

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Thesis Economics and Business: International Economics

**Firm survival in a time of global crisis – Effect of
firm productivity and the COVID-19 restrictions**

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The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

Acknowledgment

I would really like to thank my supervisor Dr. Julian Emami Namini for his guidance, support, and valuable time. Furthermore, I would like to thank my family and friends who motivated me throughout my Master's journey. Lastly, I would like to thank Erasmus University Rotterdam for providing me with this great opportunity to study and graduate from one of the prestigious universities.

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Abstract

COVID-19 has a devastating impact on human well-being and economies. The businesses have suffered a lot because of lockdowns, demand shocks, and supply chain disruptions. These restrictions might have resulted in the cleansing of firms that were less productive. This paper analyzes the medium to the long-term effect of COVID-19 restrictions on the firm survival using Worlds' Bank Enterprise Survey data and COVID-19 survey. The analysis in this paper depicts that COVID-19 restrictions resulted in the exit of less productive firms. The impact of COVID-19 restrictions on firm exit was significant in various sectors i.e., hospitality, retail, other sectors, etc. but it is most pronounced in the hospitality sector. There is no significant effect of COVID -19 restrictions in exporting partner countries on the exit of exporter firms. Furthermore, the analysis also highlights that certain factors like firm age, Managers' experience, product innovation investment, and online presence can significantly decrease the probability of firm exit.

Keywords: COVID-19 restrictions, firm exit, stringency index, World Bank Enterprise survey, COVID-ES

1. Introduction

The results of the COVID-19 outburst are exceptional and observed across the globe. It has profoundly impacted the work life. Other than being a risk to public health it is greatly impacting economies, labor markets, and businesses, comprising global supply chains, resulting in prevalent disruptions of business (ILO, 2020).

The outburst of COVID-19 had a severe effect on the global economy. Several firms have realized various challenges with evident losses. The rapid spread of COVID-19 in March 2020 forced Governments across the globe to enforce partial or complete lockdown in the countries which led to severe economic disruptions. Due to a decrease in demand, travel restrictions, lockdowns, and health concern the businesses faced serious challenges, decreasing productivity and output that resulted in business closures (Shafi, Liu, & Ren, 2020). These factors could impact the business's ability to cover the expenses and survive the lockdown which may be resulted in the permanent closure of the firms. The impact of the COVID-19 restrictions could be severe and devastating for businesses around the globe. However, as the restrictions are continuing, the long-term effects are still very difficult to examine. The short-term challenges like cash flow, low demand, health and safety, workforce, and lower sales, faced by businesses

have exceptionally disrupted the firms in various industry sectors (Donthu & Gustafsson, 2020).

As consumers are at home and the countries have imposed lockdowns the demand for a lot of products has decreased which may have caused a lot of businesses in various industries to file for bankruptcy. The traveling, hospitality, and tourism industry has been deeply affected; and has observed little to no profits at the beginning of COVID-19 (Fairlie R. , 2020). The functions of industries, like salons, transportation, gyms, and sports, have also been interrupted, whilst some businesses have struggled, some online businesses like entertainment, takeout and food deliveries, virtual education, remote work solutions like IT, and online shopping have flourished and grown as well (Donthu & Gustafsson, 2020). Medication and healthcare businesses also are doing well because of the COVID-19 restrictions. As per the reports of the International Labor Organization effect of the restrictions is high on the productivity of repair of motor vehicles, hotels, and restaurants, real estate sector, retail and wholesale, and is low for human health, social work activities, utilities, education, and public administration and defense (ILO M. , 2020)

Kozeniauskas, Moreira, & Santos (2020) using Portuguese firm-level data found a large and heterogenous impact of the shock across the firms. Most of the firms faced reduced sales, but productive firms had a higher probability to stay open, less probable to lay off and using less government assistance. Bartik et. al (2020) using data from the US found out that most job losses were due to the closure of firms, however, some of them reopened afterward. Further, the less productive firms were more prone to shut down and were less prone to open again. Bartik A., Bertrand, Cul, Glaeser, & Stanton (2020) estimates the early effects of COVID-19 using data from small businesses in the USA. They found that 53% of the business were already temporarily closed and they reduced their employee counts by 40%. Most of the papers mainly focus on the developed economies or have used data from one country only.

As time progressed and the data is becoming available, recent research papers have used cross-country data to see the effect on developed, emerging, and developing economies. (Aga & Maemir, 2021) using cross-country data found that the effect of the COVID-19 restrictions on firms is more pronounced in Sub-Sahara Africa, because of the level of development of the country. The large firms have higher chances of survival in the restrictions caused by COVID-19 and even succeed in increasing their revenue throughout the crisis and the firm resistance is probable to be pushed by their resources, institutions, and the culture of the country (Liu Y. P., 2021).

The paper uses Enterprise survey data from The World Bank to see the long-term effect of the crisis, of “the firm productivity on the firm probability to exit the market”. This research paper builds on the empirical paper by Muzi S., Jolevski, Ueda, & Viganola (2021) who used the COVID-ES for two rounds of data collection to find out that firms who are less productive are probable to permanently exit the market. This paper uses more recent data, i.e., the data from the third round of the survey, to see the long-term impact of COVID-19 restrictions and the third round of data will also help in estimating if the firm exit was permanent or temporary. Furthermore, this paper intends to highlight the differential characteristics of firms that survive as compared to who fail to survive during times of crisis.

As highlighted above various sectors and industries have been impacted by the COVID-19 restrictions. It is interesting to see how firm survival in various sectors has been significantly impacted by these restrictions. Due to the lockdown and other restrictions, the demand for certain products and the supply chain have been adversely impacted, which in turn could impact the demand and supply of exporting goods. The theory highlights that exporting firms are highly productive and are more probable to survive and force unproductive firms out of the market, it is interesting to see the differential impact, if any, of COVID-19 restrictions on the survival of non-exporting and exporting firms.

Figure 1 demonstrates how the rate of firm exit increased after COVID-19 restrictions. Total assumed exits are 2,792 out of the sample of 12,685. At the beginning of COVID-19 i.e., in 2020 the exit rate is around 1200 and as time passed the exit rate in 2021 is around 1400. These stats show that there is an impact of restrictions in relations of both short-term and long-term on firms. Hence it would be interesting to see the difference in characteristics of firms that exited and the ones that survived. Figure 2 shows the firm exits in different sectors, we can see that all sectors have been impacted by these restrictions, to further investigate the significant impact on various sectors a statistical estimation is performed. Lastly, in figure 3 we can see that exporting as well as non-exporting firms exited the market, however, the rate is quite high for the non-exporting firms. Hence, it is also a motivating theme to explore statistically and economically.

Firms' Productivity is a critical factor in determining their efficiency and profitability. In a competitive market only, those firms survive who are productive forcing the less productive firms to leave the market. With this threat, businesses are in a continuous race to find innovative ways to stay in the market. The COVID-19 restrictions have a distinctive effect on economic activity worldwide due to the mass control of movements and interactions among people. It is important to see if these restrictions have caused the less productive firms to exit

the market causing long-term reallocation to more productive firms or if had a damaging impact across the firms irrespective of their productivity and innovations.

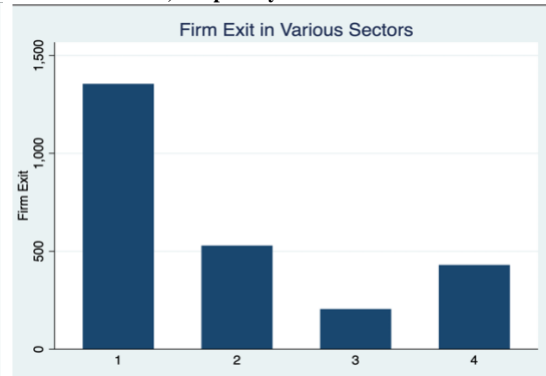
Figures for firm Exit

Fig 1: Firm Exit before and after COVID-19 Restrictions



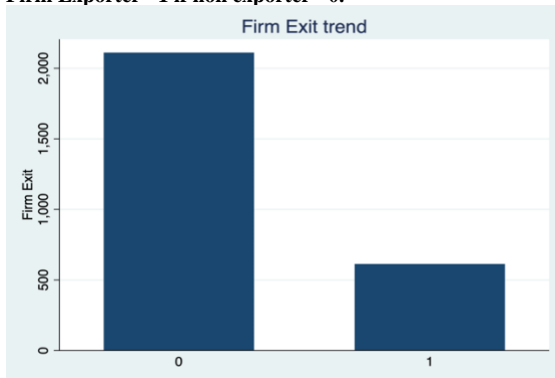
The data is taken from the World bank's COVID-ES survey from 21 countries have been used in this paper. The fig shows the exit trend before and after COVID-19. The data taken is from third round which was completed in the last quarter of the year 2021.

Fig 2: Firm Exit in different sectors; Manufacturing=1, Retail=2, Hospitality =3 and other sectors =4



The data is from the World Bank's COVID-ES survey's third round which was completed in the quarter of the year 2021 for 21 countries. The graph shows the effect of COVID-19 restrictions on the exit rate of the firms belonging to manufacturing, retail, Hospitality and the rest of the sectors (other sectors)

Fig 3: Firm Exit in exporting and non-exporting firms. Firm Exporter =1 if non exporter =0.



The data used is from the World Bank's COVID-19 ES survey for 21 countries whose third round of the survey was completed in the last quarter of the year 2021. The fig shows the exit rate of exporter vs non-exporter firms after the COVID-19 restrictions by the end of the year 2021.

2. Literature Review

The productivity of a firm is an imperative measure of its survival. Furthermore, the productivity of the firms is also a significant factor in determining the features of the market in which it functions. As the market competition increases, the overall market productivity increases hence forcing the unproductive or lesser productive firms out of the business. So, for a firm to survive in a highly competitive market, it must be continuously working on improving its efficiency and profitability to be more productive.

According to Industrial Dynamics Theory, “the market selection mechanism triggers business turnover by increasing pressure on inefficient firms to quit and stimulating resource reallocation from inefficient establishments to more efficient ones” (Ericson & Pakes, 1995), (Hopenhayn, 1992) & (Jovanovic, 1982). Moreover, a large amount of literature has found that high productivity is linked to a high probability of firm survival. In general, it has been shown that establishments with lower productivity levels have a higher probability to experience market share losses and/or quitting due to low-performance levels in competition. Such evidence suggests that the high-performing firms derive out low performing ones and this results in the restructuring of resources from firms that are less productive to more productive firms, hence improving overall market productivity. This proof is per the Schumpeterian growth theory. A significant number of studies have confirmed the productivity-survival relationship. Various studies using data from various countries like Spain (Farinas & Ruano, 2005), Columbia (Eslava, M, Haltiwanger, Kugler, & Kugler, 2004), USA (Foster, Haltiwanger, & Syverson C., 2008), Taiwan (Aw, Chen, & Roberts, 2001) and Ghana (Frazer, 2005) determined that firms that survive have higher productivity than the firms who exit the market. Papers by Melitz & Ottaviano (2008) & Melitz (2003) also confirm that the survival of firms depends on productivity differences arising from the i.e., small size, inefficient, and young firms have a lower probability of survival.

Though crises are situations of accelerated adjustment, evidence of the effect of shocks on the reallocation of resources is scarce at the firm level. Some macroeconomic models predict that during crises Schumpeterian “cleansing” of firms takes place as the crises derive the unproductive firms out of the business leaving more resources to be used by productive firms i.e., Caballero & Hammour (1994). The previous studies on micro firm-level data do provide empirical evidence on Schumpeter’s creative destruction but they don’t answer the question of how it changes over time. A study by Griliches & Regev (1995) in Israel on a large dataset from 1979-1988 known as the “lost decade” founds weak evidence for the proposition that

cyclical downturns escalate the allocative efficiency. If there are market imperfections, the crisis rather than supporting the economy, may hinder the adjustments and prolong the progression of economic recovery. Some papers do suggest that policies do play a significant part in facilitating the reallocation process. The distortionary policies governing the dynamics of firms and the regulations in the labor market are unfavorable for the efficient reallocation of resources (Haltiwanger, Scarpetta, & Schweiger, 2008).

Barlevy (2002) finds that in times of downturns the sullyng effect is more dominant than the cleansing effect, which can damage the economy and hamper productivity growth in the long run by demolishing the firms that are productive and worsening the credit market imperfections. There are analyses on firm-level data that try to disentangle the effect of crises on cleansing or scaring the economy, by examining the connection between firm exit, productivity, and growth, but they are still limited. A study by Hallward-Driemeier (2013) using Indonesian Census data for the time of the East Asian Crisis i.e. (1991-2001) found that in the time of crisis the connection between productivity and employment creation was not increased, but the crisis stimulated the exit of the firms that were comparatively more productive. Nishimura, Nakajima, & Kiyota (2005) also found similar results analyzing the period of Japanese firms during the Japanese bank crisis that the crisis somewhat resulted in the exit of more productive firms. Carreira & Teixeira (2016) studying the Portuguese recession period found out that in times of extreme recessions the efficiency of the reallocation mechanism can be diminished, they further found that a significant amount of productive firms may exit the market during crises. Baden-Fuller (1989) founds that during the UK steel casting industry crisis the four-year productivity declined by growth by one quarter, which resulted in the exit of most profitable firms. According to Bosio, Jolevski, Lemoine, & Ramalho's (2020) article, as per traditional economics, Schumpeter's creative destruction theory should be active, where the crisis/ downturns result in the exit of unproductive firms. But during times of severe economic crisis, all the firms are unable to do their business as usual.

The emphasis of this paper is on the productivity of a firm and its survival, hence the reallocation of resources and its impact on welfare is out of the scope of this paper. There are arguments that this may increase the overall productivity of the market hence this phenomenon is welfare-enhancing while some studies show that it could also be less productivity-enhancing. Melitz's (2003) trade models show that the increased industry exposure to trade drives less productive firms out of the industry which leads to inter-firm reallocation of resources, and the aggregate growth of industry generated by this reallocation process results in welfare gain.

However, the Study in Portugal shows that the link between productivity and the survival of the firm exists, but the reallocation process cannot be certain because the entry rate was decreasing while the exit rate was higher (Carreira & Teixeira, 2016). In times of crisis, the findings of the great recession of the US show that the restructuring process was less welfare-enhancing as compared to previous crises (Foster, Grim, Haltiwanger, & Wolf, 2016)

A paper by Muzi S., Jolevski, Ueda, & Viganola (2021) used Enterprise Survey data and the COVID-19 Survey from the World Bank and found that during the initial period of COVID-19 the Schumpeter's creative destruction may be at work as the crisis resulted in the higher probability of exit for the less productive firms. This paper is an extension of the above-mentioned paper as this paper incorporates the recent data of the COVID-ES survey to see the medium to the long-run effect of the crisis on firm survival. This paper also focuses on the differential impact on firm exit from different sectors, as, although COVID-19 restrictions have impacted overall all the businesses and sectors due to the closure of markets, businesses, and schools, certain sectors where the direct interaction between people is more and unavoidable might be more impacted. The paper also incorporates the differential effect of the crisis on the survival of non-exporter and exporter firms. Hence this paper focuses on three main questions 1) Is there any differential effect of COVID-19 restrictions on firm survival of productive and un-productive firms? 2) Is there any differential effect of COVID-19 restrictions on various business sectors and lastly 3) Is there any differential effect of COVID-19 restrictions on firm survival if the firm is an exporter or not?

3. Data and Methodology

The dataset used in the paper is Enterprise Survey Data (ES survey)¹ and COVID-ES from the World Bank. ES survey is the baseline survey and COVID-ES is the follow-up survey with the same firms included in ES, which will be completed in three rounds. The data is comparable across countries because of the same standard methodology and questionnaire used in each country. By the end of March, three rounds were available for 21 countries, hence the dataset comprises these countries the details of the countries are in table 1. The total observations of the dataset are 12,675 for each round.

One of the main explanatory variables to capture the severeness of COVID-19 restrictions in each country, is the dataset on stringency index from the University of Oxford used. According to the data description “it is a combination of various indicators like school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls; which is between 0- 100 zero being no restrictions and 100 being strictest” (Hale et. al, 2021). Total COVID-19 cases for each country are also controlled for each country taken from the University of Oxford dataset².

Other controls like Ease of doing business and certain economic factors are taken from World Bank to control for country-specific effects.

¹ Source: World Bank Enterprise Surveys, <http://www.enterprisesurveys.org>

² Thomas Hale, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, Emily Cameron-Blake, Laura Hallas, Saptarshi Majumdar, and Helen Tatlow. (2021). “A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker).” *Nature Human Behaviour*. <https://doi.org/10.1038/s41562-021-01079-8>

4. Empirical Strategy

To estimate our research questions, the following logistic regressions models have been predicted:

4.0.1. Labor Productivity and Firm Survival

The regression equation used to evaluate the effect of labor productivity on firm survival in times of crisis is as follows:

$$\text{FirmExit}_{ijk} = \beta_0 + \beta_1 \text{Productivity}_{ijk} + \beta_2 \text{FirmControl}_{ijk} + \epsilon_{ijk}$$

The outcome variable is a firm exit which is calculated as a permanent exit of the firm from the market, according to the firm's operations. The main explanatory variable is productivity which captures firms' performance.

4.0.2. Effect of COVID-19 restrictions on Firm Exit

The following regression equation has been used to gauge the effect of Covid-19 regulations on firm survival

$$\text{FirmExit}_{ijk} = \beta_0 + \beta_1 \text{Productivity}_{ijk} + \beta_2 \text{StringencyIndex} + \beta_3 \text{Stringency Index} * \text{Sector}_{ijk} + \beta_4 \text{FirmControl}_{ijk} + \epsilon_{ijk}$$

Other than the productivity stringency index which is a measure of government policy in COVID-19 is used to gauge the impact of the strict regulations in the country on the exit or survival of the firm. As the COVID-19 restrictions might have impacted the sectors differently, the stringency index has also interacted with various sectors to see if these hold true or not.

4.0.3. Effect of Exporting Partners countries Regulations on Firm Exit

To see the differential impact of COVID-19 restrictions on exporting and non-exporting firms following strategy has been used.

$$\text{FirmExit}_{ijk} = \beta_0 + \beta_1 \text{Productivity}_{ijk} + \beta_2 \text{Stringency Index} * \text{Exporter}_{ijk} + \beta_3 \text{Stringency Index of Exporting Partner} + \beta_4 \text{FirmControl}_{ijk} + \epsilon_{ijk}$$

In this regression equation, the stringency index of the average of the top three exporting partner countries of the respective country has interacted with its exporting status.

In all the three models above the firm control variables include the age of the firms, size of the firm if the firm is an exporter, foreign ownership, management characteristics, business environment, innovation and technology, and the sector in which firms operate. In the

equation above subscript, i refers to the firm, j to the sector, and k to the country. The regression equation will be estimated using a logistic regression model.

There could be a possibility of simultaneity in the regression equation above, so to mitigate that impact the lagged variables for explanatory variables are used i.e., Firm Exit is generated using the COV-ES survey, while all the explanatory variables are taken from the baseline survey. Another possibility of biasness is the natural rate of exit for that purpose only those countries and firms are included in the analysis whose surveys were completed the most year prior to the breakout. This might not fully eliminate the probability of exit because of other factors but helps in reducing the gap.

4.1. Definition of Main Variables

This section briefly explains the main exploratory and explanatory variables along with the controls identified and highlighted in the previous literature.

4.1.1 Firm Exit:

Variable firm exit is computed using baseline and COVID-ES survey i.e., the firm that was operational in the baseline but has closed the business in the following rounds. It is to be noted that in the analysis only permanently closed firms are included and not the ones who temporarily closed their business. The reason is that; the reason why a firm is temporarily closed can't be identified as it could be due to work closure or as a reaction to the government response to COVID-ES or because of the firm productivity. Hence, including these firms can bias the results.

The firm exit is calculated using two measures:

- 1) Actual Exit: The firm when contacted stated that the business has been shut down.
- 2) Assumed Exit: The firm was contacted multiple times during each round but didn't respond, hence the assumption is made that the firm has closed the business.

The reason behind this assumption is that it is highly unlikely that a firm won't respond even contacted multiple times and has participated in previous rounds. In the main analysis, the variable for firm exit is used that included both of these measures. To confirm the validity of our results from baseline an analysis including actual exit data will be performed as a robustness check.

4.1.2 Explanatory Variables:

The main independent variable is firm productivity, which is calculated using the ES baseline survey. This is measured as labor productivity, which is computed the using log of

sales in the baseline year and is divided by the total number of permanent employees in the baseline year. The sales are converted into USD 2015 for comparison purposes.

The stringency Index is used as a measure of government response to COVID-19. The data on the stringency index is available on daily basis but in our analysis, we use data of monthly average as the shutdown date of the firm is not available in the data, but it has information on the month it was closed. Mostly all sectors have been impacted due to COVID-19 restrictions but according to most reports Hospitality sector, transportation, and sectors where interaction with customers is inevitable are impacted the most. To see which sectors were significantly impacted because of COVID-19 restrictions an interaction dummy of each sector with a stringency index is included. To measure the effect correctly the total number of COVID-19 cases for the month is also included. The stringency index interacted with different sectors based on ISIC codes, to see the differential impact. To see the difference in permanent shut down of exporting and non-exporting firms, the average stringency index of the top three trading partner countries interacts with the exporter dummy. In regressions, the log of Monthly cases has been also controlled for.

The other variable to be included in the regression to quantify firm efficiency is capital. To control for capital, we use investment in fixed assets like land, machinery, building, equipment, and vehicles in the year before the baseline survey. This variable does though have limitations as this is not the capital stock but the purchase of capital. This indicator is used in our baseline regression as it is available for all the firms in our data. To control for stock rather than the purchase of capital other proxies are used in robustness checks. These include the cost of capital i.e., the log of cost of electricity and fuel which is a proxy for capital employed in the process of manufacturing and providing services. The costs are deflated at USD 2015.

4.1.3. Control Variables:

Several firm-level Control variables are used i.e., size of the firm, if the firm is an exporter, age, access to finance, infrastructure and regulations, managerial characteristics i.e., the top manager is female, Experience of a top manager, investment in permanent employees training, innovation and technology i.e. if the firm has any website, investment in R&D, the introduction of the new improved process the introduction of new products. All these measures are taken from the baseline ES survey. Country level controls include GDP growth, trade openness, and business regulations taken for the year 2015 as the latest information for all countries was available for 2015. The detailed calculation of each firm-level variable is given in table 2.

Other than labor productivity, several factors have been highlighted in the literature that impact firms' survival. The survival of the firm may depend on its size. Falk (2013) using Austrian ski data from 1995-2011 found that firm size decreases the likelihood of a firm's exit. Due to economies of scale and availability of financial funds, larger firms are less impacted by the fluctuations in the business cycle and variation in the interest rates (Kaniovski, Peneder, & Smeral, 2008; Bruni, Pittiglio, & Reganati, 2014). Big firms have more diversified products and procedures and hence have more chances of survival. The larger firms are more innovative and productive hence they provide better quality products to the customers and hence are less prone to fluctuations (Erkus Ozturk & Terhorst, 2018). However, younger firms may be less reactive and flexible in adapting to the downturns, by exploiting the niche activities and the marketplaces distinguished by external economies of scale, and as small economies rely less on formal credits hence, they are subject to lower sunk cost and are less inert (Tan & See, 2004; Liu, Tsou, & Hammitt, 1999)

Similarly, the age of a firm has a significant role in the survival of the firm. A firm that is operating in the market for a long time is more experienced which may positively impact its survival. Audretsch, Houweling, & Thurik (2000) used a longitudinal dataset from Statistics Netherlands (CBS) and found that the likelihood of the firm survival rises with the firm size and age. The older and bigger firms have more capacity to invest in the business and their processes may also improve because of learning by doing, better understating of the market and customers, and improved productivity with time (Ericson & Pakes, 1995; Aga G. &, 2017). The survival failure of the younger firms could be because of their management competencies and their financial management potential. Persson (2004) in his research on Swedish firms from 1987-1995 found that other than the age and size of the firm, being part of multi-unit firms also has a positive impact on a firm's survival. This could be because the multi-level unit firms develop highly skilled organizational units that help them to compete in competitive markets through exploitative and exploratory innovations (Jansen, Van den Bosch, & Volberda, 2005). The risk of exit may also be lower because the multilevel establishments may be benefitted because of their risk diversification, competitive restraint, and organizational knowledge sharing and learning (Audia, Sorenson, & Hage, 2001).

Among other firm-level control, the analysis also controls for export orientation and foreign ownership of the firm. Kronborg & Thomsen (2009) found that foreign-owned firms have a greater survival rate, almost double that of domestic firms. This could be because of the access to knowledge, resources, or brands of the foreign affiliates. During a crisis, multinational firms are expected to exist longer as compared to domestic firms because of advantages like

access to raw materials, increased access to customers, and the sunk cost associated with their business (Desai, Foley, & Forbes, 2004; Chung, Lu, & Beamish, 2008). However, there is also a possibility of “foreign ownership liability” i.e., the lack of knowledge of the domestic market and policies, they have less probability of survival in crisis than domestic firms (Zaheer & Mosakowski, 1997). The support for the effect of foreign ownership on the survival of the firm is varied, Wagner & Gelübcke (2012); Ferragina, Pittiglio, & Reganati (2014) found a negative relationship between foreign ownership and firm survival, whereas Pennings, Barkema, & Douma (1994) & Mata & Portugal (2002) found no significant differential impact on the firm survival for domestic or foreign-owned firms.

Görg & Spaliara (2009) found robust verification that exporters face a greater likelihood of survival. The exporting firms have more diversification because of selling products/ services in different markets which are in various phases of the business cycles (Hirsch & Lev, 1971). This helps firms to shift their sales to foreign markets when there is a crisis or shock in the domestic market (Foster, Grim, Haltiwanger, & Wolf, 2016). The COVID-19 situation around the world is comparable to the above-mentioned situation as different countries were hit differently and at different times. Esteve-Pérez, Mánez-Castillejo, & Sanchis-Llopis (2008) also found that exporting enterprises have a considerably lower failure probability in comparison to non-exporters because of the advantage of learning by doing phenomenon of exporters.

This study also includes a set of control variables on firms’ managerial characteristics. Managers’ knowledge and experience can be important factors in firm survival as they are better equipped to tackle crises, as they are the ones to take decisions and devise strategies. Their experience and knowledge may compensate for the lack of knowledge the firms have which can increase the chance of firm survival (Freixanet, Renart, & Rialp-Criado, 2018; Sapienza, Autio, George, & Zahra, 2006). Schutjens & Wever (2000) found that the firm survival is impacted by the knowledge and capabilities of managers and the board. Other than managers’ experience the gender of top managers may impact the business. Boden Jr & Nucci (2000) found out that on average the mean survival rate of female-owned businesses is 4-6% less than that of male-owned firms. Women-led firms are less successful as associated to their male colleagues (Fairlie & Robb, 2009; Mboko & Smith-Hunter, 2010). Conversely, a paper by Kalleberg & Leicht (1991) found that women-led firms are not more probable to be unsuccessful or go out of business as compared to men. Alekseev, et al. (2022) inspected the effect of COVID-19 on United State firms and found that large, old, and male-owned businesses were more plausible to continue their operations in the initial periods of the COVID-

19 restrictions. The dummy of a female top manager is included in our analysis to control for this factor.

Business environmental factors like electricity, government policies, and fraudulent practices play a vital part in the firm survival and growth (Oginni & Adesanya, 2013). Clover & Darroch (2005) found that factors like the availability of proper infrastructure, the policies to decrease the expenses of compliance and regulations, and the new loan offers can help in firm survival. To control for infrastructure quality a variable of electric outages has been included in the regression and to capture regulations a control variable that how much time of senior manager spent on dealing with regulations is included. A paper on the effect of the international crisis in the Eastern and Central Europe Region discovered that the prospect of survival was higher for the firm with more access to the finance (Clarke, Cull, & Kisunko, 2012). Access to finance is a significant factor in firm growth and the financial constraints can significantly lower the probability of firm survival (Musso & Schiavo, 2008; Saridakis, Mole, & Storey, 2008). Due to access to finance, the firms probably can deal with momentary shocks, hence this may play a significant role in firm survival during a crisis (King & Levine, 1993). The firm's financial access is controlled by including if the firm has a loan/line of credit and the dependence of the firm on loans to sponsor its working capital.

Additionally, innovative firms have a significant and positive probability of survival (Cefis & Marsili, 2006). The firms get benefit from the innovation premium and process innovation all have a distinct effect on firm survival (Cefis & Marsili, 2005) and the innovation in products also have a positive effect on firm survival (Audretsch & Mahmood, 1995; Fontana & Nesta, 2009). To capture the impact of process and product improvement the variables of the process and product improvement in previous years have been incorporated into the analysis. Adoption of technology is captured through a firm's digital presence, i.e., whether the firm has any website or not. Wagner (2021) using World Bank Enterprise data and a COVID-19 survey found that having a website had a significant role in firm survival. The advantages of the adoption of new technology may not be fully reaped if the employees don't have the right skills hence technology and human capital development are complementary to each other (Gal, Nicoletti, von Rueden, OECD, & Renault, 2019). To capture human development a variable "training to employees" have been included in the analysis.

5. Estimation Results

The following section provides a detailed analysis of the logistic regression results for our three main questions.

5.1. Labor Productivity and firm survival:

The results for the impact of labor productivity on firm survival are stated in table 5. The results indicate the statistically significant and negative effect of labor productivity on firm exit, which means that during COVID-19 restriction the cleansing of unproductive firms might be taking place. The results show that the estimated marginal effects of labor on survival are from 0.0907 – 0.222. In column 1 the results are stated for the permanent exit (measured as assumed exit). For an assumed measure of permanent exit, the results show that for a unit increase in the log productivity of labor the probability of the firm exit decreases by 0.09 percentage points. If we look at column 2 the measure of exit is confirmed exit, and the results show that one unit increase in the productivity of labor decreases the probability of exit by 0.22 percentage points. The results we have obtained are in line with the vast previous literature, that during times of crisis the process of creative destruction may be in action (Hopenhayn, 1992) (Jovanovic, 1982) & (Ericson & Pakes, 1995) and the high productive firms have higher chances of survival (Foster, Haltiwanger, & Syverson C., 2008), (Melitz & Ottaviano, 2008), (Aw, Chen, & Roberts, 2001) & (Farinas & Ruano, 2005).

Further, the results show that number of controls has a substantial effect on the firm survival and those are in line with the expected signs discussed before. Firstly, the age of the firm statistically significant effect on the firm survival in both specifications. A one-year increase in the age of the firm would decrease the likelihood of firm exit by 0.13- 0.29 percentage points. Our measure if a firm bought fixed assets like machinery, equipment, land, etc. which is a proxy for capital also shows a significant and negative impact on firm exit, which again shows that more productive firms have a greater likelihood of survival. The coefficient of foreign-owned firms shows that if a firm is foreign-owned the probability of exit increases by 0.15- 0.39 percentage points, which is significant statistically at the 10% level. Here Zaheer & Mosakowski's (1997) proposition of “foreign ownership liability” may be the reason, as due to COVID-19 the unanticipated policies and market events, the probability of foreign firms leaving the market may be higher than for domestic firms. The same results were found previously by Ferragina, Pittiglio, & Reganati (2014) & Wagner & Gelübcke (2012). The introduction of improved products before the start of the COVID-19 restrictions also had a negative impact on firm exit. If the firm has offered a new improved product before COVID-

19 the probability of the firm exiting decreases by 1.3-2.5 percentage points. Similarly, if the firm had a digital presence through a website before the COVID-19 the probability of the firm's exit decreases by 2.6-4.2 percentage points. Furthermore, the results in column 1 show that Top Managers' experience has a negative and statistically significant effect on firm exit i.e. if the Managers' experience goes up by 1 year the probability of firm exit decreases by 0.08 percentage points. This is because the experienced manager has greater knowledge and capabilities which can be of great use and help during such stressful times Schutjens & Wever (2000). In column 2, where the actual exit measure is used, the coefficient of firm size shows that if a firm is large the probability of firm exits decreases having a marginal effect of 0.295. Furthermore, the results also show that if a firm belongs to the Hospitality sector the probability of its exit is higher and more significant. That means the sector that is heavily reliant on direct contact and the physical presence of the employers and customers suffered the most. It could be because since in restaurants and hotels contact between people is inevitable, most governments imposed strict measures and policies on them, hence they suffered the most. The results also show that the presence of a female manager had a negative impact on survival, the results are similar to that of (Boden Jr & Nucci, 2000) (Fairlie & Robb, 2009) & (Mboko & Smith-Hunter, 2010). Lastly, the results in Column 2 show that if more time of senior management was spent on dealing with the regulations, it had a negative impact on firm survival, i.e., its probability to exit is high.

5.2. Effect of COVID-19 restrictions on Firm exit

Table 6 shows the outcomes of the approximation of the effect of the strictness of government measures on the firm's survival, the differential impact of these measures on various sectors along with our main specification variables in the section above. The results show that as the stringency index goes up by one unit the probability of exit increases by 0.45 percentage points for the assumed exit measure and by 0.60 percentage points when the exit is measured as confirmed exit, and both are significant at 1% significant level. The results show that as the government's strictness and policy measures that include workspace closure, school closure, etc. increased the probability of firm exit increases. This means that not necessarily only unproductive firms were forced to exit but also the strictness in measures impacted all the firms, but however, the impact is significantly high for unproductive firms. Looking at the interaction term of the sector to which the firm belongs with the stringency index shows that in the assumed exit measure the firms belonging to all the sectors i.e., hospitality, services, and

retail sector were more likely to exit the market when the stringency index goes up in comparison to the manufacturing sector. The co-efficient of the hospitality sector is high as compared to others i.e., if the firm is operating in the hospitality sector and the stringency index goes up by one unit the marginal effect on firm exit is 0.0163, followed by the retail sector (0.0112) and services sector (0.0110) respectively. The results are the same for the confirmed exit except it is insignificant for the retail sector and the coefficients are more pronounced. One interesting thing to note here is the coefficient on the new monthly cases, which shows that if cases increased the probability of a firm exiting the market goes down. It could be because the number of cases depends on the testing policy, if one country is testing proactively then the cases might turn out to be higher as compared to the one where COVID-19 testing was low. Furthermore, there is no consensus about the co-movement of COVID-19 cases and restrictions imposed by the Government. Furthermore, the restrictions imposed by the government do matter to control the cases but the behavior of individuals and how they respond to the policies matter as well i.e., the government imposed the policy of wearing masks and practicing social distancing but how beneficial it depends on how people adapt and react to such policies and restrictions. All other controls that were significant in our previous specification have the same signs and significance.

5.3. Effect on Exporting firms

Table 7 shows the differential impact of COVID-19 restrictions (stringency index) of home country and average of top 3 trading partners if a firm is an exporter on the survival of the firm. The results are not significant for the assumed measure of exit but all other results from the previous specification hold true. But when we look at column 2 where the confirmed exit status is used as a measure of exit, the estimate for the interaction of firm exporter and trading partner stringency index is negative and significant. This means that if a firm is an exporter and the average stringency index of the top three trading partners increases the probability of firm exit decreases by 0.3 percentage points. This could be as the strictness in trading partner countries went up, the more business closures and strict measures businesses faced, which could increase the demand of exported goods, hence home country exporting firms have an incentive to keep running the business and stay in the market.

5.4. Robustness Checks

For robustness checks only the assumed exit variable has been used in the following estimations:

5.4.1. Country Level Control Variables

For robustness of the results rather than using fixed effects (country dummy) certain country-level control variables like ease of doing business, log GDP per capita, percentage of people above the age of 65, exchange rate, and regulatory quality have been incorporated in our three models. All these variables are taken for the year 2015 as this data was available for all the countries in our model. Results in Table 9 show that our main results hold true. The results become more pronounced for worker productivity as the impact is around 0.1 in all three models at a 1% significance level. All other results for the stringency Index, firm age, Female manager, and the introduction of improved products are the same as in our baseline models. One thing to notice here is that the higher stringency index of exporting partner countries has a positive impact and significant effect on the assumed exit of the firm. But the differential impact on exporting and non-exporting firms is insignificant, hence nothing concrete can be determined from this.

5.4.2. Model Extension Using Cost of Capital

To control for stock rather than the purchase of capital, the cost of capital i.e., the log of cost of electricity and fuel is a proxy for capital employed in the process of manufacturing and providing services. The costs are deflated at USD 2015. The results are stated in table 8. The variable log of capital itself is statistically insignificant and all the results that were obtained in the baseline model are the same in this specification.

6. Conclusion

The economic theory suggests that a crisis forces unproductive firms to exit the market, which may result in the resource reallocation of resources resulting in higher sector productivity. However, statistically, the evidence is still scarce. COVID-19 crisis resulted in several restrictions in countries including lockdowns which impacted the daily lives of people and the economies. As this crisis is quite recent, the long-term impact on economies and businesses is still unknown. The paper investigated COVID-19 restrictions' effect on the private sector firms from 20 countries. The data was taken from the Enterprise Survey and COVID-19 survey from the World Bank, where the same firms were surveyed before and after the crisis. This paper focused on the data that was collected in 2021 to gauge the medium to long-term effect of the COVID-19 restrictions and the steps taken by governments to contain the disease on firms. The results show that higher productivity is associated with the probability of firm survival. Due to these restrictions, firms with low

labor productivity had to exit the market. The strictness in restrictions also resulted in firm exit, and the effect of the restrictions is higher for the hospitality sector followed by the retail sector and then other sectors. The hospitality sector suffered the most because of the travel restrictions, and closure of restaurants, hotels, and other entertainment and tourist spots. Furthermore, the outcomes also suggest that the age of the firm, Managers' experience in the relevant sector, investment in innovation of products, and having an online presence through a website can help in firm survival. However, no statistically significant differential impact of exporting vs non-exporting firms on firm exit has been found.

This paper has various contributions. Firstly, it highlights the destruction as a result of COVID-19 restrictions to businesses around the globe and the sectors it impacted the most. This can be helpful for government organizations whose business sectors were impacted the most because of COVID-19 restrictions and to design targeted policies for sectors to revive them. Secondly, this paper highlights the differential characteristics of the firms that survived these restrictions. This has implications for business owners and organizations that invest in research and development, having an online business presence where they can reach their customers in times of crisis, and adapting to the changing environment can help in the survival of businesses. This paper also highlights that if the business regulations and policies implemented by the government are complicated and strict, the managers would have to spend more time dealing with them, which could result in a firm exit as the focus will be on dealing with the regulations. Hence the government should form business-friendly policies that can promote productivity and flourish the business environment.

The analysis underlined the damaging effect of COVID-19 restrictions on firms in various sectors. However, further research is needed to answer the question of the reallocation of resources and if it resulted in Schumpeterian creative destruction. Moreover, exhausting firm-level data of exporting firms and the country the firm is exporting to can help in further exploring the effect of COVID-19 restrictions on exporting firms' dynamics. Lastly, it is interesting to explore the after-effects of the COVID-19 restrictions; how the business dynamics and environment have changed after the restrictions, whether there is any increase or decrease in the business sector productivity, and how businesses have changed their business models, and strategies to cope up with the COVID-19 shock.

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Appendix:

Table 1

Country Name	Obs	ES Baseline	COV-ES Round	COV-ES Round2	COV-ES Round3
Bulgaria	772	Mar/20	Jan/00	Dec/20	May/21
Croatia	404	Nov/19	Sept/20	Jan/21	Jun/21
Cyprus	240	Jul/19	Jun/20	Dec/20	Apr/21
Czech Republic	502	Mar/20	Oct/20	Feb/21	Jun/21
Estonia	360	Jan/20	Oct/20	Feb/21	Aug/21
Georgia	581	Jan/20	Jun/20	Nov/20	Oct/21
Greece	600	Jul/19	Jun/20	Nov/20	May/21
Hungary	805	Mar/20	Sept/20	Feb/21	June/21
Italy	760	Jul/19	Jun/20	Dec/20	May/21
Jordan	601	Nov/19	Aug/20	Jan/21	July/21
Latvia	359	Jan/20	Sept/20	Feb/21	Aug/21
Lithuania	358	Jan/20	Oct/20	Feb/21	Aug/21
Malta	242	Sept/21	Sept/20	Feb/21	Jun/21
Moldova	360	Nov/19	May/20	Nov/20	Jun/21
Morocco	1,096	Jan/20	Aug/20	Feb/21	Jun/21
North Macedonia	360	Oct/19	Nov/20	Jun/20	Dec/21
Poland	1,369	Dec/19	Aug/20	Dec/20	Jun/21
Portugal	1,062	Jan/20	Oct/20	Feb/21	Jun/21
Romania	814	Jun/20	Sept/20	Dec/20	Jun/21
Slovak Republic	429	Feb/20	Oct/20	Feb/21	Jun/21
Zambia	601	Mar/20	Feb/20	Feb/21	Sep/21
Total	12,675				

Table 2: Description of Variables

Variable	Description	Variable Source
Firm Exit	A dummy variable equals 1 if firm shut down its business permanently after COVID-19 and zero otherwise	World Banks COVID-ES survey
Stringency Index	A measure of government policy response to COVID-19 of firm's respective country, ranging from 1-100, 100 being the strictest	Oxford COVID-19 Government Response Tracker https://doi.org/10.1038/s41562-021-01079-8
Trading Partner Stringency Index	Average of the stringency Index of the firm's respective country's top three trading partners	Oxford COVID-19 Government Response Tracker https://doi.org/10.1038/s41562-021-01079-8
Log of new Monthly COVID Cases	Log of respective firm's country of the total of new monthly cases	Oxford COVID-19 Government Response Tracker https://doi.org/10.1038/s41562-021-01079-8
Labor Productivity (log in USD 2015)	Log of total sales (USD 2015) divided by total number of permanent employees	World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Log Age of Firm	Log of the number of years firms started its operations	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Log of Firm Size	Log of the total number of permanent employees of the firm	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Sector of Firm	A dummy variable equal 1 for each sector (manufacturing, retails services, hotels & restaurants, construction, Computer and related activities, Transport, storage, and communications) Sectors are identified based on ISIC codes of sectors in which firm is operating	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Bought Fixed Assets	A proxy for capital. Equals 1 if firm bought machinery, land, equipment, building before the ES survey and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Part of multi-level establishments	Equals 1 if firm is a member of firm that is composed of more than one firm and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Exporter	Equals 1 if firm exports more than 10% of it's sales directly or 0 otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Foreign ownership	Equals 1 if at-least 10% is foreign owned and zero otherwise.	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Top Manager female	Equals 1 if top manager is female zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Top Manager experience in sector	Years of experience of the top manager in the sector firm is operating	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Electrical Outages	Proxy for infrastructure. Equals 1 if the firm experienced any electrical outages before the year of baseline survey and zero otherwise.	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Website	Equals 1 if firm has it's own website zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org

Time spent on dealing with regulations	Proxy for regulations. Equals 1 if the top management spent any time on dealing with government regulations year before ES survey and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Improved Products	Equals 1 if the firm introduced any improved product or services during three years before the baseline survey, and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Firm offers training	Equals 1 if the firm offers training to it's permanent, full-time employees and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Firms using banks to finance working capital	Proxy for access to finance. Equals 1 if firm is using any bank services to finance working capital and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Firm with a bank loan/line of credit	Proxy for access to finance. Equals 1 if bank has any loan or line of credit and zero otherwise.	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
R&D	Equals 1 if the firm spent on R&D during three years prior to the baseline survey zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org
Introduced New Process	Equals 1 if the firm introduced any significantly improved process during three years prior to baseline survey and zero otherwise	Source: World Bank Enterprise Surveys, http://www.enterprisesurveys.org

Table 3: Summary Statistics

Summary Statistics of Main Variables					
Variable	Obs	Mean	Std. dev.	Min	Max
Assumedexit (Y:1 , N:0)	12,675	.2194872	.4139155	0	1
Stringency Index (low=1- high=100)	12,325	57.13069	14.23655	0	93.52
log New Cases (New Monthly cases)	12,482	9.83184	1.726075	0	13.35042
log of Labor Productivity (USD)	11,229	10.68858	1.444921	3.243169	18.06878
log Size	12,658	3.274262	1.356123	0	8.987197
log Age (No. of years operations started)	12,673	2.892954	.9195779	0	7.615298
Manufacturing (Y:1, N:0)	12,487	.5220629	.499533	0	1
Retails services (Y:1, N:0)	12,487	.1821895	.3860161	0	1
Other services (Y:1, N:0)	12,487	.1403059	.3473181	0	1
Hotels and Restaurants (Y:1, N:0)	12,487	.0555778	.2291138	0	1
Top Manager female (Y:1, N:0)	12,675	.1753057	.3802434	0	1
Top Manager experience in sector (No. of years)	12,243	21.47505	11.6332	1	60
Part of multi-level establishments (Y:1, N:0)	12,658	.1368305	.3436819	0	1
Bought Fixed Assets (Y:1, N:0)	12,683	.4222976	.4939449	0	1
Firmexporter (Y:1, N:0)	12,418	.2474634	.4315556	0	1
Foreign Ownership (Y:1, N:0)	12,401	.1120877	.3154871	0	1
Electric Outages (Y:1, N:0)	12,675	.3196055	.4663421	0	1
Website (Y:1, N:0)	12,675	.6646154	.4721434	0	1
Time spent on dealing with regulations (Y:1, N:0)	10,836	.6264304	.4837737	0	1
Improved Products (Y:1, N:0)	12,673	.2561351	.4365145	0	1
Firm offers training (Y:1, N:0)	12,672	.3489583	.4766596	0	1
Firms using banks to finance working capital (Y:1, N:0)	12,673	.3303085	.4703427	0	1
Firm with a bank loan/line of credit (Y:1, N:0)	12,672	.4071181	.4913166	0	1
Investment in R&D (Y:1, N:0)	11,644	.1739952	.3791216	0	1

Table 4: Country wise Assumed Exit

Country	Assumed exit		Total
	0	1	
Bulgaria	596	176	772
Croatia	372	32	404
Cyprus	220	20	240
Czech Republic	475	27	502
Estonia	276	84	360
Georgia	448	133	581
Greece	584	16	600
Hungary	702	103	805
Italy	609	151	60
Jordan	368	233	601
Latvia	184	175	359
Lithuania	233	125	358
Malta	222	20	242
Moldova	246	114	360
Morocco	774	322	1,096
North Macedonia	202	158	360
Poland	983	386	1,369
Portugal	915	147	1,062
Romania	600	214	814
Slovak Republic	355	74	429
Zambia	529	72	601
Total	9,893	2,782	12,675

Table 5: Baseline results for the effect of Productivity on Exit

VARIABLES	(1) Permanent Exit (Assumed measure)	(2) Permanent Exit (Confirmed Measure)
Log Sales Per Worker (USD)	-0.0907*** (0.0230)	-0.222*** (0.0423)
log Size	-0.00174 (0.0263)	-0.295*** (0.0630)
log Age	-0.132*** (0.0437)	-0.295*** (0.0950)
Hotels and Restaurant	0.205 (0.141)	0.551** (0.233)
Manufacturing	-0.130 (0.0972)	-0.135 (0.187)
Retail	-0.0863 (0.106)	-0.227 (0.206)
Other Services	0.0851 (0.110)	0.111 (0.214)
Top Manager Female	0.0962 (0.0716)	0.457*** (0.136)
Top Manager Experience Years	-0.00898*** (0.00282)	-0.00362 (0.00607)
Part of Multi Establishment Firm	0.0775 (0.0920)	-0.171 (0.223)
Firm buying fixed asset	-0.184*** (0.0663)	-0.250* (0.134)
Firm Exporter	-0.0976 (0.0754)	-0.138 (0.177)
Foreign Ownership	0.159* (0.0954)	0.398* (0.210)
Electric Outages	-0.0228 (0.0636)	0.0244 (0.127)
Website	-0.261*** (0.0615)	-0.428*** (0.120)
Time Spent on Regulations	-0.00776 (0.0654)	0.222* (0.130)
Improved products	-0.133* (0.0691)	-0.250* (0.149)
Formal training	-0.101 (0.0637)	-0.114 (0.132)
Bank finance Working Capital	-0.00874 (0.0719)	0.0167 (0.143)
Bank loan or line of credit	-0.0172 (0.0724)	-0.226 (0.149)
Country FE	Yes	Yes
Constant	0.606** (0.293)	1.886*** (0.531)
Observations	9,295	6,561

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

Table 6: Differential effects of COVID-19 restrictions on various Sectors

VARIABLES	(1) Assumed Exit	(2) Permanent Exit
Log Sales Per Worker (USD)	-0.0927*** (0.0240)	-0.195*** (0.0439)
Stringency Index	0.0454*** (0.00680)	0.0609*** (0.0162)
log New Cases	-0.373*** (0.0390)	-0.851*** (0.0934)
log Size	0.00306 (0.0273)	-0.291*** (0.0657)
log Age	-0.148*** (0.0442)	-0.300*** (0.0872)
SI * Hospitality Sector	0.0163* (0.00872)	0.0256* (0.0140)
SI* Retail Sector	0.0112** (0.00476)	0.00178 (0.00997)
SI* Other Services	0.0110* (0.00590)	0.0193* (0.0103)
SI * Manufacturing Sector	-	-
Hotels and Restaurants	0.0212 (0.510)	-0.552 (0.810)
Manufacturing	0.516* (0.290)	-0.0779 (0.575)
Retail	-0.0668 (0.110)	-0.228 (0.220)
Other Services	0.116 (0.357)	-0.922 (0.637)
Top Manager Female	0.0790 (0.0747)	0.542*** (0.147)
Top Manager Experience in Years	-0.00770*** (0.00290)	-7.41e-05 (0.00619)
Part of Multi-Establishment Firm	0.0810 (0.0927)	-0.211 (0.217)
Firm buying fixed asset	-0.176** (0.0685)	-0.179 (0.139)
Firm Exporter	-0.0998 (0.0789)	-0.0211 (0.194)
Foreign Ownership	0.143 (0.0995)	0.428* (0.222)
Electric Outages	-0.0365 (0.0662)	-0.0273 (0.133)
website	-0.267*** (0.0636)	-0.425*** (0.127)
Time Spent on Regulations	-0.00159 (0.0677)	0.131 (0.139)
Improved products	-0.133* (0.0715)	-0.140 (0.155)
Formal training of Employees	-0.0734 (0.0659)	-0.0207 (0.140)
Bank finance Working Capital	-0.0250 (0.0740)	-0.0556 (0.155)
Bank loan or line of credit	0.0210 (0.0740)	-0.132 (0.158)
Country FE	YES	YES
Constant	1.589*** (0.434)	6.566*** (0.786)
Observations	9,020	6,406

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

**North Macedonia dropped out because of the unavailability of the stringency index.

***SI* Manufacturing dropped out because of collinearity

Table 7 Differential effect of COVID strictness measures on Exporter or Non-exporter firms

VARIABLES	(1) Assumed Exit	(2) Permanent Exit
Log Sales Per Worker (USD)	-0.0909*** (0.0243)	-0.193*** (0.0441)
Firm exporter	0.0586 (0.424)	2.403** (1.174)
Firm Exporter* Home SI	-0.00121 (0.00529)	-0.0155 (0.0127)
Stringency Index	0.0664*** (0.00846)	0.0786*** (0.0191)
Firm Exporter * Exporting Partner SI	-0.00157 (0.00619)	-0.0316** (0.0160)
Exporting Partner SI	-0.0103 (0.0112)	-0.00459 (0.0326)
log new cases Partner	0.346*** (0.0693)	0.0512 (0.123)
log new cases	-0.188*** (0.0547)	-0.744*** (0.101)
log Size	-0.00996 (0.0273)	-0.302*** (0.0678)
log Age	-0.138*** (0.0455)	-0.288*** (0.0894)
Hotels and Restaurant	0.286* (0.147)	0.724*** (0.245)
Manufacturing	-0.121 (0.102)	-0.158 (0.202)
Retail	-0.0827 (0.111)	-0.194 (0.224)
Other Services	0.0824 (0.114)	0.0459 (0.226)
Top Manager Female	0.0735 (0.0757)	0.547*** (0.147)
Top Manager Experience in Years	-0.00814*** (0.00294)	0.000446 (0.00639)
Part of Multi Established Firm	0.0557 (0.0932)	-0.310 (0.239)
firm buying fixed asset	-0.168** (0.0685)	-0.171 (0.144)
Foreign Ownership	0.179* (0.0992)	0.461** (0.231)
Electric Outages	-0.0246 (0.0659)	-0.0268 (0.136)
Website	-0.249*** (0.0646)	-0.399*** (0.130)
Time Spent on Regulations	-0.00547 (0.0686)	0.128 (0.141)
improved products	-0.114 (0.0723)	-0.109 (0.158)
formal training	-0.0685 (0.0661)	-0.0243 (0.142)
Bank finance Working Capital	-0.0441 (0.0746)	-0.0686 (0.159)
Bank loan or line of credit	0.0421 (0.0747)	-0.117 (0.163)
Country FE	YES	YES
Constant	-4.488*** (1.172)	4.227*** (1.401)
Observations	8,962	6,216

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

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Robustness Check

Table 8 Including Cost of Capital (Assumed Exit)

VARIABLES	(1) model 1	(2) model 2	(3) model 3
Log Sales Per Worker (USD)	-0.0561** (0.0279)	-0.0619** (0.0298)	-0.0526* (0.0303)
log Cost of Capital	-0.0318 (0.0234)	-0.0353 (0.0242)	-0.0392 (0.0250)
Stringency Index		0.0579*** (0.00769)	0.0975*** (0.0100)
Log New Cases (Monthly)		-0.422*** (0.0468)	-0.165** (0.0680)
Firm Exporter * Home SI			-0.00432 (0.00559)
Firm Exporter * exporting partners SI			0.00155 (0.00650)
Exporting Partners SI			-0.0408*** (0.0122)
Log New cases Partner (Monthly)			0.466*** (0.0844)
Log Size	0.0544 (0.0335)	0.0612* (0.0348)	0.0475 (0.0357)
log Age	-0.154*** (0.0463)	-0.173*** (0.0496)	-0.169*** (0.0505)
SI * Hospitality Sector		0.0169* (0.00948)	
SI* Retail Sector		0.0130** (0.00524)	
SI* Other services		0.0109* (0.00647)	
Hotels and Restaurants	0.264* (0.153)	0.198 (0.565)	0.435*** (0.163)
Manufacturing	-0.134 (0.104)	0.642** (0.324)	-0.0978 (0.111)
Retail	-0.0620 (0.113)	-0.0318 (0.119)	-0.0454 (0.121)
other services	0.116 (0.118)	0.277 (0.400)	0.135 (0.125)
Top Manager Female	0.156** (0.0770)	0.129 (0.0808)	0.128 (0.0831)
Top Manager Experience in Years	-0.00716** (0.00296)	-0.00580* (0.00308)	-0.00612* (0.00316)
Part of Multi Established Firm	0.0876 (0.0972)	0.103 (0.0979)	0.0631 (0.0983)
firm buying fixed asset	-0.191*** (0.0720)	-0.197*** (0.0746)	-0.184** (0.0750)
Firm exporter	-0.0561 (0.0800)	-0.0685 (0.0843)	0.112 (0.446)
Foreign Ownership	0.123 (0.104)	0.119 (0.109)	0.170 (0.109)
Electric Outages	-0.0163	-0.0103	0.00746

	(0.0673)	(0.0704)	(0.0706)
Website	-0.248***	-0.249***	-0.222***
	(0.0671)	(0.0699)	(0.0719)
Time Spent on Regulations	0.0267	0.0400	0.0344
	(0.0711)	(0.0738)	(0.0753)
Improved products	-0.147**	-0.143*	-0.128
	(0.0747)	(0.0773)	(0.0795)
Formal Training	-0.103	-0.0675	-0.0683
	(0.0676)	(0.0702)	(0.0709)
Bank finance Working Capital	-0.00278	-0.0219	-0.0521
	(0.0763)	(0.0781)	(0.0790)
bank loan or line of credit	-0.0273	0.0217	0.0553
	(0.0768)	(0.0781)	(0.0792)
Constant	0.431	1.261**	-6.233***
	(0.332)	(0.521)	(1.451)
Country FE	Yes	Yes	Yes
Observations	8,083	7,832	7,780

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
 **North Macedonia dropped out because of the unavailability of the stringency index.
 ***SI* Manufacturing dropped out because of collinearity

Table 9: Including Country level control variables

VARIABLES	(1) Assumed Exit (Model 1)	(2) Assumed Exit (Model 2)	(3) Assumed Exit (Model 3)
Log Sales Per Worker USD	-0.101*** (0.0219)	-0.103*** (0.0230)	-0.114*** (0.0232)
Stringency Index		0.0132*** (0.00371)	0.00899** (0.00360)
log new cases		-0.215*** (0.0204)	-0.185*** (0.0249)
log Size	0.00580 (0.0257)	0.0167 (0.0268)	-0.00310 (0.0273)
In Age	-0.110*** (0.0407)	-0.143*** (0.0411)	-0.108*** (0.0416)
SI* Hospitality Sector		0.0167** (0.00828)	
SI* Retail Sector		0.0102** (0.00448)	
SI*Other Services		0.00865 (0.00550)	
Firm Exporter * Home SI			-0.00397 (0.00503)
Export* exporting partner SI			-0.00915 (0.00649)
Exporting Partner SI			0.0108*** (0.00374)
log new cases Partner			0.355*** (0.0345)
Hospitality Sector	0.0586 (0.137)	-0.213 (0.485)	0.0998 (0.144)
Manufacturing	-0.0573 (0.0943)	0.550** (0.271)	-0.0533 (0.0992)
Retail	-0.0577 (0.103)	-0.0624 (0.107)	-0.0460 (0.109)
Other Services	0.174 (0.107)	0.295 (0.331)	0.169 (0.112)
Top Manager Female	0.156** (0.0689)	0.167** (0.0713)	0.207*** (0.0729)
Top Manager Exp in Years	-0.0120*** (0.00266)	-0.0137*** (0.00275)	-0.0125*** (0.00277)
Part of Multi Est Firm	-0.0150 (0.0867)	0.00394 (0.0885)	0.00330 (0.0903)
Firm Buying Fixed Asset	-0.179*** (0.0625)	-0.187*** (0.0650)	-0.143** (0.0674)
Firm Exporter	-0.0957 (0.0730)	-0.102 (0.0759)	0.602 (0.435)
Foreign Ownership	0.0586 (0.0918)	0.0506 (0.0954)	0.148 (0.0979)
Electric Outages	-0.0569 (0.0607)	-0.0105 (0.0631)	-0.0124 (0.0646)
Website	-0.266*** (0.0599)	-0.284*** (0.0619)	-0.257*** (0.0634)
Time Spent on Regulations	-0.0835 (0.0599)	-0.121* (0.0633)	0.0230 (0.0673)
Improved Products	-0.111* (0.0648)	-0.137** (0.0678)	-0.102 (0.0695)
Formal Training	-0.0524 (0.0606)	-0.0927 (0.0635)	-0.0589 (0.0645)
Bank finance Working Capital	0.0706 (0.0695)	0.0324 (0.0715)	-0.0106 (0.0731)
Bank loan or line of credit	-0.0722 (0.0698)	-0.0591 (0.0711)	-0.0185 (0.0734)

log GDP (2015)	0.514*** (0.0638)	0.484*** (0.0600)	0.506*** (0.0574)
Exchange rate (2015)	-0.00154*** (0.000445)	-0.00226*** (0.000496)	-0.00116** (0.000525)
Ease of doing business (2015)	0.128*** (0.0109)	0.128*** (0.0109)	0.160*** (0.0119)
Percent of age>65 (2015)	-0.00728 (0.0103)	-0.00302 (0.0104)	-0.0241** (0.0100)
Regulatory Quality	-0.0424*** (0.00598)	-0.0356*** (0.00593)	-0.0409*** (0.00593)
Constant	-10.46*** (0.909)	-9.788*** (0.966)	-15.98*** (1.132)
Country FE	YES	YES	YES
Observations	9,295	9,021	8,962

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
 **North Macedonia dropped out because of the unavailability of the stringency index.
 ***SIxManufacturing dropped out because of collinearity

