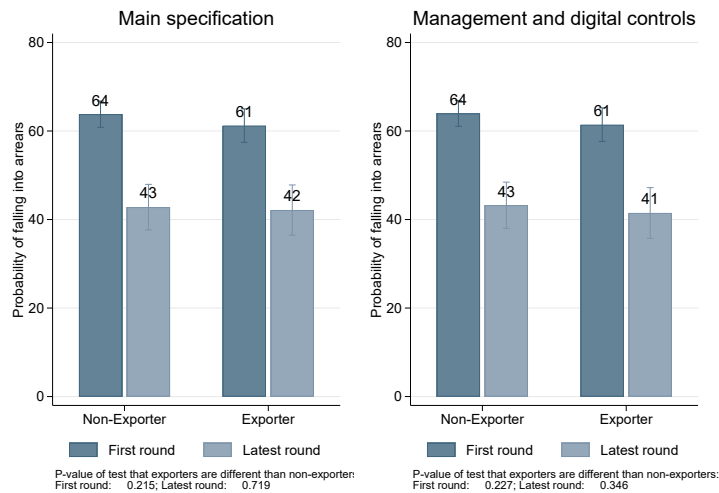
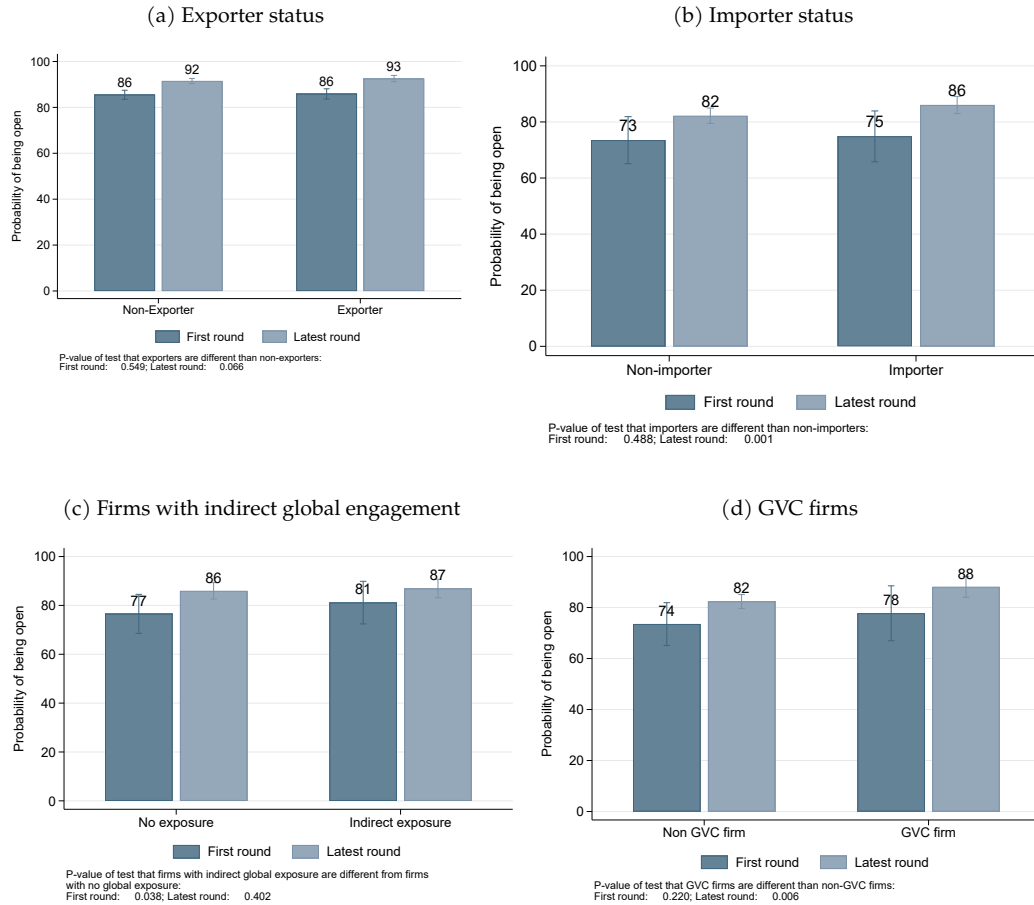


Figure C8: Probability of being open



Notes: The sample includes 12,016 firms in 11 countries in panel a and 11,761 firms in 11 countries in panels b.

Figure C9: Initial impact and recovery by intensity of global engagement

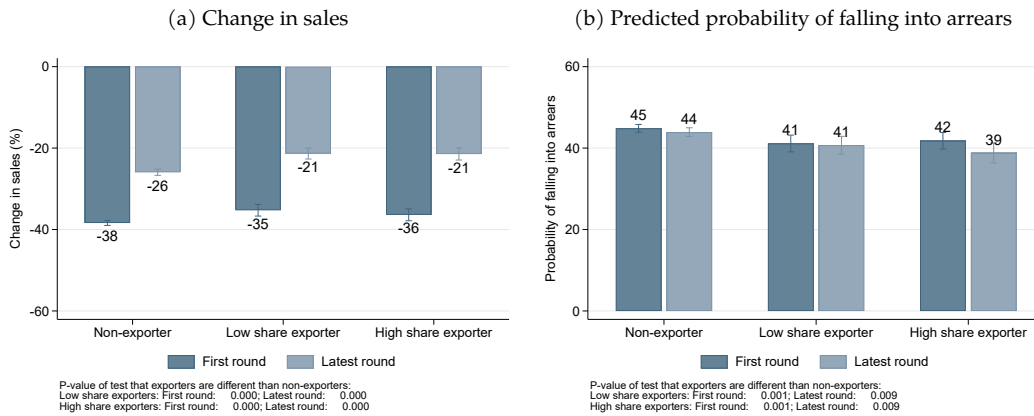
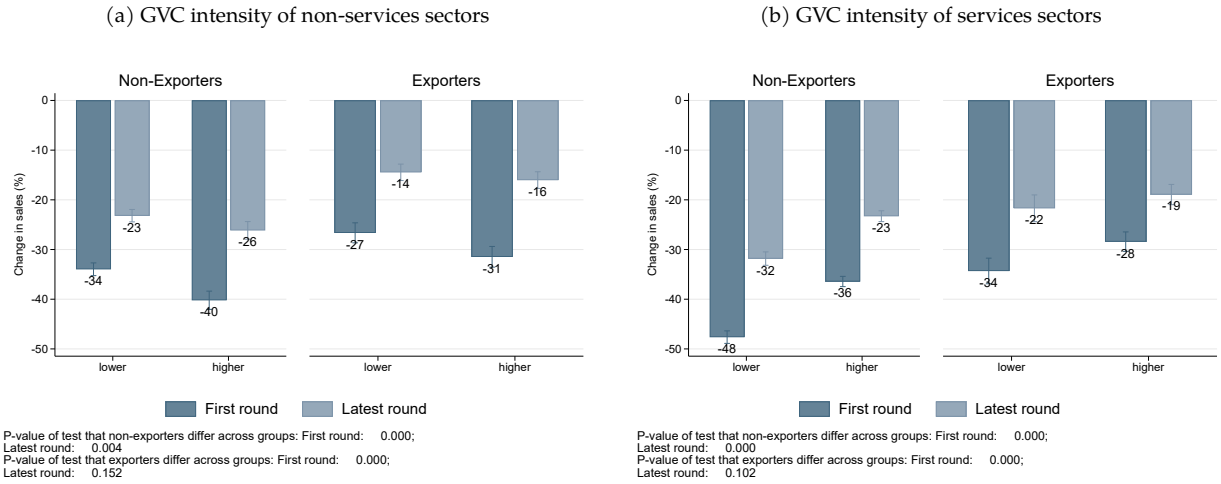
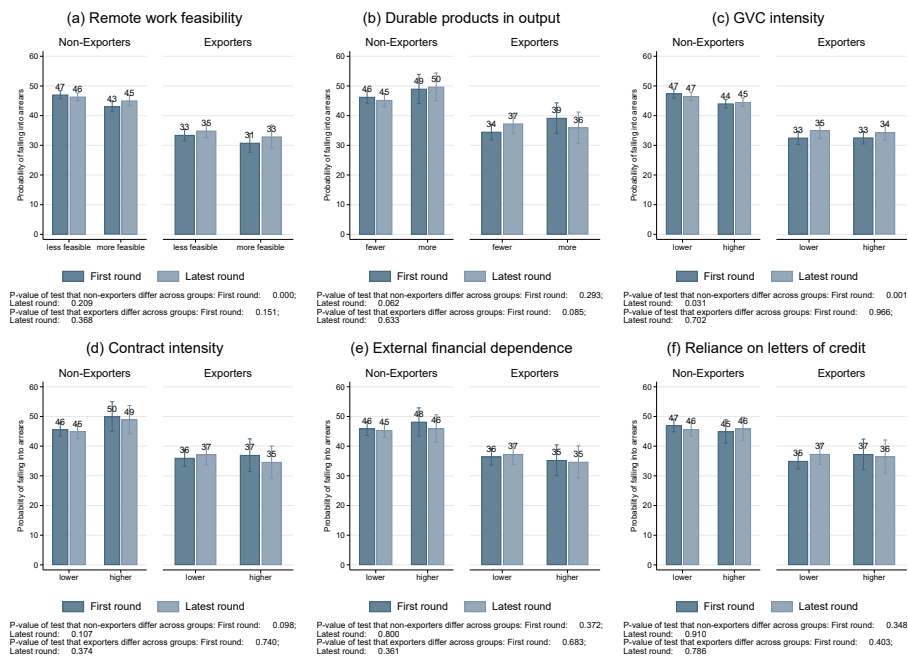


Figure C10: Change in sales by sectoral GVC intensity separating non-services and services



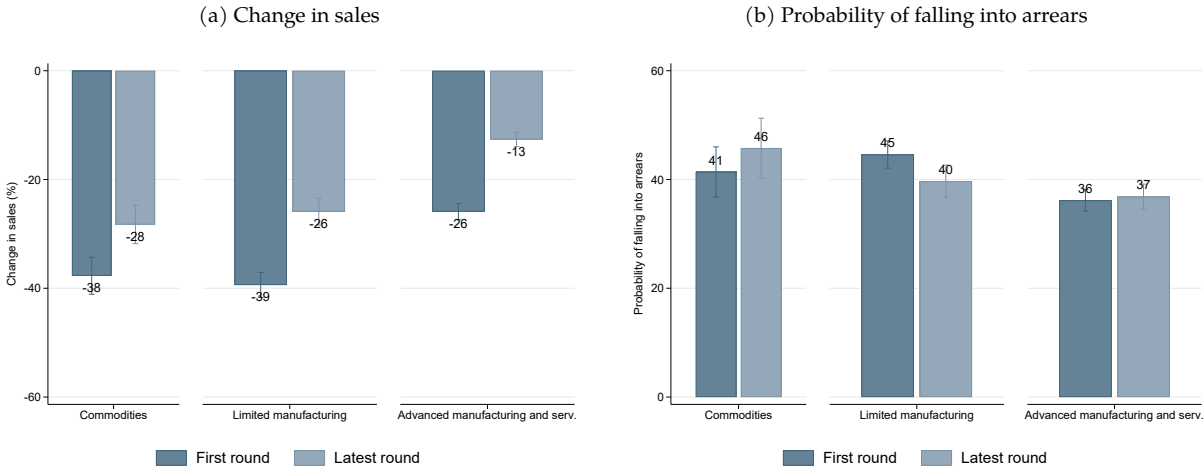
Notes: The sample includes 32,145 firms in 38 countries.

Figure C11: Probability of falling into arrears by sector type



Notes: The sample includes 26,237 firms in panel a, 10,602 firms in panel b, 27,498 firms in panel c, 8,889 firms in panels d and e, and 10,620 firms in panel f, in 35 countries.

Figure C12: Initial impact and recovery of exporters by country sophistication in GVC participation



D. Trade Module

COV-T – Trade and Global value chains (All firms)

In 2019 did you sell to exporters or multinationals located in your country?	covt1	1 = Yes 2 = No
Since the beginning of the COVID-19 crisis did you stop selling to those exporters or multinationals? CONDITION: Ask only if covt1=1	covt1a	1 = Yes 2 = No
Did the establishment directly participate in export or import in the last 2 years SKIP: IF covt2=2 go to cov1c16	covt2	1 = Yes 2 = No

(ONLY FOR EXPORTERS AND/OR IMPORTERS)

Did the establishment import in 2019?	covt3a	1 = Yes 2 = No
Which was your top source country for imports in 2019? CONDITION: Ask only if covt3a=1	covt3b	Country name
What was the establishment's share of imported intermediate inputs and raw materials in total inputs? CONDITION: Ask only if covt3a=1	Covt3c	_____% (Share) 0=zero -9 = Don't know
Did the establishment import in 2020?	covt4a	1 = Yes 2 = No
Which is your top source country for imports in 2020? CONDITION: Ask only if covt4a=1	covt4b	Country name
What was the establishment's share of imported intermediate inputs and raw materials in total inputs? CONDITION: Ask only if covt4a=1	covt4c	_____% (Share) 0= zero -9 = Don't know
Did this establishment export in 2019?	covt5a	1 = Yes 2 = No
Which is your top destination country in 2019 CONDITION: Ask only if covt5a =1	covt5c	Country name
Did this establishment export in 2020?	covt6a	1 = Yes 2 = No
What is the share of exports in overall sales in 2020? CONDITION: Ask only if covt6a =1	covt6b	_____% (Share) -9 = Don't know
Which is your top destination country in 2020 CONDITION: Ask only if covt6a =1	covt6c	Country name