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Modelling economic policy issues

Credit constraints and the severity of COVID-19 impact: Empirical evidence from enterprise surveys

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ABSTRACT

The COVID-19 pandemic decreases firm revenue and raises the demand for liquidity, resulting in increased financial stress for firms throughout the world. In attempts to mitigate the impact of the COVID-19 crisis, governments have established a range of credit programs to provide credit to firms with poor liquidity. However, the efficacy of those relief programs has been low, and the relief funds do not reach the businesses most in need of liquidity injection, indicating a need to identify firms that are the most vulnerable during the crisis. We first combine the standard Enterprises Surveys and the follow-up surveys on the economic consequences of the COVID-19 pandemic. The sample firms are used to test how credit constraint conditions and firm characteristics affect the severity of the COVID-19 impact on firm performance. Our empirical results indicate that small firms and firms with limited access to finance are more likely to be severely affected by the crisis. Firms with foreign ownership and that are located in small cities are less at-risk. Compared to the 2008 Global Financial Crisis, COVID-19 less severely affects credit-constrained firms and foreign-owned firms and more severely affects small and medium-sized enterprises (SMEs).

1. Introduction

The COVID-19 pandemic has been found to affect the economy and financial markets through its impacts on consumption, supply-side disruptions, financial markets, and their spillover effects on the real economy (Brodeur et al., 2020; Coibion et al., 2020). Economic inactivity and the negative impacts on supply chains and employment directly affect firms' operational and financial performance. Revenue uncertainty, accompanied by financial commitments to suppliers, employees, and lenders, has significantly raised the demand for liquidity, indicating financial stress. As stated by Dua et al. (2020), firms with limited financial resources are more vulnerable during the pandemic. Small and medium-sized enterprises (SMEs) generally have lower liquidity than large firms due to their constrained access to external financing (Zhang, 2022), which may decrease the survival rate of SMEs during large crises such as the COVID-19 pandemic (Gourinchas et al., 2020; Greenwood et al., 2020; Li, 2020). SMEs play a crucial role in job creation and economic growth in both developed countries (Gourinchas et al., 2020) and developing countries (Nguyen et al., 2019), indicating an urgent need for policy interventions.

Governments worldwide have initiated various support funds to provide credit to non-financial firms, which are expected to mitigate the negative economic impacts of the COVID-19 pandemic on firms' liquidity shortage and insolvency

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risk (Hanson et al., 2020). For example, the U.S. has implemented several relief programs for all firms, focusing on small businesses (Fleming et al., 2020); (Gourinchas et al., 2020; Li, 2020). The EU's long-term budget included a total of 1.8 trillion euros to boost the recovery from the COVID-19 pandemic (https://ec.europa.eu). However, some of these relief programs have not been very effective, and the relief funds did not reach the businesses in the most severe need of liquidity (Li, 2020). According to Gourinchas et al. (2020), the fiscal costs of narrowly targeted subsidies are much lower than the cost of non-targeted subsidies. Therefore, identifying firms that are the most vulnerable during the COVID-19 pandemic is a precondition for effective relief programs. However, few empirical studies have investigated the economic consequences of COVID-19 using firm-level data.

Improved understanding of the consequences of earlier crises such as the Global Financial Crisis (GFC) and related relief programs may lead to more effective responses to the current COVID-19 crisis. The reasons that caused the two crises are completely different, resulting in their different impacts on financial markets and businesses (Shehzad et al., 2020). In addition, government support programs are different in the two crises (Didier et al., 2021). As such, a comparative study identifying at-risk firms during the COVID-19 and GFC crises can provide useful policy implications for designing economic measures in response to the COVID-19 crisis.

The purpose of this study is to investigate whether firms' credit constraint conditions, firm size, ownership, firm age, and location can be used to identify vulnerable firms during the COVID-19 pandemic. The empirical results reveal the types of firms that are the most vulnerable during the COVID-19 pandemic, which provides practical implications for policymakers to design efficient targeted interventions. The firm-level data are collected by the World Bank Enterprise Surveys for 17 Central- and Eastern–European and Central Asian countries. While data on firms' access to finance is obtained from the 2019 standard Enterprise Surveys, the economic consequences of the pandemic were the main focus of the follow-up surveys conducted during the second half of 2020. We used the number of months for firms to return to their normal sales to measure the severity of the COVID-19 impact. Credit constraint conditions are based on the survey question about whether access to finance affects firms' daily operations. In general, firms turn to banks for financing during a crisis (Li et al., 2020).[1] Accordingly, we also identify financially constrained firms according to loan applications and their outcomes. Additionally, we compared economic consequence determinants between that of COVID-19 and the FGC.

This study contributes to the literature in several ways. First, this study is based on firm-level data and explores how credit constraint conditions affect the consequences of COVID-19. While existing literature has widely discussed crisis-induced liquidity stress, few studies have provided empirical evidence. Second, this study adds to the literature of cross-country studies on the consequences of the pandemic. Our sample firms are from 17 countries with different levels of economic development. The empirical results are obtained after controlling for the country and sector effects. Third, this study contributes to the literature on comparing the consequences of COVID-19 and the GFC. Using similar measures of firms' losses as a result of the two crises, we compare the differences in the impacts of financial status on the economic consequences of the ongoing and the previous crises. Above all, our empirical results shed light on identifying at-risk firms during the pandemic, which is directly applicable for policymakers when designing narrowly targeted and efficient government support programs.

The rest of this paper is organized as follows. Following a literature review and hypothesis development in Section 3, Section 4 discusses the consequences of the pandemic and government support programs. Section 5 presents the data, variables, and methodology. Section 5 discusses the empirical results. Section 6 compares the estimation results for the COVID-19 and GFC models, followed by the conclusion in Section 7.

2. Literature review

In this section, we review studies on the economic consequences of COVID-19 on business firms, their liquidity demand and credit constraints, and comparisons of the effects of COVID-19 and GFC. From the literature reviewed, we derive the hypotheses tested in this study.

The literature on the economic consequences of the COVID-19 pandemic has been growing since its outbreak in early 2020. Brodeur et al. (2020) review the literature on the economic and financial impact of COVID-19 and government prevention measures in response to the pandemic. They point out the direct impact of COVID-19 resulting from the reduced consumption of goods and services and supply-side disruptions as well as the indirect impact working through the financial and credit markets and their spillover effects on the real economy. Nicola et al. (2020) review the socio-economic implications of COVID-19 on primary, secondary, and tertiary sectors. For the manufacturing industry, the disruption to the global supply chain and staffing deficiencies due to government interventions are the key concerns for businesses. The economic consequences of COVID-19 are further interdependent on the whole of social and political impacts (Tisdell, 2020), indicating an urgent need to derive clear implications for empirical studies.

Most empirical studies are conducted to reveal the impacts of COVID-19 on financial markets due to data availability. For example, Anh and Gan (2020) document the negative impact of the number of COVID-19 confirmed cases on daily stock returns in Vietnam. Although the impact of COVID-19 on firm profitability and revenues is well observed, empirical studies are scant due to the lack of timely and granular data on firm performance during COVID-19. Tisdell (2020) proposes

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[1] Between 11 March and 1 April 2020, commercial and industrial loans on American banks' balance sheets increased by $482 billion.

a theoretical model to evaluate the social choice with regard to trade-offs between COVID-19 restrictions and the level of economic activity. Based on historical data, Greenwood et al. (2020) find that small businesses rely heavily on bank debt and loans from shareholders, which may trigger financial distress for those firms during the pandemic. Using data from 2017, Kroeger et al. (2020) assess the baseline corporate vulnerability of Vietnam's firms prior to the crisis, from which the simulation analysis is conducted to evaluate the financial fragility of these firms during the pandemic. Li (2020) uses survey data and evaluates how government support and loan forgiveness affect the severity of the impact of COVID-19 on industrial sectors. The current study is motivated by the lack of empirical evidence in the literature regarding the direct impact of COVID-19 on firm performance.

Since the pandemic raises demand for liquidity due to less active operation and revenue uncertainty, firms with access to credit may be less affected by COVID-19. In other words, firms constrained by poor access to credit prior to the pandemic are probably more vulnerable. In addition to formal financing sources, informal credit markets may alleviate financial stress, especially for SMEs in developing countries (Archer et al., 2020). Researchers further confirm that financial leverage is one of the factors affecting the likelihood of either credit constraints or demand for credit (Nguyen et al., 2019). Credit constraints further affect cost of capital (Rand, 2007), innovations (Gorodnichenko and Schnitzer, 2013; Zhang, 2021), exports (Jinjarak and Wignaraja, 2016), capacity utilization and labor productivity (Rodríguez-Pose et al., 2021; Zhang, 2022), and environmental practices (Tian and Lin, 2019; Zhang and Xie, 2021). As such, the testable hypothesis is that firms constrained by access to credit are more severely affected by the COVID-19 pandemic. In addition to fitting the gap in the literature, our study supplements the previous studies and can be used to further reveal how the pandemic affects firms' operational and financial performance.

The COVID-19 impact on firm revenues was comparable to that of the GFC (Greenwood et al., 2020). In financial markets, researchers compare the impacts of COVID-19 and the GFC and found that the impact of these crises varies across markets (Shehzad et al., 2020). At the employee level, both crises have affected low-income groups more severely than their richer counterparts; however, COVID-19 has shown a stronger distributional impact than the GFC for the most vulnerable group in terms of wage levels (Shibata, 2020). Regarding the support fund programs, the severe economic consequences of COVID-19 have forced governments to take quick and aggressive actions, including in the U.S. as well as other countries (Bhar and Malliaris, 2021; Hanson et al., 2020; Makin and Layton, 2021). According to the calculation for the selected emergent markets and developed countries by Didier et al. (2021), the growth of commercial credit for up to four months after the outbreak of the COVID-19 has substantially increased, whereas the corresponding value during the GFC and other previous crises fell. Accordingly, the testable hypothesis is that the economic consequences of COVID-19 and GFC may differ from each other.

3. Background

Since its outbreak at the end of 2019, the COVID-19 virus has spread to the entire world and has led to deep concerns and uncertainty for families, firms, communities, and society at large. According to the World Health Organization, there were 114,467,303 confirmed cases of COVID-19 globally, including 2,520,550 deaths by the end of February 2021; the corresponding numbers for the European region were 38,674,452 and 861,803, respectively. The COVID-19 pandemic has led to a dramatic slowdown in the global economy due to government interventions such as social distancing, mobility restrictions, cessation of tourism, reduction of transport services, and lockdowns. Meanwhile, various economic measures were implemented by governments worldwide in attempts to alleviate the negative economic consequences of the crisis.

Government interventions to limit the spread of the virus and ensure the provision of medical equipment varied substantially across countries in terms of the types of measures adopted and the speed at which they have been implemented (Plümper and Neumayer, 2022). According to Qiu et al. (2020), in the beginning, government interventions focused on mitigation, which proved ineffective in stopping the virus; later, more stringent measures such as city lockdowns and mandatory quarantines were adopted. In Europe, Italy was the first country that imposed restrictive anti-coronavirus measures in March 2020. At the end of March, Russia also went into lockdown. Plümper and Neumayer (2022) illustrate the timeliness of the lockdowns and the accumulated infections for European countries. Both Italy and Russia took stringent intervention measures when the cumulative infection cases were relatively high. On the other hand, lockdown measures were implemented with low or intermediate levels of infections in some European countries such as Albania, the Czech Republic, Hungary, and Romania.

There have generally been four types of economic measures used to mitigate the effects of the COVID-19 and support jobs, businesses, and the economy, namely monetary policy, macro-prudential regulation, fiscal policy, and policy coordination (Padhan and Prabheesh, 2021). In terms of monetary policy measures, a range of business-lending and corporate-bond purchase programs were introduced to provide credit to non-financial firms (Hanson et al., 2020). Additionally, fiscal policy responses were conducted through tax relief and by providing grants to firms (Makin and Layton, 2021). On 23 April 2020, the European Union (EU) endorsed a 540 billion euros package to provide support to mitigate unemployment risks in emergency (SURE), guarantee funds for loans to companies, and pandemic crisis support for member states. In December 2020, the EU leaders approved the recovery plan for Europe, the largest stimulus package ever, with a total of 1.8 trillion euros to help rebuild a post-COVID-19 Europe (https://ec.europa.eu). Among non-EU countries in Europe, Russia provided 15 billion rubles for loan guarantees and subsidized interest for SMEs' working capital and investments (https://www.imf.org). See Table A.3 in the Appendix for the list of economic measures implemented by the selected sample countries.

Table 1
Sample distribution, by country.

Country	Obs.	In %	Survey conducted in month 2020
Albania	335	4.1%	June
Belarus	522	6.4%	August
Bulgaria	508	6.2%	July/August
Croatia	335	4.1%	September
Czech Republic	376	4.6%	September/October
Georgia	463	5.7%	October/November
Greece	524	6.4%	June/July
Hungary	606	7.4%	September
Italy	395	4.8%	May/June
Moldova	271	3.3%	October/November
Mongolia	281	3.4%	August
Morocco	665	8.1%	July/August
North Macedonia	284	3.5%	October/November
Poland	919	11.2%	July/August
Romania	499	6.1%	August/September
Russian Federation	1091	13.3%	June
Slovenia	118	1.4%	July/August
All countries	8192	100.0%	

4. Data, variables, and model

In this study, we use firm-level data collected by the World Bank Enterprise Surveys to measure the severity of the COVID-19 impact and identify financially constrained firms. After presenting the data, this section describes the econometric models, which are used to estimate whether the COVID-19 impacts depend on credit constraint conditions, among other potential determinants.

4.1. Data

For countries in Central and Eastern Europe and Central Asia, the standard survey data collected by the World Bank Enterprise Surveys in 2019 and 2020 covered private firms in the service and manufacturing sectors (Enterprise Surveys, 2020). These standard surveys employ a stratified-sampling methodology for the dimensions of region, sector, and firm size to ensure good representativeness of the survey data. The follow-up surveys conducted in 2020 were targeted to provide quick information on the impact of COVID-19 on the private sector. For the 17 sample countries used in this study, the average response rate of the follow-up surveys was about 80%. We combined the standard and follow-up survey data for the purpose of this study. After deleting survey responses with missing values, we obtained a total of 8192 sample firms. Table 1 presents how the sample is distributed by country. The number of firms by country ranges between 118 (for Slovenia) and 1091 (for the Russian Federation), which reflects the economic size and the composition of the industrial and service sectors. (See Table A.1 in the Appendix for the sample distribution by country and economic sector).

4.2. Measuring COVID-19 impacts and credit constraint conditions

The economic consequences of COVID-19 are captured by the survey question, 'In how many months is it expected that this establishment's sales will get back to normal?' In order to facilitate comparisons of the severity of the current crisis with the GFC, a dummy variable, *Long-Recovery,* was created, equaling one for firms that expected 0–12 months "to get back to normal sales" and zero for more than 12 months and 'Never'.

Following Gorodnichenko and Schnitzer (2013), firms' financial status is based on the survey question, "To what degree is access to finance an obstacle to the current operations of this establishment?" A dummy variable, *Constrained*, is created to represent credit constraint conditions. Firms are considered constrained (*Constrained* = 1), when they answered 'Moderate obstacle', 'Major obstacle', or 'Very severe obstacle', and considered to be unconstrained (*Constrained* = 0), when answered "No obstacle" or "Minor obstacle".

The empirical results may be subject to the measure of credit constraints (Hansen and Rand, 2014). In the literature, researchers have distinguished credit-constrained firms from their counterparts according to loan applications and their outcomes (Bigsten et al., 2003; Zhang, 2021, 2022). Firms are treated as being constrained by access to external finance if they (1) applied for a line of credit or loans in the recent fiscal year and the application was rejected, or (2) did not apply for a loan for the reasons of 'application procedures were complex', 'collateral requirements were too high', or 'size of loan and maturity were insufficient'. Accordingly, we created another measure for firm financial status, *Rejection*, which equals one for constrained firms according to loan applications and the outcomes, and zero for unconstrained firms.

We tabulated firm distribution according to the values of *Constrained* and *Rejection* below. For the sample firms, 29.9% of constrained firms had a line of loans granted by a bank, indicating other factors influenced the perceived credit constraint

Table 2

Share of firms with *Long-Recovery*, by country and credit constraint conditions.

Country	Number of			Share of firms with *Long-Recovery*		
	Whole sample	Constrained firms	Unconstrained firms	Whole sample	Constrained firms	Unconstrained firms
Albania	335	149	186	26.0%	23.5%	28.0%
Belarus	522	159	363	21.6%	27.0%	19.3%
Bulgaria	508	97	411	20.1%	18.6%	20.4%
Croatia	335	61	274	12.8%	19.7%	11.3%
Czech Republic	376	107	269	7.18%	5.61%	7.81%
Georgia	463	172	291	50.3%	51.7%	49.5%
Greece	524	239	285	15.5%	18.4%	13.0%
Hungary	606	48	558	5.6%	6.25%	5.56%
Italy	395	181	214	12.4%	12.7%	12.1%
Moldova	271	129	142	34.3%	39.5%	29.6%
Mongolia	281	195	86	36.7%	35.4%	39.5%
Morocco	665	386	279	7.82%	7.51%	8.24%
North Macedonia	284	80	204	35.2%	32.5%	36.3%
Poland	919	382	537	24.9%	31.2%	20.5%
Romania	499	242	257	27.5%	30.2%	24.9%
Russian Federation	1091	465	626	7.42%	8.60%	6.55%
Slovenia	118	20	98	10.2%	20.0%	8.16%
All countries	8192	3112	5080	19.2%	22.0%	17.6%

condition. On the contrary, 4.2% of firms had a rejected bank loan application and did not consider access to finance to be a moderate or more severe obstacle to their operations.[2]

	Rejection $= 0$	Rejection $= 1$
Constrained $= 0$	4734	346
Constrained $= 1$	2453	659

As shown in Table 2, for the whole sample, 19.2% of firms were severely affected by the pandemic in that they chose a recovery time of more than 12 months. It seems that the credit-constrained firm group responded more negatively to the pandemic than the unconstrained firm group (22.0% versus 17.6% of firms with long recovery). At the country level, constrained firms in 11 out of the 17 sample countries foresaw a longer recovery than their counterparts in the same country. For the other six countries, sample firm distribution regarding firm size, economic sector, and so on may explain why constrained firms are less affected by COVID-19 than unconstrained firms.

4.3. Econometric model and control variables

We applied a logit model to estimate the impact of credit constraints (and other control variables) on the probability of *Long-Recovery* being chosen. For the measure based on the self-report survey question ('Obstacle to Operations'), the model specification (Model A) is in the form:

$$Z_i = a_0 + a_1 Constrained_i + \sum_{k=1}^{m} b_k X_{k,i} + \sum_{k=1}^{n} d_k Country_{k,i} + \sum_{k=1}^{o} e_k Sector_{k,i} + U_i$$

$$\text{(Model A)} \tag{1}$$

where Z_i is the logarithmic odds ratio between the probabilities of *Long-Recovery* and quick recovery; $X_{k,i}$ is a vector of control variables; U_i is error terms. The dummy variables for countries (*Country*) and manufacturing subsectors (*Sector*) control for heterogeneity in these two dimensions in the regressions.

For the model using the measure based on firms' bank loan applications and the outcomes, we further include an explanatory variable, *Informal-Finance*. Firms that rely on sources of informal finance sources, such as moneylenders and friends for purchasing fixed assets or working capital may indicate a liquidity problem. This gives rise to Model B:

$$Z_i = a_0 + a_1 Rejection_i + a_1 InformalFinance_i + \sum_{k=1}^{m} b_k X_{k,i} + \sum_{k=1}^{n} d_k Country_{k,i} + \sum_{k=1}^{o} e_k Sector_{k,i} + U_i$$

$$\text{(Model B)} \tag{2}$$

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[2] As shown in Table A.2 in the Appendix, the rejection of bank loan applications increases the probability of the perceived obstacle to operations due to the access to finance by about 28.5%, indicating that other financial sources may alleviate firm credit constraints.

Table 3
Variable definitions and descriptive statistics.

Variable	Definition	Mean	SD	Min	Max
Long-Recovery	A dummy variable that equals to one for firms that need more than 12 months (or never) to go back to normal sales, and zero otherwise.	0.192	0.394	0	1
Constrained	A dummy variable that equals to one for credit constrained firms, and zero otherwise.	0.380	0.485	0	1
Rejection	A dummy variable that equals to one for firms with a rejected bank loan application, and zero otherwise.	0.123	0.328	0	1
Informal-Finance	A dummy variable that equals to one for firms with informal financial sources for purchasing fixed asset or working capital, and zero otherwise.	0.111	0.315	0	1
SME	A dummy variable that equals to one for firms with employees less than 100, and zero otherwise.	0.757	0.429	0	1
Foreign-Ownership	A dummy variable that equals to one for firms with foreign ownership, and zero otherwise.	0.089	0.285	0	1
Firm-Age	Firm age in years and logarithmic scale	2.759	0.728	0	5.268
Location-Small	A dummy variable that equals to one for firms in the location with population less than 50,000, and zero otherwise	0.342	0.475	0	1
Location-Medium	A dummy variable that equals to one for firms in the location with population between 50,000 and 250,000, and zero otherwise	0.254	0.435	0	1
Location-Large	A dummy variable that equals to one for firms in the location with population between 250,000 and 1 million, and zero otherwise	0.203	0.403	0	1

Finally, we estimate the joint impact of *Constrained* and *Rejection*, using Model C as follows:

$$Z_i = a_0 + a_1 ConstrainedOnly_i + a_1 RejectionOnly_i + a_1 Constrained\&Rejection_i + a_1$$

$$InformalFinance_i + \sum_{k=1}^{m} b_k X_{k,i} + \sum_{k=1}^{n} d_k Country_{k,i} + \sum_{k=1}^{o} e_k Sector_{k,i} + U_i$$

$$\text{(Model C)} \quad (3)$$

where *Constrained-Only* for firm with *Constrained* = 1 and *Rejection* = 0; *Rejection-Only* for firms with *Constrained* = 0 and *Rejection* = 1; *Constrained* & *Rejection* for firms with *Constrained* = 1 and *Rejection* = 1. For these dummies, the base is firms with *Constrained* = 0 and *Rejection* = 0.

The control variables include firm size in terms of the number of employees, foreign ownership, firm age, and locations. SMEs have a low survival risk resulting from COVID-19 (Gourinchas et al., 2020; Li, 2020). Young firms have a low level of cumulative earnings and hence are more vulnerable in the pandemic era (Golombek and Raknerud, 2018). Firms with foreign ownership may have reliable financing sources and consequently are less vulnerable to the pandemic. Firm location relates to COVID-19 cases, lockdowns, and consequently, the severity of the COVID-19 impact.

Table 3 presents the definitions of variables and descriptive statistics. For the dummy variable, the mean represents the share of the relevant firms out of the total sample. For example, for the whole sample, 38% of firms were constrained by access to external finance; 12.3% of firms had their loan applications being rejected by banks. The importance of SMEs is indicated by the share of SMEs out of all sample firms, at the value of 75.7%. For the sample countries, 8.9% of firms are partly owned by foreign investors.

Table 4 reports the pairwise correlation between the variables used in the econometric estimation. *Long-Recovery* is positively correlated to *Constrained*, *Rejection*, and *SME*. On the contrary, there is a negative correlation between *Long-Recovery* and *Foreign-Ownership* and *Firm-Age*. The correlation between *Long-Recovery* and *Informal-Finance* is negative and negligible, as indicated by the small coefficient. *Constrained* is negatively correlated to both *Rejection* and *Informal-Finance*, indicating the high probability of the perceived obstacle of financing to operations when firms' loan applications were rejected by banks and when firms used informal finance for purchasing fixed assets or working capital.

5. Estimation results

5.1. Mean difference test

Before presenting the estimation results, we tested the mean differences of the variables for the credit-constrained firm group and the credit-unconstrained firm group. As shown in Table 5, constrained firms are more severely affected by the pandemic than unconstrained firms, as indicated by the significant mean difference between the values of *Severity* (0.22 versus 0.18). Except for the variable, *SME*, all control variables have a significant difference in means for the two types of firm groups. As such, we need to control for those variables when estimating how credit constraints affect the severity of COVID-19 damage.

Table 4

Correlation matrix.

	Long-Recovery	Constrained	Rejection	Informal-Finance	SME	Foreign-Ownership	Firm-Age	Location-Small	Location-Medium
Long-Recovery	0.0544***								
Constrained	0.0119	0.2125***							
Rejection	−0.0004	0.1428***	0.0948***						
Informal-Finance	0.0468***	0.0135	0.0157	−0.0113					
SME	−0.0431***	−0.0191	−0.0218*	0.009	−0.2311***				
Foreign-Ownership	−0.0258*	−0.0471***	−0.0491***	−0.0320**	−0.1943***	0.0109			
Firm-Age	−0.0029	−0.0971***	−0.0816***	−0.0737***	0.0097	0.0079	0.0758***		
Location-Small	0.0195	0.0358**	−0.0024	−0.0029	0.018	−0.0358**	0.0539***	−0.4204***	
Location-Medium	−0.0158	0.0301**	0.0191	0.0796***	0.0033	0.0121	−0.0469***	−0.3645***	−0.2945***
Location-Large	0.0544***								

Note: ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

Table 5

Mean difference test results.

Variable	Constrained firms	Unconstrained firms	Diff	p-value
	Mean	Mean		
Long-Recovery	0.220	0.176	0.044	<0.001
Rejection	0.212	0.068	0.144	<0.002
Informal-Finance	0.169	0.076	0.093	<0.003
SME	0.764	0.753	0.012	0.221
Foreign-Ownership	0.082	0.094	−0.011	0.079
Firm-Age	2.715	2.786	−0.071	<0.001
Location-Small	0.283	0.378	−0.095	<0.002
Location-Medium	0.273	0.241	0.032	<0.003
Location-Large	0.219	0.194	0.025	0.007

Note: The null hypothesis: The mean difference is not significantly different from zero.

5.2. Estimation results

Tables 6 and 7 present the estimation results for Models A, B, and C, respectively. For each model, there are two regressions: one with the primary variables and the other including further control variables. For each model, the regression with more explanatory variables has a greater pseudo-R^2 value than the regression with fewer variables. We reported the covariates' marginal effects, representing changes in the probability of a long recovery time in response to a one-unit change in a given covariate (from zero to one for a dummy variable).

As shown in the left panel of Table 6, *Constrained* in Regression 1 is significant and positive, indicating the existence of a positive relationship between credit constraints and the severity of COVID-19 impacts, regardless of firm size, age, ownership, and firm location. In particular, credit-constrained firms have a 3.05% higher probability of experiencing a long recovery period than unconstrained firms. Including control variables in Regression 2 reduces the impact of *Constrained* to 2.91%, indicating the explanatory power of the control variables.

The right panel of Table 6 presents the estimation results for Model B. The coefficient of *Rejection* is significant in Regressions 1 and 2 with a similar size. For example, in Regression 2, for firms with a rejected bank loan application, the probability of being severely affected by the pandemic is about 3.04% higher than that for firms with access to credit. In addition, holding other factors, especially *Rejection*, constant, firms using informal finance for purchasing fixed assets or working capital are more likely to be severely affected by COVID-19. For the two regressions, the coefficients of *Rejection* are slightly greater than their counterparts in Model A.

Table 7 presents the estimation results for Model C. Credit constraint conditions are likely affected by access to bank loans and other sources of financing that were fully considered by firms when they reported whether access to finance is an obstacle to their operations. The base is firms without a perceived obstacle and without an approved bank loan application. Compared to the base, firms with a perceived obstacle and with access to bank loans (*Constrained*-Only) and firms with a rejected bank loan application and without perceived obstacle (*Rejection*-Only) do not perceive different consequences. However, firms that perceived obstacles to operations as a result of limited access to finance and had their loan applications being rejected by banks (*Constrained* & *Rejection*) are more likely to experience severe consequences of COVID-19, with an increased probability at the value of about 4.25% (in Regression 2). This value is greater than the estimated coefficient of *Constrained* in Model A and *Rejection* in Model B, indicating a joint effect of the perceived obstacle and limited access to bank loans on firm performance resulting from the pandemic crisis.

Models A, B, and C provide similar estimation results for control variables. Among the control variables, only *Location-Medium* and *Location-Large* are not significant. SMEs are more likely to experience a lengthy recovery period than large firms. Firms with foreign ownership are less likely to experience a lengthy recovery period, compared to firms fully owned

Table 6

Estimation results of the logit model regression for Models A and B (dependent variable: *Long-Recovery*).

Variable	Model A			Model B		
	Regression 1		Regression 2		Regression 1	Regression 2
Constrained	0.0305	***	0.0291	***		
	[0.0088]		[0.0087]			
Rejection					0.0316 **	0.0304 **
					[0.0138]	[0.0137]
Informal-Finance					0.0279 *	0.0282 *
					[0.0152]	[0.0152]
SME			0.0217	**		0.0220 **
			[0.0098]			[0.0098]
Foreign-Ownership			−0.0464	***		−0.0472 ***
			[0.0131]			[0.0131]
Firm-Age			0.0121	**		0.0121 **
			[0.0061]			[0.0061]
Location-Small			−0.0223	*		−0.0227 *
			[0.0124]			[0.0124]
Location-Medium			−0.0068			−0.0066
			[0.0129]			[0.0129]
Location-Large			−0.0104			−0.0110
			[0.0134]			[0.0134]
Country effects	Yes		Yes		Yes	Yes
Sector effects	Yes		Yes		Yes	Yes
Pseudo R-squared	0.104		0.107		0.104	0.107
Observations	8192		8192		8192	8192

Note: ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

Table 7

Estimation results of the logit model regression for Model C (dependent variable: *Long-Recovery*).

Variable	Regression 1		Regression 2	
Constrained-Only	0.0156		0.0150	
	[0.0149]		[0.0149]	
Rejection-Only	0.0084		0.0069	
	[0.0235]		[0.0236]	
Constrained & Rejection	0.0445	***	0.0425	***
	[0.0155]		[0.0155]	
Informal-Finance	0.0244	*	0.0248	*
	[0.0151]		[0.0151]	
Foreign-Ownership			0.0217	**
			[0.0098]	
SME			−0.0461	***
			[0.0131]	
Firm-Age			0.0126	**
			[0.0061]	
Location-Small			−0.0222	*
			[0.0124]	
Location-Medium			−0.0070	
			[0.0129]	
Location-Large			−0.0102	
			[0.0134]	
Country effects	Yes		Yes	
Sector effects	Yes		Yes	
Pseudo R-squared	0.103		0.108	
Observations	8192		8192	

Note: ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

by domestic investors. As excepted, young firms are more likely severely affected by COVID-19. Firms located in small cities or in rural areas are less severely affected by the crisis, which may be attributed to socioeconomic factors and different policies for managing the pandemic. Additionally, small cities may have a low level of transmission within the city and from other cities (Qiu et al., 2020).

5.3. Robustness checks

Some unobserved covariates may affect both firm financial status and the severity of COVID-19 impact, indicating an endogeneity issue caused by selection bias. Accordingly, we applied a bivariate probit model to test endogeneity

Table 8

Estimation results of the logit model (dependent variable: *Sales-Reduction*).

Variable	Regression 1		Regression 2	
Constrained	0.0832	***	0.0552	**
	[0.0273]		[0.0287]	
SME			0.061	*
			[0.0328]	
Foreign-Ownership			−0.13220	***
			[0.0464]	
Firm-Age			−0.0833	***
			[0.0266]	
Location-Small			0.0362	
			[0.0390]	
Location-Medium			0.1798	***
			[0.0418]	
Location-Large			0.3342	***
			[0.0358]	
Country effects	Yes		Yes	
Sector effects	Yes		Yes	
Pseudo R-squared	0.0383		0.101	
Observations	1396		1396	

Note: ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

in Model A and Model B. The bivariate probit model simultaneously estimates one probit model for credit constraint condition (Constrained for Model A and Rejection for Model B) and the other probit model for *Long-Recovery*. In the probit model for credit constraints, a dummy for firms that faced competition from informal or unregistered firms is used as an instrumental variable. Firms' access to credit and the level of liquidity are affected by informal competition in the market (Distinguin et al., 2016). However, informal competition is not obviously related to the severity of COVID-19 impact.

After estimating the probit model (results available upon request), we first test for the endogeneity of credit constraints, using Marra et al.'s (2017) gradian test with the null hypothesis that there is not a bilateral causality. The *p*-value of the test is 0.06 for Model A and 0.63 for Model B. Thus, the bilateral causality between financial causality and the severity of COVID-19 is firmly rejected for Model B and is weakly rejected for Model A. For Model A, the estimated coefficients are similar to their counterparts in the initial estimation results with regard to both sign and the significance level, indicating the robustness of the initial estimation results.

6. Comparison between COVID-19 and GFC

COVID-19 lockdowns affect both consumption and production, suggesting that the different impacts of COVID-19 and the GFC on firms' operations. The Enterprise Surveys conducted a follow-up survey in 2009 for 1396 firms in seven South–Eastern European and Central Asian countries. The survey question about the impact of the GFC is, 'What do you expect will happen with this establishment's sales one year from now?' We created a dummy variable measuring the economic consequences of the GFC, which equals one for firms that answered 'Decreased' to the question above. With the dependent variable, *Sales-Reduction*, we estimated the two regression models for the GFC and reported the estimation results in Table 8.

Although the measures of the economic consequences of COVID-19 and the GFC are based on different survey questions, a recovery period longer than 12 months (for COVID-19) indicates sales reduction in one year from the survey time point. Accordingly, we compared the estimation results in Table 8 with their counterparts in Table 6.

In Regressions 1 and 2 for the GFC, the estimated marginal effect of *Constrained* is significant and positive, indicating that constrained firms were more severely affected by the GFC compared than were unconstrained firms. The magnitude of *Constrained* is 0.083 in Regression 1 and 0.055 in Regression 2, both of which are much greater than their respective counterparts in the regression results for COVID-19 (0.0305 and 0.029). Thus, constrained firms were more vulnerable in the previous crisis than in the current COVID-19-induced economics crisis, probably due to aggressive government support (Didier et al., 2021). While SMEs are less negatively affected by COVID-19 than by GFC, firms with foreign ownership were at a much lower risk during the GFC than during COVID-19. Young firms were less likely affected by the GFC than large firms; the opposite is true for the case of COVID-19. Above all, the economic consequences of COVID-19 and the GFC differ from each other, indicating two different ranges of at-risk firms. However, one caveat is that this comparison is limited by different measures of economic consequences and different samples used for COVID-19 and the GFC.

7. Conclusion

Although the literature on the economic consequences of COVID-19 has been growing rapidly since its occurrence (Brodeur et al., 2020), there are still many research questions needing to be answered (Tisdell, 2020). In response to the

Table A.1
Sample distribution by country and sector.

Sector	Albania	Belarus	Bulgaria	Croatia	Czech	Georgia	Greece	Hungary	Italy	Moldova	Mongolia	Morocco	North Macedonia	Poland	Romania	Russia	Slovenia	Sum
15	25	94	89	31	38	86	98	90	59	42	32	87	26	126	72	136	6	1137
17	0	24	8	3	7	0	6	8	4	1	7	10	7	5	9	2	3	104
18	42	74	21	6	1	8	5	10	6	12	9	92	25	85	15	113	0	524
19	18	6	7	1	0	2	1	4	3	3	5	3	7	5	8	1	0	74
20	1	7	8	6	1	5	4	9	4	3	11	5	4	17	6	12	4	107
21	3	4	5	2	0	1	8	6	1	1	2	1	4	9	4	5	2	58
22	6	6	8	4	2	6	5	8	8	4	6	12	3	14	10	22	5	129
24	4	9	9	9	8	7	13	7	7	3	2	11	1	6	5	23	1	125
25	2	18	18	9	19	6	15	14	3	7	1	7	8	81	7	24	6	245
26	8	6	16	4	7	17	7	4	4	7	11	16	1	10	6	121	3	248
27	0	1	4	3	2	6	4	3	6	0	1	4	1	3	4	5	4	51
28	7	7	26	20	60	9	74	101	62	8	3	14	5	86	80	107	8	677
29	1	12	55	16	60	0	18	76	61	4	2	6	5	84	54	116	5	575
31	1	4	10	2	4	0	3	10	2	3	0	5	1	13	6	18	1	83
33	0	8	2	3	6	1	2	4	4	2	0	2	0	3	4	10	1	52
34	0	4	0	2	11	0	1	8	5	0	0	1	3	3	4	6	2	50
36	11	14	10	6	9	15	9	4	7	11	3	9	6	95	12	15	0	236
37	0	2	0	1	0	0	0	0	0	0	0	1	0	31	0	13	0	48
45	27	34	38	33	25	38	35	33	19	33	52	73	26	66	32	40	10	614
50	25	11	25	9	2	11	12	25	13	19	8	29	14	22	19	23	6	273
51	24	43	18	39	35	52	35	30	20	20	25	71	14	34	24	113	7	604
52	70	102	75	77	40	92	111	103	63	73	66	115	83	75	75	131	18	1369
55	42	10	15	27	13	84	41	22	19	3	26	57	25	15	11	9	14	433
60	7	10	35	10	14	6	1	19	7	6	5	13	10	16	15	11	6	191
63	8	3	2	7	0	9	11	2	1	2	3	5	0	2	6	1	3	65
72	3	9	4	5	12	2	5	6	7	4	1	16	5	13	11	14	3	120
Sum	335	522	508	335	376	463	524	606	395	271	281	665	284	919	499	1091	118	8192

Table A.2

Estimation results of the logit model (dependent variable: *Constrained*).

Variable	Regression 1		Regression 2	
Rejection	0.2871	***	0.2850	***
	[0.0179]		[0.0180]	
Informal-Finance	0.1453	***	0.1440	***
	[0.0198]		[0.0199]	
SME			0.0200	
			[0.0139]	
Foreign-Ownership			−0.0278	
			[0.0204]	
Firm-Age			−0.0163	**
			[0.0083]	
Location-Small			−0.0087	
			[0.0185]	
Location-Medium			0.0481	**
			[0.0189]	
Location-Large			−0.0072	
			[0.0182]	
Country effects	Yes		Yes	
Sector effects	Yes		Yes	
Pseudo R-squared	0.107		0.110	
Observations	8192		8192	

Note: ***, **, and * denote significant at the 1%, 5%, and 10% levels, respectively.

crisis, governments around the world have adopted aggressive fiscal policies such as wage subsidies for firms to retain employees and avoid permanent closure (Makin and Layton, 2021). Several studies have confirmed the low efficacy of these relief programs (Li, 2020), indicating the requirement of targeted subsidies, which can reduce the fiscal cost as compared to non-targeted subsidies (Gourinchas et al., 2020). Accordingly, identifying most vulnerable in the pandemic era is one of the essential issues that require more attention.

Using the World Bank Enterprise Survey data and the follow-up surveys on the economic consequences of COVID-19, we investigated the determinants of the COVID-19 impacts for 8192 firms. Firms with limited access to finance or on a low scale regarding the number of employees are more likely to be severely affected by the crisis. On the contrary, firms with foreign ownership and that are located in small cities are less at risk. Firms with a rejected bank loan application may have other financing sources, which either alleviates a demand for liquidity or is perceived as an obstacle. The possible opposite effects of other financial sources may offset each other and lead to similar estimations of the self-reported credit constraint conditions and the limited access to bank loans. Firms with bank rejections and perceived obstacles to operations are more likely to experience severe consequences from COVID-19. Compared to the 2008 Global Financial Crisis, COVID-19 less severely affected credit-constrained firms and firms with foreign ownership, and more severely affected SMEs. This coincides with Gourinchas et al.'s (2020) findings that SMEs are more vulnerable under the COVID-19 crisis. Our empirical results provide supportive evidence for identifying at-risk firms under the crisis, which further helps policymakers design effective initiatives to mitigate the consequences of COVID-19.

As in previous literature (Li, 2020), this study is based on firms' perceived losses to measure the consequences of COVID-19, which may deviate from the actual economic losses. This is also related to another limitation regarding the comparison results of COVID-19 and the GFC. Using actual post-COVID-19 data in the future may improve the reliability of the comparison. Our empirical cases are based on the Enterprise Surveys data from 17 sample countries in different levels of development. A caveat is that using credit constraint conditions to predict the economic consequences of the pandemic for other surveyed countries should account for country heterogeneity, which leads to future research directions.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

See Tables A.1–A.3

Table A.3
COVI-19 cases and fiscal policy response, by sample country.

Countries	COVID-19 cases	Key fiscal policy responses
Albania	78.85	A combined size of Lek 45 billion (2.8 percent of GDP) consisting of budget spending, sovereign guarantees and tax deferrals.
Belarus	753.12	The package of fiscal measures started in 2020 until end-2021 include tax relief and tax deferral measures to support businesses.
Bulgaria	239.15	Revenue measures includes reduced VAT rate. Expenditures for business support: (i) 60/40 wage subsidy scheme (BGN 1019 mn).
Croatia	399.00	Key measures include deferment of public obligations, free of interest for three months, temporary suspension of payments of selected parafiscal charges, and interest free loans to local governments.
Czech Republic	1093.57	The government implemented a fiscal package of CZK 287.3bn (€10.9bn, 5.1 percent of GDP) in 2020 and other fiscal package of CZK 292.1bn (incl. in particular impact of new tax package, new compensatory bonus).
Georgia	20.61	Fiscal support provided to businesses (and individual) amounted GEL 1.86 billion i.e., 3.8 percent of GDP in spending and revenue measures.
Greece	32.71	A fiscal package of measures totaling about 14 percent of GDP (€23.5 billion) in 2020 includes loan guarantees, financed from national and EU resources.
Hungary	273.91	Measures to alleviate the fiscal burden on businesses include employers' social contributions were lifted in the most affected sectors and around 80,000 SMEs (mainly in the services sector) were exempt from the small businesses.
Italy	396.46	The government adopted a €25 billion (1.6 percent of GDP) "Cura Italia" emergency package, including tax deferrals and postponement of utility bill payments and measures to support credit supply.
Moldova	191.50	A comprehensive fiscal package has been adopted, including tax relief for sectors affected by state-imposed restrictions, delaying tax payment, suspending tax audits, and other controls.
Mongolia	9.06	A comprehensive set of fiscal measures for consideration was adopt, including exemptions on social security contributions, an increase in credit guarantees to SMEs, and soft loans from the development bank to cashmere producers.
Morocco	154.66	The authorities have created a special fund that covered the costs of support businesses. The qualified businesses were authorized to defer social contribution payments and income tax payment.
North Macedonia	1627.55	The measures included subsidies on private sector wages and social security contributions for firms that maintain employment, postponement of income tax payments, loans at favorable terms, and loan guarantees.
Poland	170.92	The fiscal policy response to the first wave of the pandemic was sizeable, estimated at PLN 116 billion (5.2 percent of GDP). New credit guarantees and micro-loans for entrepreneurs estimated at PLN 74 billion (3.3 percent of GDP) were also approved. Additionally, the Polish Development Fund has financed a PLN 100 billion (4.5 percent of GDP) liquidity program for businesses.
Romania	651.92	Measures to support businesses include covering in part the wages of self-employed and workers in danger of being laid off, partially subsidizing the wages of those returning to work, deferral of utilities payments for SMEs, bonus for corporate income tax payments, and grants for the businesses.
Russian Federation	439.34	Measures to support businesses include interest rate subsidies for SMEs and systemically important enterprises, tax deferrals for most affected companies on most taxes, deferrals on social contributions for SMEs in affected sectors for 6 months, and a tax holiday on all taxes (excluding VAT) and social contributions for SMEs.
Slovenia	105.39	A wide support program including (1) tax deferrals for up to 24 months or tax payments in installments in 24 months, (2) wage subsidies for suspended employees due to pandemic-related closures and quarantined people (about €50 million), and (3) support to corporate liquidity through grants, equity purchase, and government guarantees and credit lines to the affected businesses, particularly SMEs.

Note: Total COVID-19 cases per 100 000 population at the end of the survey date for each sample country (See Table 1) are collected from the World Health Organization. Key fiscal responses are collected from the International Monetary Fund.

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