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INTERNATIONAL FIRMS AND COVID-19: EVIDENCE FROM A GLOBAL SURVEY

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Abstract

This paper investigates whether international exposure played a role in how companies were impacted and which strategies they used in response to the COVID-19 crisis. Our conceptual model, based on Melitiz (2003), introduces a continuum of intermediate goods—which can be sourced domestically and from abroad—into the production function and generates three testable hypotheses. First, international firms are expected to be more affected by the COVID-19 crisis than domestic firms due to their exposure to both domestic and foreign lockdowns. Second, international firms are more likely to be affected through demand and supply channels. Third, despite higher exposure, we expect international firms to be more resilient to the crisis than domestic firms. Our empirical analysis corroborates all three hypotheses. The tests are based on a unique firm-level data set covering nearly 5000 enterprises in 133 countries, collected by the International Trade Centre under the COVID-19 Business Impact Survey. At the policy level, the results underscore the importance of global connectedness and international trade for promoting resilience to external shocks.

JEL Classification: F23, F12, F61

Keywords: COVID-19 crisis, lockdown, international business, heterogenous firms, firm coping strategies, external shock, global value chains, globalization

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1. Introduction

The spread of the novel coronavirus worldwide in 2020 forced governments to impose strict containment measures in the first wave of the pandemic. These include lockdowns, travel restrictions, prohibitions of large gatherings, as well as temporary closures of schools and office buildings. These measures, taken to protect public health, have hampered both supply and demand, as factories slow production and consumers stay home (Brinca et al., 2020). Global trade and financial linkages complicate and compound the effects of the pandemic as economic slowdowns in one country spill over to its partners (Baldwin & Freeman, 2020). Governments around the world find themselves questioning global supply chains and have pushed for increased localization of production in the wake of the pandemic. Indeed, many countries have already established export prohibitions and restrictions in order to mitigate domestic shortages at a national level (WTO, 2020).

Given the apparent shortcomings of global value chains (GVCs) unveiled by the pandemic, this paper attempts to test if the international orientation of companies plays a role in how they have been affected during the lockdown as well as how they have coped with the crisis. To answer this question, we use a novel dataset comprising 4,445 enterprises across 133 countries.

Experience has shown that firms that source inputs from different locations confront an additional risk: even if the virus does not affect the production site, they nevertheless need inputs originating from a potentially affected area. This risk materialised for example when China decided to lock down the city of Wuhan in January. Manufacturing firms in the rest of the world were quickly hit (Miroudot, 2020). This type of contagion flowing through GVCs has also been observed with natural disasters, such as the 2011 tsunami in Japan. Transportation is also a potential source of disruption. International companies still producing during the lockdown became more vulnerable, as subject to the stability and pricing of international transportation networks.

Several studies have also shown that global trade and financial linkages can make economies more susceptible to large shocks like the COVID-19 crisis. For example, Ramelli and Wagner (2020) show that international firms, especially those with significant production ties to Chinese companies, saw their stock prices drop relative to less exposed firms, as lockdowns began in mainland China.

Furthermore, Baldwin and Freeman (2020) show that because COVID-19 is both a supply and a demand shock, it has led to economic contagion and reinfection. For instance, early in the course of the pandemic, firms in Germany experienced a supply shock as factories in China shut down. Months later, as Chinese businesses reopened, these factories experienced a demand shock as Germany instituted its own lockdowns. Prior literature supports the observation that trading firms are more susceptible to shocks than firms that only operate domestically. For example, Vannoorenberghe (2012) shows that exporters' output is more volatile than the output of non-exporters, due to their exposure to demand shocks in multiple markets.

Nevertheless, a growing line of literature points to the benefits of global connectedness in the time of COVID-19. This stream of papers shows that while sourcing from foreign suppliers can make firms more susceptible to economic shocks from abroad, regionalization is no pancea either, as it does not resolve the issue of massively correlated shocks to the supply chain. Shocks can easily propagate through production networks in which a large number of firms rely on a small, common set of suppliers (Acemoglu et al., 2012). In other words, heavy reliance on manufacturing inputs from one main region can put importing firms at the end of the GVC at increased risk. Renationalizing supply chains does not alleviate this risk neither. Rather, it merely reshores firms' susceptibility to shocks from a single country (Baldwin & Tomiura, 2020). Concentrating production in a single country (being it domestic or foreign) is hardly risk-free, given the potential for environmental upsets like floods, earthquakes and the like (Stellinger et al., 2020).

Along this vein, Bonadio et al. (2020) calibrate a model with global consumption and production linkages in which a country's foreign shock is proportional to the sum of the shocks from its individual partners. They show that the main economic shock to economies during the COVID-19 crisis comes from domestic lockdowns rather than foreign containment measures. They show that regionalizing production makes the health of the supply chain more correlated with the health of the domestic economy while global sourcing

allows firms to hedge their risks. Similarly, Hyun et al. (2020) show that firms with higher global connectedness (via supply chains and exports) are more resilient to domestic pandemic shocks.

The resilience of trading firms is consistent with prior literature. For example, using data on US manufacturing plants, Bernard and Jensen (1999) show that exporters have significantly lower failure rates than non-exporters. This is likely a result of their increased size, productivity, and profitability. Prior empirical work has shown that exporting firms tend to be larger and more productive than firms that do not export (Bernard et al., 2007; Pavcnik, 2002). This increased productivity implies that exporting firms are earning far more than their reservation profitabilities, below which they will be forced to shut down (Hopenhayn, 1992; Melitz, 2003).

Our paper is also related to work focusing on the firm-level effects of the COVID-19 crisis. This branch of literature finds that small and medium-sized enterprises (SMEs) are disproportionately affected by the COVID-19 pandemic because of their prevalence in the most affected sectors (ITC, 2020). These include accommodation and food services, cultural and creative sectors, and wholesale and retail services, heavily impacted by a drop in demand (OECD, 2020). Moreover, SMEs have generally lower cash reserves and smaller inventories and supplier networks. Sourcing from new suppliers, or absorbing price increases, is more challenging for a small firm with limited supply options and capital, meaning that supply chain disruptions can impact SMEs faster and harder than large firms. According to Lindsay et al. (2020), 50 per cent of SMEs in the United States had already shut down or had laid off or furloughed employees by May 2020 — only a few months into lockdowns — and 27 per cent stated that they will be obliged to take such measures in the next few weeks if the situation does not improve.

Beck et al. (2020) use a sample of nearly 500 firms across 10 developing countries and find that firms chose to reduce investment rather than payroll as a response to COVID-19 crisis. Other firm-level surveys have stressed the need for liquidity. Using a survey of American businesses, Bartik et al. (2020) find that firms with more cash on hand are more confident about their prospects for surviving the crisis. Similarly, Buchheim et al. (2020) find that firms with better pre-crisis liquidity are more optimistic about the duration of the crisis. Using enterprise data from Ireland, McGeever et al. (2020) find that SMEs will require liquidity in the coming months to manage persistent operating costs.

Using a unique firm-level data set covering nearly 5000 enterprises in 133 countries, this paper shows how firms' experiences of and responses to the COVID-19 crisis differ by international orientation. The results of this paper can be organized into the following three findings. First, in line with previous research, we find that international firms were hit harder by the pandemic compared to firms that only operate domestically. Second, we find that international firms are affected both on the supply and demand side. Because international firms are more involved in GVCs than firms that only operate domestically, we find that international exposure makes firms more likely to report difficulties accessing inputs as well as selling outputs. Despite these effects, our findings confirm that international firms have proved more resilient to the COVID-19 crisis than firms that only operate domestically.

Businesses around the globe responded to the pandemic and ensuing restrictions in different ways. Some companies adopted retreating strategies – laying off employees, selling off assets or taking on new debt, all of which may hurt their long-term viability. However, the majority adopted a strategy of resilience – scaling down the business temporarily in a way that will allow resuming it fully later. Being resilient during the pandemic entitled strategies such as shifting the sales mix towards online sales, sourcing from new suppliers or using telework. Resilient firms also transformed themselves to fit the new situation, creating novel products such as designer masks or loaned their workers to other active businesses in essential industries. Compared to domestic firms, we find that international firms are more likely to adopt resilient strategies rather than retreating strategies. International firms are less likely than their domestic counterparts to lay off workers and file for bankruptcy and are more likely to adopt countermeasures that continue production such as telework.

The remainder of the paper is organized as follows. In section 2, we present the conceptual framework and offer empirical implications of the model. Section 3 describes the ITC COVID-19 Business Impact Survey and the data. Section 4 presents the results, and section 5 concludes.

2. Conceptual framework

In this section we develop a conceptual model to show how the effects of the pandemic can depend on trade status. As in Kasahara and Lapham (2013), we extend the model set forth in Melitz (2003) to include an intermediate goods market. We show how domestic firms, importers, exporters, and firms that both import and export are differentially affected by the pandemic. Consistent with the model, data from the survey indicates that trading firms are more likely to report being strongly affected by the COVID-19 crisis but are also less likely to layoff employees or file for bankruptcy.

The final goods sector is characterized by monopolistic competition with differentiated products. Each final goods firm produces output by combining intermediate goods bought in a perfectly competitive input market. All firms in the final goods sector have access to the same production technology but each firm has a unique efficiency level that allows some firms to generate more output per unit of inputs than other firms. In addition, firms can source inputs domestically as well as from abroad but must pay a fixed import cost in order to access foreign materials. Final goods firms can sell their products domestically or abroad but must pay a fixed export cost to access foreign customers. The combination of heterogeneous productivity and fixed costs of market access leads firms to select into trade strategies based on their productivity.[6]

Lockdowns and containment measures resulting from the COVID-19 pandemic affect firms by reducing domestic consumer spending, reducing foreign consumer spending, and reducing the availability of foreign and domestic inputs. In this way, internationally oriented firms are more exposed to the effects of COVID-19 because lockdowns in their home countries and lockdowns in their partner countries both enter into the revenue function. However, international firms are also more resilient to the effects of the pandemic because their increased productivity allows them to respond to the shock by operating at reduced scale or by changing their trade strategy rather than shutting down.

2.1. Heterogeneous productivity and global strategies in the open economy

Assume the world is populated with $N + 1$ identical countries which can each trade freely with one another. The representative consumer in each country maximizes utility given by

$$U = \left(\int_{\Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \tag{1}$$

subject to the budget constraint $\int_{\Omega} p(\omega)q(\omega)d\omega \leq E$ where Ω is the set of all product varieties, $p(\omega)$ is the price of a particular variety ω, $q(\omega)$ is the quantity of the variety consumed, E is the total expenditure of the consumer, and $\sigma > 1$ is the elasticity of substitution across varieties. This yields the demand curve

$$q(\omega) = EP^{\sigma-1}p(\omega)^{-\sigma} \tag{2}$$

for each good. Each firm produces a single variety and the operating profits are given by $\pi_v(\omega) = (p(\omega) - c(\omega))q(\omega)$ where $c(\omega)$ is the constant marginal cost of production. Profit maximization yields the revenue function

$$r(\omega) = E\left(\frac{p(\omega)}{P}\right)^{1-\sigma} \tag{3}$$

for each $\omega \in \Omega$ and operating profit

[6] Empirical evidence suggests that relatively more productive firms are more likely to export (see, for example, Alvarez and Lopez (2005), Aw et al. (2000), Bernard and Jensen (1999), Bernard et al. (2003), Clerides et al. (1998), and Eaton et al. (2004)). Previous research also support the positive relationship between importing inputs and productivity (see Amiti and Konings (2007), Halpern et al. (2006), and Kasahara and Rodrigue (2008). Few empirical studies simultaneously examine both exports and imports at the micro-level. A notable exception is Bernard et al. (2005) who provide empirical evidence regarding both importers and exporters in the U.S.

$$\pi_v(\omega) = \frac{r(\omega)}{\sigma}. \tag{4}$$

Final goods firms generate output by combining intermediate goods which they can source either domestically or internationally. Intermediate goods are combined using CES technology. The production function for a firm that exclusively sources domestic materials is given by

$$y^D(\varphi) = \varphi\left(\int_0^1 x_d(j)^{\frac{\gamma-1}{\gamma}} dj\right)^{\frac{\gamma}{\gamma-1}} \tag{5}$$

where φ is an idiosyncratic Hicks-neutral productivity parameter, $x_d(j)$ is the quantity of the domestically sourced intermediate input j, and γ is the elasticity of substitution between intermediate inputs. Firms in the intermediate goods sector each use a single unit of labor to produce their output, so production is given by $x_d(j) = l$ for each j. Assuming a perfectly competitive intermediate goods market, the price of each input is equal to the wage w and each final goods producer uses an equal amount $x_d(j) = x_d$ of each input j. The revenue function for a firm with productivity φ which uses only domestically available intermediate inputs is given by

$$r^D(\varphi) = EP^{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} w^{1-\sigma}\varphi^{\sigma-1} \tag{6}$$

where $r^\ell, \ell \in \{D, M, X, XM\}$ represent the revenue from pursuing a particular trade strategy. We let D refer to a domestic only strategy, M refer to an import only strategy, X refer to an export only strategy, and XM refer to a strategy of importing and exporting. All firms, regardless of trade strategy, use inputs in production. If a firm chooses to source intermediate inputs both domestically and from abroad, its production function is given by

$$\begin{aligned} y^M(\varphi) &= \varphi\left(\int_0^1 x_d(j)^{\frac{\gamma-1}{\gamma}} dj + \int_0^M x_i(j)^{\frac{\gamma-1}{\gamma}} dj\right)^{\frac{\gamma}{\gamma-1}} \\ &= \varphi\left((1+M)\int_0^1 x_d(j)^{\frac{\gamma-1}{\gamma}} dj\right)^{\frac{\gamma}{\gamma-1}} \end{aligned} \tag{7}$$

where $M \leq N$ is the measure of available foreign intermediate goods markets and the second equality follows from the assumption that all economies have access to identical production technology. In this case, an importing firm benefits from having access to a greater variety of inputs and has a revenue function given by

$$r^M(\varphi) = \left((1+M)^{\frac{\gamma}{\gamma-1}(\sigma-1)}\right) r^D(\varphi) \tag{8}$$

where it is assumed that $1 < (1+M)^{\frac{\gamma}{\gamma-1}(\sigma-1)} < 1+N$. An alternative interpretation of (8) is that importing firms have access to higher quality inputs, rather than a greater variety of inputs. Under the assumptions of the current model, each of these interpretations are mathematically identical.

A firm that exports but does not import can sell to N additional markets compared to a firm that neither imports nor exports. Assuming no trade costs, the revenue function of an export-only firm is given by

$$r^X(\varphi) = (1+N)r^D(\varphi)(\varphi). \tag{9}$$

Finally, a firm that both imports and exports has the revenue function

$$r^{XM} = (1+N)r^M(\varphi). \tag{10}$$

Given the previous assumptions, operating profits are ordered according to $\pi_v^{XM} > \pi_v^X > \pi_v^M > \pi_v^D$. Assume further that firms must pay the following fixed costs to operate: Firms only operating domestically face a fixed cost of f_D, firms that only import face a fixed cost of f_M, firms that only export face a fixed cost of f_X, and firms that both import and export face a fixed cost of f_{XM} where $f_D < f_M < f_X < f_{XM}$. As a result, firms' business strategies will be determined by their productivity with the following partition: Firms with $\varphi < \varphi_D$ will not operate, firms with $\varphi \in [\varphi_D, \varphi_M)$ will operate but will only use domestic inputs, firms with $\varphi \in [\varphi_M, \varphi_X)$ will import intermediate inputs but will not export, firms with $\varphi \in [\varphi_X, \varphi_{XM})$ will export but will not import intermediate inputs, and firms with $\varphi \geq \varphi_{XM}$ will import and export. The productivity partitioning in the static equilibrium is illustrated in Figure 1 below.

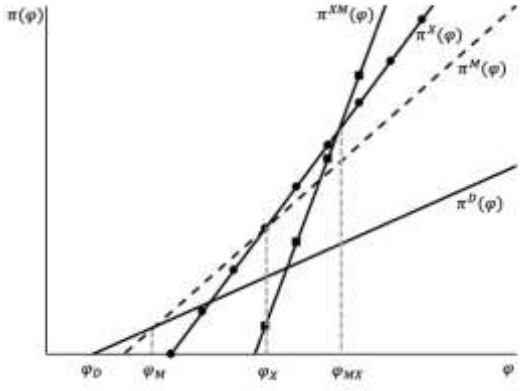

Figure 1. Firm profits by productivity and business strategy

Notes: The solid line represents domestic-only profits, the dashed line represents import-only profits, the solid line with circular marker represents export-only profits, and the solid line with square marker represents import-export profits.

2.2. Comparative statics and empirical implications

We model the COVID-19 pandemic as a reduction in E, M, and N. In other words, lockdowns across the world reduce domestic and foreign consumer demand and reduce the availability of intermediate inputs from abroad. The change in N captures the possibility that the reduction in consumer spending is not uniform across all economies. For example, in the early days of the pandemic, countries in Asia had instituted lockdowns while countries in the Western Hemisphere remained open. In such cases, firms in North America saw little change in their domestic markets but American businesses trading with Asian firms experienced disruptions to their value chains.

Using the profit function (4) and the strategy-specific revenue functions (6), (8), (9), and (10), we can write the cutoff conditions for each strategy as

$$\begin{aligned} EP^{\sigma-1}\zeta w^{1-\sigma}\varphi_D^{\sigma-1} &= f_D \\ \tilde{M}EP^{\sigma-1}\zeta w^{1-\sigma}\varphi_M^{\sigma-1} &= f_M - f_D \\ \left(N-\tilde{M}\right)EP^{\sigma-1}\zeta w^{1-\sigma}\varphi_X^{\sigma-1} &= f_X - f_M \\ (1+N)\tilde{M}EP^{\sigma-1}\zeta w^{1-\sigma}\varphi_{XM}^{\sigma-1} &= f_{XM} - f_X \end{aligned} \tag{11}$$

where $\zeta \equiv \sigma^{-\sigma}(\sigma-1)^{1-\sigma}$ and $\tilde{M} \equiv \left((M+1)^{\frac{\gamma}{\gamma-1}(\sigma-1)} - 1\right)$. Solving for each productivity cutoff and taking the total differential gives the following effects on the partition:

$$\begin{aligned} \widehat{\varphi_D} &= -\frac{1}{\sigma-1}\,\hat{E} \\ \widehat{\varphi_M} &= -\frac{1}{\sigma-1}\left(\hat{E}+\hat{\widetilde{M}}\right) \\ \widehat{\varphi_X} &= -\frac{1}{\sigma-1}\left(\hat{E}+\frac{dN-d\widetilde{M}}{N-\widetilde{M}}\right) \\ \widehat{\varphi_{XM}} &\approx -\frac{1}{\sigma-1}\left(\hat{E}+\hat{\widetilde{M}}+\hat{N}\right) \end{aligned} \tag{12}$$

where a circumflex over the variables represents a percentage change. A decrease in domestic consumer spending increases the productivity cutoff for all four strategies, but a decrease in foreign spending leads to an additional penalty for all exporting firms, and a decrease in the availability of intermediate inputs leads to an additional penalty for all importing firms.[7]

The model suggests that the economic effects of the COVID-19 crisis are more salient for international firms but that these firms are likely to be more resilient. For example, international firms have more ways to respond to the COVID-19 shock than domestic only firms. They can reduce the scale of production or they can change their trade strategy or both. Firms that export, import or both experience additional shocks due to the economic disruptions in the partner countries. Firms that both export and import experience all three sets of COVID-19 shocks and will have to adjust both their input and their output strategies.

We, therefore, have the following set of testable hypotheses:

1. First, we expect that international firms will be more affected by the COVID-19 crisis than domestic firms. This is due to their exposure to shocks from both domestic and foreign lockdowns.

2. Second, because international firms are more exposed to the economic contagion of supply and demand shocks, we expect that international firms are more likely to experience difficulties accessing inputs and selling output compared to domestic firms.

3. Nonetheless, we expect international firms to be more resilient to the crisis than domestic firms because international firms have more tools to respond to the crisis. For example, by diversifying: importing firms can find new suppliers and exporting firms can find new buyers.

3. Data

We use data from the COVID-19 Business Impact Survey, an online survey of the International Trade Centre (ITC), a joint agency of the United Nations and World Trade Organization. Participation in the survey was completely voluntary, anonymous and without payment. The survey was available in eight languages. The voluntary nature of the survey may have attracted businesses that experienced a bigger impact of COVID-19, but this should be the same for international and domestic firms, not affecting our results. While the sample of our survey has some limitations, it allows for important insights.

The sample is large and includes firms from most sectors, countries, and firm-size categoriescomprising 4,445 establishments from 133 different countries. Survey data was collected between April 10, 2020 and August 24, 2020. The survey instrument includes questions about firm characteristics like size, sector and trade status, as well as age and gender of the manager. It also includes questions about the effects of the COVID-19 crisis, such as the ability to purchase inputs and sell outputs as well as questions about coping mechanisms (the questionnaire can be found in the Appendix).

In addition to establishment-level data, we use country-level information on population and government policies. Data on population come from the UN World Population Projections. Data on government containment measures come from the Oxford COVID-19 Government Response Tracker managed by the Blavatnik School of Government. We merge daily country-level panel data to the survey sample, which

[7] The approximation in the expression for $\widehat{\varphi_{XM}}$ in (12) comes from the fact that the cutoff condition is proportional to $(1+N)$ not N.

provides a lockdown history of each country up to the date on which each company participated in the survey. As described in Section 4, we use four different measures of lockdown severity. Table A7 in the Appendix describes in more detail all the variables used in the paper.

3.1. Descriptive statistics

Table 1 summarizes the key features of the sample used in this paper. The firm size distribution is similar to that observed in previous research with the majority of the firms in the sample being SMEs and a minority of firms being large (Luttmer, 2007). In addition, most of the firms in the sample operate in service sectors, followed by manufacturing, and by the primary sector. Consistent with national statistics, the majority of firms in the sample do not export their products and one in two establishments source and sell domestically.

	N	Pct
Firm size		
Micro (1-4 employees)	1588	36.25
Small (5-9 employees)	1484	33.87
Medium (20-99 employees)	745	17.01
Large (≥100 employees)	564	12.87
Sector		
Manufacturing	1285	29.96
Primary	966	22.52
Services	2038	47.52
Trade status		
Domestic only	2312	55.48
Import/export	866	20.78
Export only	387	9.29
Import only	602	14.45

Table 1. Descriptive statistics

Source: ITC COVID-19 Business Impact Survey. Data collected from 21 April to 24 August 2020.

Table 2 shows the ways in which firms in the sample were affected by the COVID-19 crisis, which has left few firms untouched. The majority of firms in the sample report being strongly affected by the COVID-19 crisis and less than 4% of establishments report not being affected. In line with the conceptual framework in Section 2, we find that international firms are more likely to be strongly affected than domestic only firms.

	Trade status		
	Domestic	Int'l	Overall
Business operation effects			
Not affected	1.29	4.45	3.50
Slightly affected	16.85	9.46	11.69
Moderately affected	33.58	28.56	30.08
Strongly affected	48.29	57.52	54.74
Input/output effects			
Difficulty accessing inputs	43.26	55.39	51.51
Reduced sales	68.75	82.42	78.05
Other business effects			
Reduced use of logistics services	32.41	55.79	48.30
Reduced use of certification services	6.40	13.25	11.06

Table 2. Effects of COVID-19 crisis on firms in sample

Source: ITC COVID-19 Business Impact Survey. Data collected from 21 April to 24 August 2020.

Note: Respondents were asked 'How have your business operations been affected by the coronavirus?'; 'Has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell outputs?'; and 'Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways (multi-select)?' Observations weighted by country's share of population divided by number of firms observed.

In addition, the crisis has affected firms' ability to access inputs as well as sell output. 52% of all firms report having difficulty accessing inputs and 78% of firms report reductions in sales. As suggested in the conceptual framework, these difficulties are greater for importing and exporting firms. International firms are more likely to have experienced difficulties accessing inputs than firms that only operate domestically. More than half of international firms experienced input disruptions while only 43% of domestic firms reported difficulties accessing inputs. Furthermore, international firms are more likely to experience reductions in sales compared to firms that only operate domestically. Roughly 82% of international firms experienced reductions in sales while 69% of domestic firms reported reductions in sales.

In addition, the majority of international firms faced problems related to logistics services, which are required to coordinate supply chains. International firms faced problems with certification services, which are required to signal that their products meet international quality standards.

	Trade status		
	Domestic	Int'l	Overall
Coping strategy			
Retreat	12.44	7.50	9.06
Resilient	87.56	92.50	90.94
Specific coping mechanisms			
Teleworking	41.39	56.58	51.72
Temporarily reduced employment	35.27	38.02	37.14
Increased marketing efforts	33.77	35.40	34.88
Online sales	24.18	29.52	27.81
Customized/new products	20.78	20.09	20.31
Rescheduling of bank loans	17.86	20.14	19.41
Laid off employees	18.91	13.62	15.31
Sourcing from new suppliers	12.94	14.03	13.68
Loaned employees to other enterprises	5.39	2.63	3.52
Filed for bankruptcy	1.77	1.52	1.60
Other	8.25	5.85	6.62
None	8.26	6.10	6.79

Table 3. Coping mechanisms employed by firms in sample

Source: ITC COVID-19 Business Impact Survey. Data collected from 21 April to 24 August 2020.

Note: Note: Respondents were asked 'Have you adopted any of the following strategies to cope with the crisis?' Categorizations: Retreat – filed for bankruptcy, laid off employees, sold off assets, took on new debt or took no action. Resilient – all other strategies; chose one or more options: temporarily reduced employment; teleworking; rescheduled bank loans; greater marketing; online sales; sourcing from new suppliers; or temporary shutdown. Observations weighted by country's share of population divided by number of firms observed.

Firms met the challenge posed by the crisis using a variety of strategies. Some firms adopted retreating responses to the crisis, such as laid off empoyees, sold assets or took on new debt. About 10% of enterprises in the sample took this approach, which undermined the long-term competitiveness of the company. International firms were significantly less likely to adopt this sort of approach, than those selling only domestically.

For the most part, firms in the sample adopted resilient strategies to cope with the crisis, maintaining competitiveness. Resilient approaches during the pandemic involve strategies such as shifting towards online sales, sourcing from new suppliers, using telework or improving marketing efforts. Other resilient strategies involve identifying and taking advantage of new opportunities. For example, some firms have created new products such as designer masks and other firms lent their employees to active businesses in

essential industries. Overall, about 90% of firms adopted resilient strategies[8]. International firms were far more likely to adopt resilient response to the crisis than domestic firms.

Table 3 shows that the most common coping mechanisms are teleworking, temporarily reducing employment, and increasing marketing efforts. Over half of all firms adopted remote work and the majority of international firms use this strategy. The least common coping mechanism is filing for bankruptcy with only 1.6% of firms adopting this strategy.

4. Empirical framework

To study the impact of the COVID-19 crisis on firms, we use the following estimating equation for firm i in country j:

$$y_{ij} = \beta_0 + \beta_1 INTL_{ij} + \beta_2 LOCKDOWN_{ij} + \sum \gamma_{IND} \delta_i^{IND} + \sum \eta_{SIZE} \delta_i^{SIZE} + \sum \zeta_{CNTRY} \delta_j^{CNTRY} + \varepsilon_{ij} \quad (13)$$

where y_{ij} is the outcome variable, $INTL_{ij}$ is an indicator that the firm operates internationally (either through imports or exports or both) and $LOCKDOWN_j$ is a measure of government-imposed economic restrictions in country j. In addition, we control for industry, size, and country[9] fixed effects shown as δ_i^{IND}, δ_i^{SIZE}, and δ_j^{CNTRY}, respectively.

We look at the following business effects. First, we ask firms how the crisis has affected their business on a discrete scale from 1 to 4, where 1 is no effect and 4 represents a strong effect. Second, we look at the effects of the crisis on the supply chain. In particular, we look at difficulty accessing inputs, and difficulty selling output. Third, we look at other business effects of the crisis. Specifically, we look at difficulty with logistics services and certification services.

Finally, to see how firms respond to the crisis, we characterize coping strategies as either retreating or resilient. Retreating strategies are those that lead to long-term reductions in scale. Retreating responses to the crisis undermine the long-term competitiveness of firms and include: filed for bankruptcy, laid off employees, sold off assets, took on new debt or took no action. Resilient strategies are those that preserve the business, either through a temporary reduction in sales or by finding new input sources and output markets. They include temporarily reduced employment; teleworking; rescheduled bank loans; greater marketing; online sales or sourcing from new suppliers. Therefore, resilient firms emerge from the crisis in no worse shape than before.

The main coefficient of interest is β_1 which measures the effects of the crisis for international firms relative to domestic firms. We apply a weighting strategy similar to that of Autor et al. (2016) and weigh each observation by the country's share of the world population divided by the number of establishments observed in that country. In the Appendix, we show that the results are robust to alternative weighting methods and considering different subsamples.

5. Results

5.1. Impact of COVID-19 on business operations

In this section, we look at the effect of lockdowns on business operations. Firms were asked "How have your business operations been affected by the coronavirus (COVID-19) pandemic?" and could choose from the

[8] Some firms employed multiple coping mechanisms to respond to the crisis. In cases where firms used a combination of retreating and resilient mechanisms, the strategy is coded as "Retreat".

[9] Some nonlinear models do not converge with country fixed effects. In such cases we use region fixed effects to control for the role of geography.

following responses: Not affected, slightly affected, moderately affected, or strongly affected. Because this variable is a discrete ordinal measure, we use an ordered logit based on equation (13).[10]

We assume that the response follows a latent-variable framework. Let y be the survey response and let y^* be the unobserved continuous effect of the pandemic. The response is operationalized as follows:

$$y = \begin{cases} 1 \text{ if } y^* < \mu_1 \\ 2 \text{ if } \mu_1 \leq y^* < \mu_2 \\ 3 \text{ if } \mu_2 \leq y^* < \mu_3 \\ 4 \text{ if } \mu_3 \leq y^* \end{cases}$$

where $\mu_i, i \in \{1, 2, 3\}$ are cutoff points. Using (13), we model y_{ij}^* as

$$y_{ij}^* = \beta_0 + \beta_1 INTL_{ij} + \beta_2 LOCKDOWN_j + \sum \gamma_{IND} \delta_i^{IND} + \sum \eta_{SIZE} \delta_i^{SIZE} + \sum \zeta_{REGION} \delta_j^{REGION} + \varepsilon_{ij} \qquad (14)$$

for a representative firm i in country j where the business effect is a function of trade status and days since lockdown.

First, we test if international firms were more affected by the COVID-19 crisis than domestic firms. Consistent with the framework presented in Section 2, Table 4 shows that international firms have been more strongly affected by the crisis than domestic firms. The ordered logit shows that the odds of an international firm being in a higher affected category is 1.48 times the odds of a domestic firm when the other variables in the model are held constant. Because the effect of the lockdown measure is statistically large, we estimate the model using different measures of lockdown.[11] The odds of an international firm experiencing a greater effect of COVID-19 are between 1.36 and 1.42 times the odds of an otherwise comparable domestic only firm.

	Dependent variable: Business operations affected			
	(1)	(2)	(3)	(4)
International	0.298***	0.297***	0.401***	0.395***
	(0.0675)	(0.0698)	(0.0726)	(0.0727)
Days since lockdown	-0.00347***	-0.00371***	-0.00303**	-0.00158
	(0.000924)	(0.000939)	(0.000973)	(0.00108)
Sector FE		✓	✓	✓
Size FE			✓	✓
Region FE				✓
N	3833	3728	3714	3714

Table 4. Impact of COVID-19 lockdowns on business operations

Source: ITC COVID-19 Business Impact Survey. Data collected from 21 April to 24 August 2020.

[10] Our response variable is going to be treated as ordinal under the assumption that the levels of how much a firm is affected by COVID-19 have a natural ordering (low to high), but the distances between adjacent levels are unknown.

[11] As shown in the Appendix, this result is robust to alternative measures of economic lockdown, and to alternative specifications, such as probit and linear probability models.

Note: Log odds of ordered logistic regression reported. Dependent variable is "Business operations affected." Respondents were asked "How have your business operations affected by the coronavirus (COVID-19) pandemic?" Responses are ordered "Not affected", "Slightly affected", "Moderately affected", and "Strongly affected". Column (1) shows the results a model estimated without fixed effects. Column (2) controls for sector. Column (3) controls for size. Column (4) controls for region. Region fixed effects used because ordered logit does not converge with country fixed effects. Regressions weighted by share of population divided by observed number of firms. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

5.2. Channels through which COVID-19 affects business operations

Next, we test specific effects of the COVID-19 crisis. In particular, we look at difficulty accessing inputs, difficulty selling output, reduced logistics services, and reduced certification services. Based on the framework in Section 2, we expect international firms to have more difficulty accessing inputs and selling output than domestic firms. This is because they experience supply and demand disruptions from domestic lockdowns as well as lockdowns in partner countries.

We estimate a linear probability model[12] based on (13) where the probability that a firm has difficulty accessing inputs or selling output is given by

$$\Pr(Y_{ij} = 1) = \beta_0 + \beta_1 INTL_{ij} + \beta_2 LOCKDOWN_j + \sum \gamma_{IND} \delta_i^{IND} + \sum \eta_{SIZE} \delta_i^{SIZE} + \sum \zeta_{CNTRY} \delta_j^{CNTRY} + \varepsilon_{ij} \quad (15)$$

Table 5 shows that international firms are more likely than domestic firms to experience difficulty accessing inputs and difficulty selling output. The probability that an international firm had difficulty accessing inputs is 0.181 larger than the probability for an otherwise comparable domestic firm and the probability that an international firm experienced a reduction in sales is 0.131 larger than the probability for a domestic firm. These numbers are economically large. A representative international firm has a 55% chance of facing difficulties accessing inputs (Table 2). If the same firm only sourced domestically, they would only have a 37% chance of facing such difficulties. A representative international firm has an 82% chance of experiencing reduced sales. If the same firm only sold output domestically, they would have a 69% chance of seeing their sales decreased. These results support the idea that international firms were more exposed to the economic effects of the pandemic, experiencing both domestic and international shocks to supply and demand from COVID-19 lockdowns.

[12] We use a linear probability model for ease of interpretation. However, the results are robust to nonlinear specifications and estimates from logit models are shown in the Appendix.

Dependent variable:	Difficulty accessing inputs	Reduced sales	Reduced logistics services	Reduced certification services
	(1)	(2)	(3)	(4)
International	0.181***	0.131***	0.219***	0.0593***
	(0.0180)	(0.0153)	(0.0180)	(0.0112)
Days since lockdown	0.00153**	-0.00329***	-0.00426***	0.0000306
	(0.000589)	(0.000499)	(0.000588)	(0.000365)
Sector FE	✓	✓	✓	✓
Size FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
N	4015	4015	4031	4031

Table 5. Channels through which COVID-19 affects business operations

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model reported. Dependent variables are "Difficulty accessing inputs" and "Difficulty selling output". Respondents were asked "How has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell output?" and "Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways?" Difficulty accessing inputs includes domestic and foreign inputs. Difficulty selling output includes selling to domestic consumers, foreign consumers, and businesses. Regressions weighted by share of population divided by observed number of firms. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001. This result is robust to alternative measures of economic lockdown.

As shown in the conceptual framework in Section 2, it is likely that international firms reduced the scale of production and it is likely that some changed trade strategies. That is, some exporters may have temporarily stopped exporting and some importers may have temporarily stopped importing. Table 5 supports this possibility that international firms reduced the scale of their operations, showing that they are more likely to report being affected by a reduction of logistics services needed to manage supply chains, as well as issues accessing certification services. Relative to domestic only firms, international firms have a 0.219 and 0.059 higher probability of being affected by reduced logistics and certification services, respectively. These results are economically large. For example, a representative international firm has a 55% chance of reporting being affected by reduced logistics services. If that same firm sourced domestically, they would have a 33% chance of being affected. A representative international firm has a 13% chance of being affected by reduced certification services, against 7% for domestic firms.[13]

This is important, as literature shows that logistics and certification services contribute to firms' abilities to compete in the international market. Logistics costs make up a significant share of the final price of goods for SMEs and firms in developing countries (Schwartz et al., 2009). In addition, formal certification allows firms to signal the quality of their products. Meeting international certification standards helps businesses in developing countries penetrate new markets and reduce costs associated with customs regulations (Goedhuys & Sleuwaegen, 2013; Henson et al., 2010; Latouche & Chevassus- Lozza, 2015; Martincus et

[13] Table A4 in the Appendix shows that results are robust to the use of logistic and probit specification.

al., 2015). Therefore, the difficulties associated with accessing logistics and certification services stemming from COVID-19 lockdowns could lead to an increase in product prices and a decrease in firm competitiveness, especially for SMEs in developing countries.

5.3. Coping with COVID-19

In this section, we test whether international firms, despite being more affected by the pandemic, are more likely to adopt resilient coping strategies. Table 6 shows that international firms are more likely to take resilient approaches to overcome the COVID-19 crisis than domestic firms. The probability that an international firm adopts a resilient approach, as opposed to a retreating approach, is 0.075 higher than the probability for a domestic firm (Table 6). This is economically significant. Table 3 shows that international firms have a roughly 92% chance of adopting a resilient strategy. A comparable firm only operating domestically would have about an 85% chance of responding resiliently. This represents a reduction of more than 7%. This suggests that businesses with more international exposure are better positioned to weather the crisis than other firms.

Previous research have shown that international companies are more competitive and productive. This is because only the most competitive and productive firms decide to enter international markets. In addition, participation in trade can boost the capacity of firms to connect with buyers, suppliers and institutions and to change according to market needs. As a result, international firms have more physical, financial and social assets to draw on to ride out the storm. This can be explained by the fact that international firms could enjoy a more diversified portfolio of suppliers and markets, which potentially allows them to buffer negative shocks by making more flexible decisions in production and market management (Hyun et al., 2020).

When we look at specific coping mechanisms (Table 6), we see that international firms are less likely to lay off workers, less likely to file for bankruptcy, less likely to reduce investment, and more likely to adopt remote work compared to domestic only firms. In particular, the probability that an international firm laid off employees is 0.07 lower than the probability for a domestic only firm. The probability that an international firm filed for bankruptcy is 0.012 lower than the probability for a domestic only firm. And the probability that an international firm reduced investment is 0.055 lower than the probability for a domestic only firm. These results are economically large. For example, a representative international firm has a 14% chance of laying off employees. If this firm only operated domestically, they would have a 21% chance of laying off employees, a 1.5-fold increase.

Dependent variable:	Resilient	Laid off employees	Filed for bankruptcy	Reduced investment	Telework
	(1)	(2)	(3)	(4)	(5)
International	0.0747***	-0.0675***	-0.0120**	-0.0370*	0.0553**
	(0.0160)	(0.0133)	(0.00380)	(0.0172)	(0.0173)
Days since lockdown	0.000792	0.000438	-0.000386**	-0.00239***	0.000371
	(0.000524)	(0.000434)	(0.000124)	(0.000562)	(0.000564)
Sector FE	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓
N	4031	4031	4031	4031	4031

Table 6. Coping strategies of international firms

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model reported. Dependent variables are “Resilient”, “Laid off employees”, “Filed for bankruptcy”, “Reduced investment”, and “Telework”. Respondents were asked “Have you adopted any of the following strategies to cope with the crisis?” In constructing the Resilient variable, responses are categorized as follows: Retreat – filed for bankruptcy, laid off employees, sold off assets, took on new debt or took no action. Resilient – all other responses. Regressions weighted by share of population divided by observed number of firms. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

6. Conclusions

The COVID-19 pandemic has shown that global value chains are sensitive to shocks in the international production network. Containment measures taken to slow the spread of the disease have also hampered supply and reduced demand across the world. These supply chain disruptions have led some policymakers to push for the localization and regionalization of value chains (Seric et al., 2020). The results of this paper reject these views by showing that international exposure helped firms cope during the crisis.

Using a novel firm-level dataset from the ITC COVID-19 Business Impact Survey, this paper highlights the following three main findings. First, consistent with previous research by Ramelli and Wagner (2020) and Vannoorenberghe (2012), we find that international firms were hit harder by the pandemic compared to domestic firms due to their exposure to international markets. Second, consistent with our theoretical framework, we find that international firms were affected through demand and supply channels. International firms were more likely to report difficulties accessing inputs as well as difficulties selling output compared to firms with no international exposure. Third, we find that international firms proved more resilient to the COVID-19 crisis than domestic firms. International firms were less likely than their domestic counterparts to lay off workers, file for bankruptcy or reduce investment and more likely to adopt countermeasures to continue production, such as telework.

These results underscore the importance of global connectedness and international trade for strengthening a business. Nationalizing value chains is unlikely to remove the risk of shocks from suppliers. Rather, by relying solely on domestic supply, it would merely reshore this risk. A more diversified international production network, on the other hand, would allow firms to find new consumers and suppliers in the face of a major external shock. The contribution of this paper is twofold. On one side, it shows the two sides of international firms: they are clearly more exposed to shocks, and this could lead to poorer outcomes during a crisis; but they are more resilient and adaptable, which could lead to better outcomes during and after the crisis. On the other side, it provides empirical evidence against nationalistic views amplified during the pandemic and calling for localization of value chains, onshoring and nearshoring. The empirical evidence is based on novel firm-level data on the effect of Covid-19 on domestic and international firms in 133 countries.

This paper focuses on the firm-level effects of the COVID-19 crisis. Further research could investigate whether the findings can be generalized to other types of external shocks. Another policy-relevant avenue for further research is to investigate which specific characteristics of international firms make them more resilient to shocks. This would allow governments to better prepare their companies to any crisis, being it related to human health, financial system, or climate change.

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Appendix

Sensitivity analyses

To test the sensitivity of our results, we ran our regressions using different weighting schemes and different model specifications. In addition, and not reported in this Appendix but available upon request, we ran each model on different samples, for example excluding one country at a time to test for the presence of outlying regions, and we also use different definitions of lockdowns. The results are robust to the procedure.

1. Alternative weighting methods

We use the following alternative weighting methods. First, we run all regressions with no analytical weights. Next, we weight observations based on the country's share of global GDP divided by the number of firms observed in the country. Finally, we run unweighted models but control for the log of the population. We find that the results for business operations effects are sensitive to the choice of the weighting method. However, all other results are robust to alternative weighting choices.

	Dependent variable: Business operations affected			
	No weight	GDP share	Log pop, no weight	Original
International	-0.130	0.354***	-0.108	0.395***
	(0.0810)	(0.0775)	(0.0804)	(0.0727)
Days since lockdown	0.00630***	0.00364***	0.00365***	-0.00158
	(0.00111)	(0.000943)	(0.00110)	(0.00108)
Sector FE	✓	✓	✓	✓
Size FE	✓	✓	✓	✓
Region FE	✓	✓		✓
N	3714	3714	3714	3714

Table A1. Business operations affected, alternative weighting

Source: ITC COVID-19 Business Impact Survey. Data collected from 21 April to 24 August 2020.

Note: Log odds of ordered logistic regression reported. Dependent variable is "Business operation effect." Respondents were asked "How have your business operations affected by the coronavirus (COVID-19) pandemic?" Responses are ordered "Not affected", "Slightly affected", "Moderately affected", and "Strongly affected". Region fixed effects used because ordered logit does not converge with country fixed effects. * p<0.05, ** p<0.01, *** p<0.001.

Dependent variable	Panel A: Difficulty accessing inputs				Panel B: Reduced sales			
	No weight	GDP weight	Log pop, no weight	Original (pop share)	No weight	GDP weight	Log pop, no weight	Original (pop share)
International	0.129***	0.105***	0.00334	0.181***	0.0629***	0.174***	0.0851***	0.131***
	(0.0206)	(0.0190)	(0.0186)	(0.0180)	(0.0174)	(0.0160)	(0.0154)	(0.0153)
Sector FE	✓	✓	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓		✓	✓	✓		✓
N	4015	4015	4015	4015	4015	4015	4015	4015
Dependent variable	Panel C: Reduced logistics services				Panel D: Reduced certification services			
	No weight	GDP share	Log pop, no weight	Original (pop share)	No weight	GDP share	Log pop, no weight	Original (pop share)
International	0.154***	0.279***	0.145***	0.219***	0.0365**	0.0225	0.0429***	0.0593***
	(0.0213)	(0.0183)	(0.0186)	(0.0180)	(0.0112)	(0.0117)	(0.0100)	(0.0112)
Sector FE	✓	✓	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓		✓	✓	✓		✓
N	4031	4031	4031	4031	4031	4031	4031	4031

Table A2. Channels through which COVID-19 affects business, alternative weighting

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model reported. Dependent variables are “Difficulty accessing inputs”, “Difficulty selling output”, “Reduced logistics services”, and “Reduced certification services”. Respondents were asked “How has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell output?” Difficulty accessing inputs includes domestic and foreign inputs. Difficulty selling output includes selling to domestic consumers, foreign consumers, and businesses. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

	No weights	GDP share	Log pop, no weight	Original
Dependent variable: Resilient				
International	0.101***	0.119***	0.132***	0.0747***
	(0.0202)	(0.0164)	(0.0185)	(0.0160)
Dependent variable: Laid off employees				
International	-0.0352*	-0.00368	0.000469	-0.0675***
	(0.0145)	(0.0143)	(0.0142)	(0.0133)
Dependent variable: Filed for bankruptcy				
International	-0.00969	-0.00783**	-0.00969	-0.0120**
	(0.00582)	(0.00243)	(0.00582)	(0.00380)
Dependent variable: Reduced investment				
International	0.00771	-0.210***	0.00771	-0.0370*
	(0.0172)	(0.0173)	(0.0172)	(0.0172)
Dependent variable: Telework				
International	0.0962***	0.100***	0.0962***	0.0553**
	(0.0163)	(0.0170)	(0.0163)	(0.0173)
Sector FE	✓	✓	✓	✓
Size FE	✓	✓	✓	✓
Region FE	✓	✓		✓
N	4031	4031	4031	4031

Table A3. Coping strategies by international firms, alternative weighting

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model reported. Standard errors in parentheses. Dependent variables are "Resilient", "Laid off employees", "Filed for bankruptcy", "Reduced investment", and "Telework". Respondents were asked "Have you adopted any of the following strategies to cope with the crisis?" In constructing the Resilient variable, responses are categorized as follows: Retreat – filed for bankruptcy, laid off employees, sold off assets, took on new debt or took no action. Resilient – all other responses. * p<0.05, ** p<0.01, *** p<0.001.

2. Alternative specifications

To test for outlying regions or industries, in this section we run each regression using different sub-samples of the data. First, we exclude all countries where fewer than 10 establishments responded. Second, we look at high-income countries only. Third, we look at all other countries excluding high-income countries. Fourth, we look at establishments in the manufacturing sector only. Fifth, we look at firms in the services sector only. Finally, we drop micro firms from the analysis. In addition, to test for the robustness of the linear probability model we run each binary dependent variable model using a logit and a probit specification. All models include fixed effects for country and establishment size. All models also include sector fixed effects except when we restrict the sample by industry.

	A. Input/output effects					
	Difficulty accessing inputs			Reduced sales		
	LPM	Logit	Probit	LPM	Logit	Probit
International	0.181***	0.860***	0.326***	0.131***	0.749***	0.431***
	(0.0180)	(0.0891)	(0.0463)	(0.0153)	(0.0995)	(0.0498)
Days since lockdown	0.00153**	0.00903**	-0.00287***	-0.00329***	-0.0222***	-0.00191*
	(0.000589)	(0.00299)	(0.000704)	(0.000499)	(0.00271)	(0.000844)
Sector FE	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓		✓	✓	
Region FE			✓			✓
N	4015	4015	4015	4015	4015	4015
	B. Other business effects					
	Reduced logistics services			Reduced certification services		
	LPM	Logit	Probit	LPM	Logit	Probit
International	0.219***	0.876***	0.541***	0.0593***	0.694***	0.355***
	(0.0180)	(0.0784)	(0.0480)	(0.0112)	(0.152)	(0.0751)
Days since lockdown	-0.00426***	-0.000637	-0.000447	0.0000306	-0.00527**	-0.00273**
	(0.000588)	(0.00117)	(0.000719)	(0.000365)	(0.00167)	(0.000915)
Sector FE	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓
Country FE	✓			✓		
Region FE		✓	✓		✓	✓
N	4031	4031	4031	4031	4031	4031

Table A4. Business effects, alternative binary dependent variable models

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model, logit model, and probit model reported. Dependent variables are "Difficulty accessing inputs" and "Difficulty selling output". Respondents were asked "How has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell output?" Difficulty accessing inputs includes domestic and foreign inputs. Difficulty selling output includes selling to domestic consumers, foreign consumers, and businesses. Regressions weighted by share of population divided by observed number of firms. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

	Laid off employees			Filed for bankruptcy		
	LPM	Logit	Probit	LPM	Logit	Probit
International	-0.0675***	-0.584***	-0.329***	-0.0120**	-8.353	-0.0517
	(0.0133)	(0.0921)	(0.0521)	(0.00380)	(4.830)	(0.0960)
Days since lockdown	0.000438	0.00206	0.00116	-0.000386**	-0.142***	-0.00541***
	(0.000434)	(0.00159)	(0.000880)	(0.000124)	(0.0144)	(0.00143)
Sector FE	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓
Country FE	✓			✓		
Region FE		✓	✓		✓	✓
N	4031	4031	4031	4031	4031	4031
	Reduced investment			Telework		
	LPM	Logit	Probit	LPM	Logit	Probit
International	-0.0370*	-0.120	-0.0730	0.0553**	0.408***	0.250***
	(0.0172)	(0.0788)	(0.0478)	(0.0173)	(0.0759)	(0.0465)
Days since lockdown	-0.00239***	-0.00354**	-0.00219**	0.000371	0.00408***	0.00255***
	(0.000562)	(0.00119)	(0.000727)	(0.000564)	(0.00115)	(0.000706)
Sector FE	✓	✓	✓	✓	✓	✓
Size FE	✓	✓	✓	✓	✓	✓
Country FE	✓			✓		
Region FE		✓	✓		✓	✓
N	4031	4031	4031	4031	4031	4031

Table A5. Coping strategies, alternative binary dependent variable models

Source: ITC COVID-19 Business Impact Surve. Data collected from 21 April to 24 August 2020.

Note: Results of linear probability model, logit model, and probit model reported. Dependent variables are “Laid off employees”, “Filed for bankruptcy”, “Reduced investment”, and “Telework”. Respondents were asked “Have you adopted any of the following strategies to cope with the crisis?” Regressions weighted by share of population divided by observed number of firms. Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

ITC COVID-19 Business Impact Survey

COVID-19 BUSINESS IMPACT SURVEY QUESTIONNAIRE (ENGLISH)
How is your company affected by the coronavirus pandemic? Your feedback matters and will help inform assistance from Governments and Donors. This anonymous survey will take less than 10 minutes to complete. The International Trade Centre, a United Nations agency, appreciates your participation during this difficult time.
Q1. Which country is your company based in? (single-select from the list of countries)
Q2. How have your business operations been affected by the coronavirus (COVID-19) pandemic? - Not affected - Slightly affected - Moderately affected - Strongly affected
Q3. Do you think there is a risk that your business will permanently shut down because of this crisis, and if so, when could this closure occur? (single select) - 1 month or less - 3 months - 6 months or more - Business closure not envisaged
Q4. Has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell outputs? (multi-select) - Difficulty accessing inputs domestically - Difficulty importing inputs from abroad - Lower domestic sales to consumers - Lower domestic sales to businesses - Increased domestic sales - Difficulty exporting - Improved exporting - Don’t know
Q5. Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways? (multi-select) - Temporary shutdown - Employee absences due to sickness or childcare - Clients not paying their bills - Reduced logistics services - Reduced certification services - New problems with infrastructure, e.g. internet or roads - Increased administrative bottlenecks - Reduced investment - None of the above - Other - Don’t know
Q6. Please specify which other effect. (Open ended question)
Q7. Have you adopted any of the following strategies to cope with the crisis? (multi-select) - Temporarily reduced employment - Laid off employees - Loaned employees to other enterprises - Teleworking - Rescheduling of bank loans - Increased marketing efforts - Online sales - Customized / new products - Started sourcing from new suppliers - Filed for bankruptcy - Other

COVID-19 BUSINESS IMPACT SURVEY QUESTIONNAIRE (ENGLISH)
Q8. Please select the top three government measures that would be most helpful as you cope with the COVID-19 crisis. - Employment programmes (i.e. temporary unemployment programmes or social security waivers) - Financial programmes, such as low interest credit line or credit guarantees - Tax waivers or temporary tax breaks - Reduction of tariffs on imported inputs - Rent subsidies - Cash transfers - Support to self-employed people - Other
Q9. Please specify which other measure. (Open ended question)
Q10. How easy is it to access information and benefits from government COVID-related SME assistance programmes? - Very easy - Easy - Standard - Difficult - Very difficult
Q11. How many full-time employees does the business have? (single select) - 0 - 1-4 - 5-19 - 20-99 - 100-249 - 250 and more
Q12. What is the main sector of activity of the business? (single select) - Agriculture - Mining and natural resources - Agri-food processing - Non-food manufacturing - Retail and wholesale - Travel and transport - Accommodation and food services - Information technology - Finance - Other services
Q13. What is the gender of the top manager of the business? (single select) - Female - Male - Don’t know
Q14. What is the age of the top manager of the business? - 34 years and younger - 35 years of age and older - Don’t know
Q15. Is this establishment currently registered with or licenced by a national authority? (single select) - Yes, registered business - Freelancing/independent/consultant - No, unregistered business - Do not know
Q16. Does the business participate in international trade? (single select) - No, we buy and sell within our country only - We import but do not export - We export but do not import - We export and import

COVID-19 BUSINESS IMPACT SURVEY QUESTIONNAIRE (ENGLISH)
Q17. Please provide your email address if you would like to receive a copy of the report based on the responses to this survey and agree to be contacted by the International Trade Centre about future opportunities in your country. Your data will be kept confidential. (open-ended)

Country	Obs.	Percentage share in total	Country	Obs.	Percentage share in total	Country	Obs.	Percentage share in total
Afghanistan	5	0.11	Gambia	29	0.65	Pakistan	439	9.88
Albania	4	0.09	Georgia	2	0.04	Palestine	38	0.85
Algeria	7	0.16	Germany	7	0.16	Panama	8	0.18
Angola	1	0.02	Ghana	27	0.61	Paraguay	1	0.02
Anguilla	1	0.02	Greece	2	0.04	Peru	68	1.53
Argentina	7	0.16	Guatemala	17	0.38	Philippines	495	11.14
Armenia	1	0.02	Guinea	43	0.97	Poland	4	0.09
Australia	10	0.22	Haiti	1	0.02	Portugal	6	0.13
Austria	1	0.02	Honduras	5	0.11	Qatar	2	0.04
Azerbaijan	3	0.07	Hong Kong, China	1	0.02	Republic of Korea	9	0.2
Bangladesh	16	0.36	Hungary	5	0.11	Romania	3	0.07
Belarus	1	0.02	India	76	1.71	Russia	5	0.11
Belgium	3	0.07	Indonesia	20	0.45	Rwanda	8	0.18
Benin	61	1.37	Iran	11	0.25	Saint Lucia	6	0.13
Bhutan	42	0.94	Iraq	893	20.09	Samoa	1	0.02
Bolivia	10	0.22	Italy	20	0.45	Saudi Arabia	5	0.11
Bosnia and Herzegovina	2	0.04	Jamaica	4	0.09	Senegal	31	0.7
Botswana	11	0.25	Japan	5	0.11	Serbia	2	0.04
Brazil	43	0.97	Jordan	26	0.58	Sierra Leone	2	0.04
Burkina Faso	30	0.67	Kenya	70	1.57	Slovenia	4	0.09
Cambodia	286	6.43	Lao People's Democratic Republic	43	0.97	Somalia	6	0.13
Cameroon	16	0.36	Lebanon	2	0.04	South Africa	25	0.56
Canada	4	0.09	Liberia	2	0.04	Spain	25	0.56
Central African Republic	1	0.02	Lithuania	1	0.02	Sri Lanka	76	1.71
Chad	3	0.07	Madagascar	7	0.16	Sweden	1	0.02
Chile	2	0.04	Malaysia	5	0.11	Switzerland	7	0.16
China	169	3.8	Mali	7	0.16	Tanzania	10	0.22
Chinese Taipei	5	0.11	Malta	2	0.04	Thailand	6	0.13
Colombia	115	2.59	Mauritania	1	0.02	Togo	8	0.18
Comoros	1	0.02	Mauritius	3	0.07	Tunisia	12	0.27
Congo	6	0.13	Mexico	28	0.63	Turkey	97	2.18
Costa Rica	20	0.45	Moldova	3	0.07	Turkmenistan	1	0.02
Cote d'Ivoire	32	0.72	Mongolia	4	0.09	Uganda	31	0.7
Croatia	1	0.02	Morocco	27	0.61	Ukraine	5	0.11
Cuba	1	0.02	Mozambique	5	0.11	United Arab Emirates	10	0.22
Czech Republic	1	0.02	Myanmar	343	7.72	United Kingdom	15	0.34
Democratic Republic of Congo	5	0.11	Namibia	2	0.04	United States	12	0.27
Denmark	1	0.02	Nepal	36	0.81	Uruguay	3	0.07
Dominican Republic	4	0.09	Netherland Antilles	3	0.07	Uzbekistan	2	0.04
Ecuador	11	0.25	Netherlands	5	0.11	Venezuela	5	0.11
Egypt	28	0.63	New Zealand	3	0.07	Vietnam	10	0.22
El Salvador	12	0.27	Nicaragua	16	0.36	Zambia	17	0.38
Ethiopia	9	0.2	Niger	2	0.04	Zimbabwe	16	0.36
Fiji	2	0.04	Nigeria	89	2			
France	10	0.22	North Macedonia	1	0.02			

Table A6. Observations by country

Description of variables

Name	Description	Source
Dependent variables		
Business operations affected	Respondents were asked, "How have your business operations been affected by the coronavirus (COVID-19) pandemic?" Responses are: "Not affected", "Slightly affected", "Moderately affected", and "Strongly affected"	ITC COVID-19 Business Impact Survey
Difficulty accessing inputs	Respondents were asked, "Has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell outputs? " Constructed variable includes difficulty accessing domestic and foreign inputs	ITC COVID-19 Business Impact Survey
Reduced sales	Respondents were asked, "Has the coronavirus (COVID-19) pandemic affected the ability to purchase inputs for your enterprise and/or sell outputs? " Constructed variable includes difficulty selling to domestic and foreign consumers as well as to businesses	ITC COVID-19 Business Impact Survey
Reduced use of logistics services	Respondents were asked, "Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways?"	ITC COVID-19 Business Impact Survey
Reduced use of certification services	Respondents were asked, "Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways?"	ITC COVID-19 Business Impact Survey
Resilient	Respondents were asked "Have you adopted any of the following strategies to cope with the crisis?". Constructed variable "Resilient" includes two mutually exclusive choices: "Retreat" and "Resilient". The baseline response is "Retreat". Categorizations: Retreat – chose on or more of the following options: filed for bankruptcy, laid off employees, sold off assets, took on new debt or took no action. Resilient – chose one or more of the following options: temporarily reduced employment; teleworking; rescheduled bank loans; greater marketing; online sales; sourcing from new suppliers; customized/created new products or loaned employees to other enterprises.	ITC COVID-19 Business Impact Survey
Laid off employees	Respondents were asked "Have you adopted any of the following strategies to cope with the crisis?"	ITC COVID-19 Business Impact Survey
Filed for bankruptcy	Respondents were asked "Have you adopted any of the following strategies to cope with the crisis?"	ITC COVID-19 Business Impact Survey
Reduced investment	Respondents were asked, "Has the coronavirus (COVID-19) pandemic affected your enterprise in any of the following ways?"	ITC COVID-19 Business Impact Survey
Telework	Respondents were asked "Have you adopted any of the following strategies to cope with the crisis?"	ITC COVID-19 Business Impact Survey
Independent variables		
International	Indicator variable that equals 1 if business imports, exports, or both and 0 otherwise	ITC COVID-19 Business Impact Survey
Days since lockdown	Time from start of lockdown to survey response. Lockdown defined as government-mandated closure or work from home of all nonessential businesses.	Oxford COVID-19 Government Response Tracker
Controls		
Sector	Main industry of establishment. Three categories: Agriculture, Primary, and Manufacturing.	ITC COVID-19 Business Impact Survey
Size	Size of firm, based on employment. Categories: Micro, Small, Medium-sized, and Large.	ITC COVID-19 Business Impact Survey
Country	Country in which company is based	ITC COVID-19 Business Impact Survey
Region	Region in which company is based	ITC COVID-19 Business Impact Survey
Weights		
Population weight	Baseline weighting mechanism. Country's share of world population divided by number of establishments observed in that country.	UN World Population Projections and ITC COVID-19 Business Impact Survey

Table A7. Description of variables used in regressions