

Aseinov, Dastan; Sulaimanova, Burulcha; Karymshakov, Kamalbek;
Azhgaliyeva, Dina

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What determines the adaptation of enterprises to COVID-19 in CAREC member countries: Empirical evidence from Azerbaijan, Georgia, Kazakhstan, and Mongolia

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ADB Working Paper Series

WHAT DETERMINES THE ADAPTATION OF ENTERPRISES TO COVID-19 IN CAREC MEMBER COUNTRIES: EMPIRICAL EVIDENCE FROM AZERBAIJAN, GEORGIA, KAZAKHSTAN, AND MONGOLIA

Dastan Aseinov, Burulcha Sulaimanova,
Kamalbek Karymshakov, and Dina Azhgaliyeva

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Dastan Aseinov is an assistant professor at the Kyrgyz-Turkish Manas University in Bishkek, Kyrgyz Republic. Burulcha Sulaimanova is a research fellow at the OSCE Academy in Bishkek. Kamalbek Karymshakov is an economist at the Central Asia Regional Economic Cooperation Institute in Urumqi, People's Republic of China. Dina Azhgaliyeva is a research fellow at the Asian Development Bank Institute in Tokyo, Japan.

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Please contact the authors for information about this paper.

Email: dastan.aseinov@manas.edu.kg

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

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Abstract

This study empirically investigated the factors affecting firms' ability to adjust production in response to the COVID-19 outbreak. This study used firm-level survey data from the Enterprise Survey implemented by the World Bank Group, including a standard Enterprise Survey (Baseline) and two waves of Follow-up Surveys conducted in 2020 and 2021, which included questions related to COVID-19 and firm behavior during the pandemic. We used data from four CAREC member countries: Azerbaijan, Georgia, Kazakhstan, and Mongolia. Using a probit model, we studied how different factors, including firm characteristics and government policy, affected the probability that a firm would be able to adjust its activities to the changed conditions. The results showed that firms which successfully adapted to the COVID-19 crisis were younger, foreign firms that had been innovative in the recent past, with female managers, a formal firm strategy with key performance indicators, and their own website.

Keywords: COVID-19; micro, small, and medium enterprises (MSMEs); digitalization; adaptation; Central Asia, Caucasus

JEL Classification: D22, J63, L25, O53

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1. INTRODUCTION

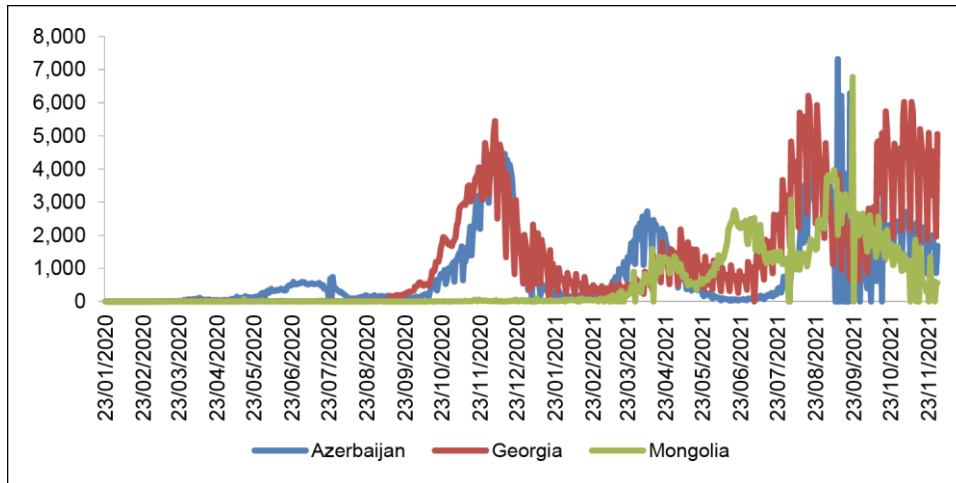
The sudden COVID-19 outbreak has affected economic activity worldwide and has been characterized by significant uncertainty regarding its duration and magnitude (Didier et al. 2021). Unlike previous global crises, the economy was challenged with both supply and demand shocks during this pandemic. Government authorities around the world deployed a wide range of aids to private firms to manage the adverse effects of the pandemic.

The COVID-19 pandemic (Figures 1–3) has been an external shock of unprecedented magnitude, both at demand and a supply side (Borino et al. 2021; Juergensen et al. 2020; Kuriakose and Tran 2020). Decline in demand has been seen due to lockdowns measurements (Figure 4), and firms also faced disruption in transportation and labor shortages on the supply side, due to stay at home orders (Borino et al. 2021; Juergensen et al. 2020). Because the pandemic remains ongoing and empirical data are scarce, there is almost no empirical evidence for how COVID-19 has affected entrepreneurs in CAREC economies.

This study aims to fill out this gap by using the COVID-19 follow up enterprise survey by the World Bank for four CAREC economies: Azerbaijan, Georgia, Kazakhstan, and Mongolia. The survey was run in two rounds for Georgia and Mongolia during 2020 and 2021. These data give us the opportunity to analyze challenges and issues, as well as their extent for firms across countries. The main objective of this study was to empirically investigate factors affecting firms' ability to adjust production in response to the outbreak of COVID-19. Potential factors include managerial and firm characteristics, as well the institutional settings in which these enterprises operate, including challenges firms face in terms of government regulations and other potential barriers to firm operation.

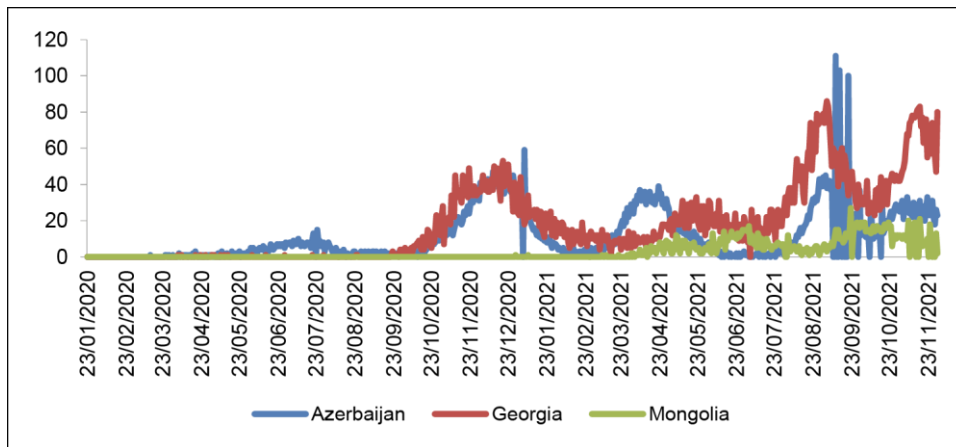
The COVID-19 pandemic dramatically changed economic growth dynamics in 2020 in reaction to government policy responses. GDP growth in Azerbaijan, Georgia, Kazakhstan, and Mongolia fell by 4%, on average, in 2020 (see Figure 5). According to the IMF (2021) policy tracker, Azerbaijan has been negatively impacted by COVID-19 and a rapid fall in oil prices. To mitigate the adverse effects of the pandemic and support entrepreneurs and individuals, the authorities in Azerbaijan implemented fiscal support to the amount of 3.3 billion AzN or 4.85% of GDP (IMF 2021). The Government of Georgia, meanwhile, has provided 1.86 billion GEL in funding to individuals and industries, or 3.8% of GDP in 2020. In Kazakhstan, the sizable fiscal support targeted to assist the most-affected economic sectors and small and medium-sized enterprises (SME), mitigated the adverse impact of the pandemic. The government of Mongolia implemented measures involving 3 billion MNT in financial support to the regions most affected by the crisis.

Figure 1: COVID-19 Cases (daily net change)



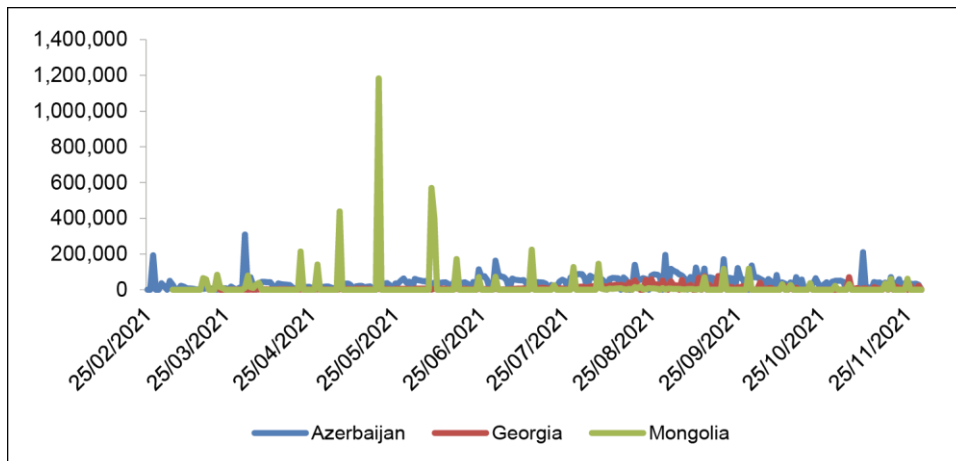
Data source: Bloomberg.

Figure 2: COVID-19 Deaths (daily net change)



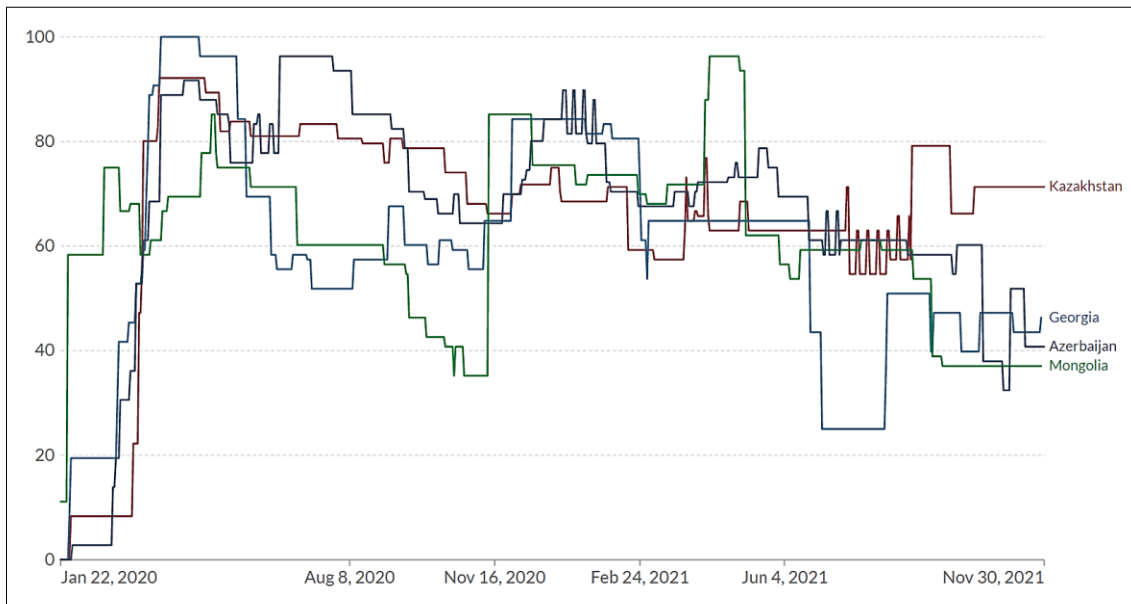
Data source: Bloomberg.

Figure 3: COVID-19 Vaccination (daily net change)



Data source: Bloomberg.

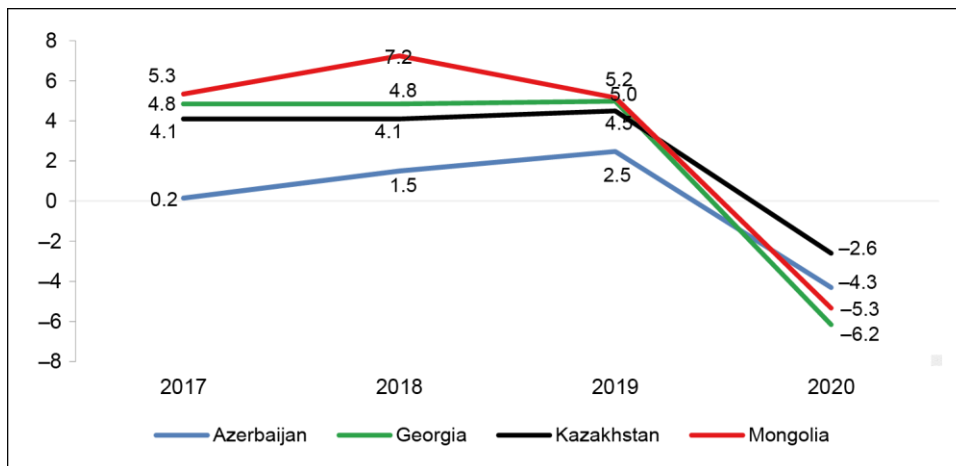
Figure 4: Stringency Index



Note: The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans. It varies from 0 to 100 (100 = strictest).

Source: Our World in Data and Hale et al. (2020).

Figure 5: GDP Real Growth Rates



Source: World Bank, World Development Indicators (accessed 24 October 2021).

Despite policy interventions to sustain the private sector, the COVID-19 pandemic has had a significant impact on the economy by affecting firms and industries and shrinking production across the countries. However, there is no empirical evidence about the extent to which policy measures and other factors have affected enterprises in these economies.

2. LITERATURE REVIEW

The empirical literature suggests that small and medium sized enterprises (SMEs) are more flexible and adaptable than larger firms because of their characteristics, such as small size, private ownership, and flat hierarchical structures (Bartik et al. 2020; Juergensen et al. 2020). SMEs thus tend to be able to respond quickly to changing environments, and this adaptive capability is vital for improving resilience to economic crises (Durst and Henschel 2021).

During a crisis, firms face declines in sales, reduced access to financing, and uncertainties about the future (Apedo-Amah 2020). One of the first short-term impacts of COVID-19 was financial concerns (particularly regarding liquidity), so smaller firms faced disproportionately greater financial constraints (Apedo-Amah 2020; Juergensen et al. 2020). However, the impact of the COVID-19 crisis could be heterogeneous, so micro and large firms could be more likely to face solvency issues, while SMEs showed lower insolvency rates (Guerini et al. 2020). The supply chain, labor supply, and final demand for goods and services are more vulnerable to negative shocks for smaller firms than for larger firms (Sonobe 2021). Firms with higher total asset values and a longer cash flow coverage period face significantly lower risk levels, because assets and liquidity operate as a buffer against the effects of a crisis such as COVID-19 (Abu Hatab et al. 2021).

The COVID-19 pandemic has had a heterogeneous impact on economic sectors and regions as well. During the pandemic, the most vulnerable sectors were hotels and restaurants, household services, and construction, while manufacturing and wholesale trade were more resilient (Guerini et al. 2020). Empirical studies have shown that the COVID-19 crisis caused dormancy in the tourism sector, and stakeholders and workers shifted to other economic sectors and looked for alternative occupation (Kristiana et al. 2021).

International firms are more vulnerable to shocks than domestic firms and faced more severe effects of COVID-19 pandemic due to their exposure to international markets (Borino et al. 2021). International firms were, however, more resilient and adaptable to the COVID-19 pandemic than their counterparts, and were less likely to close and more likely to adopt measurements to continue production (Borino et al. 2021; Bachas et al. 2020). During the pandemic, firms rapidly adopted digital technologies to solve issues related to supply chain management and production (Kuriakose and Tran 2020), which led to tentative digitalization (Kraus et al. 2020). Empirical analysis has shown that SMEs adopted different digital transformation paths, such as accelerating the transition toward firm digitalization, digitalization of sales only, or finding partners that had required digital capabilities (Priyono et al. 2020). The startups, innovators, and firms that relied on internal sources of knowledge had a greater ability to adapt to COVID-19 than non-innovators, while there was no difference between adaptability of firms led by men versus women (Krammer 2021).

The results of a micro, small, and medium-sized enterprises (MSME) survey conducted by ADBI in eight developing economies in South, Southeast, and Northeast Asia suggests online sales will increase among many MSMEs in Asia, especially those in hard-hit sectors and particularly manufacturing firms, younger firms, export-oriented firms, those that have already experienced online sales, firms experiencing a cash shortage, and firms that did not have to reduce their employment numbers. Many firms thus appear to have found it profitable to increase their online sales (Sonobe et al. 2021). Another MSME survey conducted by ADBI from the end of March to mid-April 2020 also found that the impact of COVID-19 varied by firm size and sector. Given the

different abilities of MSMEs to adjust by firm size and sector, the government could provide more targeted and differentiate policy measures by firm size and sector (Shinozaki and Rao 2021).

An important characteristic underlined by earlier empirical studies is that SMEs can adjust relatively faster to changing economic realities. Some studies have indicated that SMEs and individual enterprises may demonstrate a more dynamic tendency towards the introduction of innovation compared to large firms (Love and Roper 2015), but this may depend on different factors, ranging from the characteristics of the firm's leaders to access to financial resources, and financial constraints were found to be an important element (Skuras et al. 2008; Landesmann et al. 2016). Although, other studies assert that non-financial support to increase productivity of the labor force is important for innovation and, hence, for long-term sustainability, too (Szczepanska-Woszczyzna 2014). Qualified labor can also be considered an important challenge for enterprises within the developing country context (Norek and Arenhardt 2015). In general, it can be assumed that the innovativeness and ability of firms to take new forms when functioning during the COVID-19 conditions are important for their adaptability to new economic conditions. Interestingly, Karymshakov et al. (2019) have shown that the experience of managers has a curvilinear effect on SME innovation, which may imply that this factor is important for firms' adaptability to COVID-19 as well. However, there is scarce empirical evidence on the adaptability of enterprises to changing social and economic dynamics in the context of Central Asian economies.

3. DATA

This study uses firm-level survey data from the Enterprise Survey implemented by the World Bank Group. Our dataset was constructed by merging data from a standard Enterprise Survey (Baseline) and two waves of the Follow-up Survey using the sample of firms from the baseline survey. The COVID-19 follow-up surveys were conducted in 2020 and 2021 and included questions mostly related to the COVID-19 situation and the behavior of firms during the pandemic. However, basic firm characteristics were given in the baseline survey before the COVID-19 period (i.e., 2018–2020), and the focus was on firm characteristics such as sales, production, labor, finance, and government, while the follow-up surveys covered questions related with impact of the COVID-19 crisis.

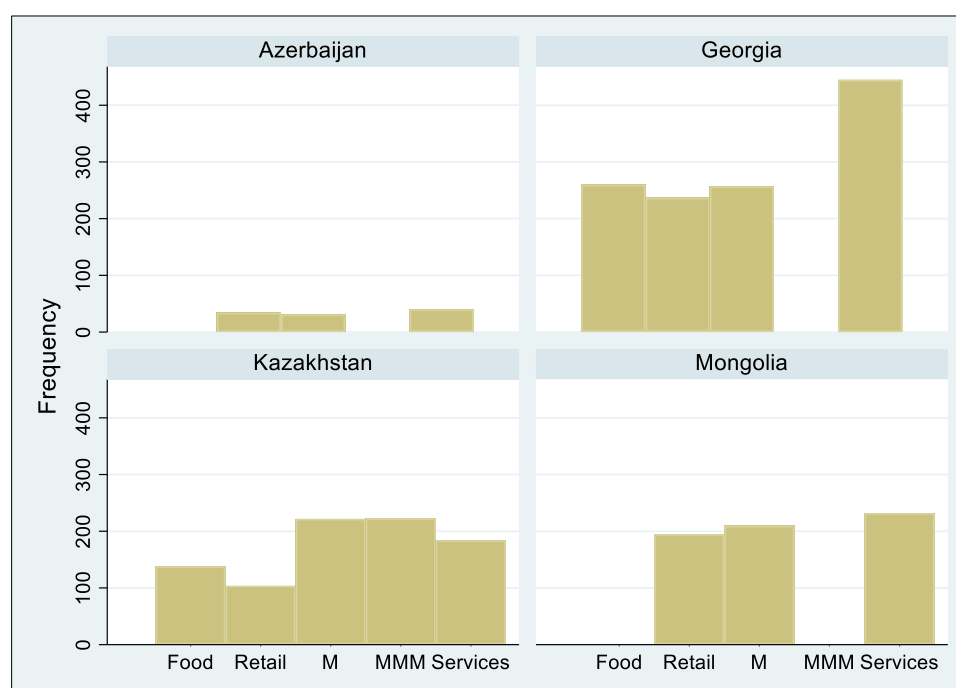
The two waves of follow-up surveys were designed to measure the impact of COVID-19 on the same firms observed in the baseline survey. However, the availability of follow-up survey data for CAREC countries allowed our dataset to include only four CAREC countries: Azerbaijan, Georgia, Kazakhstan, and Mongolia. Sample distribution by survey year, wave, and sector of both baseline and follow-up surveys by country are presented in Table 1 and Figure 6.

Table 1: Sample Distribution

Country	Year of Baseline Survey	Follow-up Survey		Total
		Wave I	Wave II	
Azerbaijan	2019, 2020	105 (Apr, May 2021)		105
Georgia	2019, 2020	614 (Jun 2020)	589 (Oct, Nov 2020)	1,203
Kazakhstan	2019	871 (Jan–Mar 2021)		871
Mongolia	2018, 2019	314 (Aug 2020)	323 (Feb 2021)	637
Total		1,904	912	2,816

<i>By sector</i>					
Industry	Azerbaijan	Georgia	Kazakhstan	Mongolia	Total
Food	0	260	138	0	398
Retail	34	237	104	195	570
Manufacturing	31	257	222	210	720
Metal, machinery, and equip. mineral	0	0	223	0	223
Services	40	445	184	232	901
Total	105	1,199	871	637	2,812

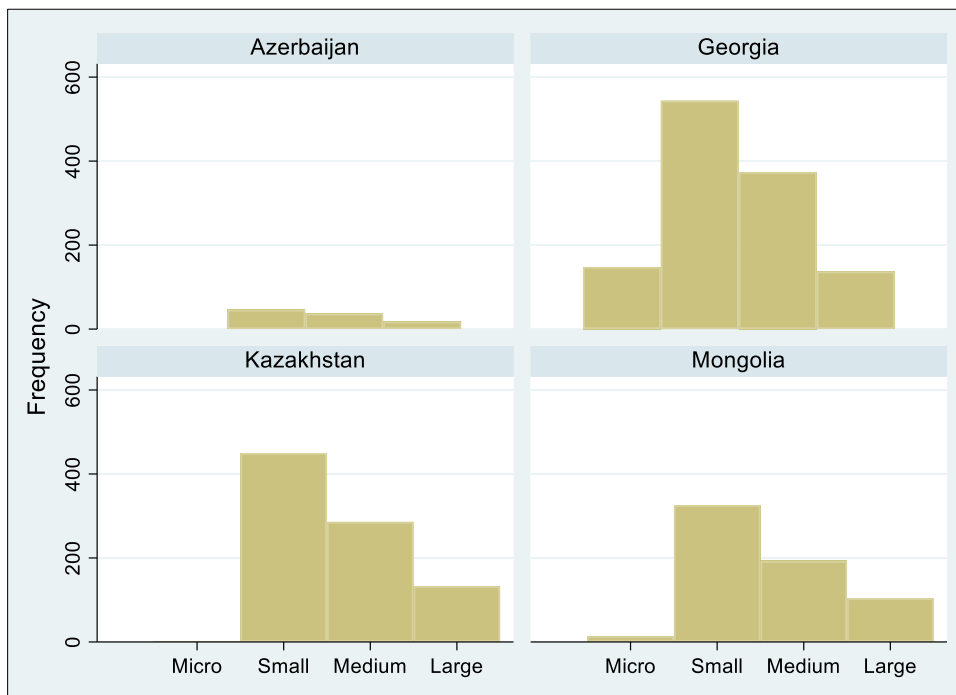
Source: World Bank Enterprise Survey (2021).

Figure 6: Sample Distribution across Sectors

Note: M – Manufacturing; MMM – metal, machinery, and equip. mineral.

Most firms in the sample are small and medium (80%), while large firms are 14% and micro, 6% (Figure 7).

Figure 7: Share of Firms by Firm Size



According to our research objectives and the properties of the dataset, we use six samples in total in our estimations. Total sample, or pooled dataset, covers all available data for the four countries. The dataset includes two waves for Georgia conducted in June and November 2020; and two waves for Mongolia implemented in August 2020 and February 2021. Only one wave of the survey was conducted in Azerbaijan and Kazakhstan during the first half of 2021. Differences in survey periods for the follow-up waves do not allow us to measure the impact of COVID-19 on an equal basis. Therefore, along with the total sample, we use a differential approach in grouping the data. First, only those surveys conducted in 2020 and 2021 are used separately. Thus, the 2020 sample includes both waves for Georgia, and the first wave for Mongolia. The 2021 sample covers Azerbaijan, Kazakhstan, and the second wave for Mongolia. In this case, the second wave of the survey in Georgia was in late 2020 and may incorporate evidence on the late effect of COVID-19 compared to the earlier period. We therefore use another sample from 2021 by including the second wave of the survey for Georgia. Data for Georgia and Mongolia include two waves, and they are used as first and second wave samples. As shown in Table 1, the total sample size consists of 2,816 with different variable availability for empirical analysis. In the estimation of models, sample sizes vary within an interval of 654–2,149.

Table 2: Descriptive Statistics

	Total Sample	2020	2021	2021(*)	Wave I: Mongolia and Georgia	Wave II: Mongolia and Georgia
Production Adaptability (1 = firm has adjusted or converted production)	0.37	0.29	0.46	0.41	0.29	0.44
Firm age (years since firm start operations)	14.03	13.31	14.87	13.94	14.20	14.41
Capital city	0.29	0.36	0.22	0.26	0.36	0.36
Share of direct export (as % of total sales)	3.24	4.25	1.95	3.96	1.84	5.99
Innovation in process (1 =firm has introduced new or improved process)	0.21	0.21	0.21	0.20	0.25	0.26
Use of website (1=firm has website)	0.51	0.50	0.53	0.53	0.48	0.49
Firm strategy (1=firm has formal strategy)	0.37	0.27	0.47	0.40	0.30	0.30
Experience of manager (years in a sector)	16.40	18.04	14.45	15.76	17.68	17.68
Gender of manager (1=female)	0.27	0.26	0.29	0.27	0.28	0.29
Foreign ownership (as %)	5.16	7.10	2.87	4.38	6.73	5.98
Firm size (N)	2812	1,517	1,295	1,884	928	912
Micro	164	155	9	82	82	80
Small	1,366	704	662	928	438	432
Medium	890	471	419	603	287	280
Large	392	187	205	271	121	120
Sector (N)	2,812	1,513	1,299	1,886	926	910
Food	398	260	138	266	132	128
Retail	570	331	239	354	216	216
Manufacturing, Garments	720	360	360	486	234	233
Metal, Machinery, and Equip. Mineral	223	0	223	223	0	0
Services	901	562	339	557	344	333
Access to financing (1=firm had a loan)	0.41	0.49	0.32	0.37	0.48	0.50
Government support (1=firm had a loan)	0.31	0.37	0.23	0.28	0.35	0.39
Stringency index (impact of COVID-19) from 0 to 100 (100 = strictest)	60.06	56.79	63.89	61.68	56.77	58.23
Transport	1.87	1.88	1.84	1.85	1.89	1.91

Note: 2021(*) includes observations of surveys from 2021 and second wave for Georgia.

Source: World Bank, Enterprise Surveys (<http://www.enterprisesurveys.org>, accessed 10 October 2021); Hale et al. (2021).

The descriptive statistics given in Table 2 indicate that, for the total sample, less than half of all firms had introduced innovative processes before the crisis, were recipients of state support, run by women, had a loan and an official strategy, and were not in the capital. As for production adaptability, on average 37% of firms adjusted or transformed their production and service delivery (Figure 8). The largest share of firms that have adjusted business activities are from Azerbaijan (around 60%) (Figure 8). The highest mean values for firm age and stringency index are observed in the sample from 2021. The stringency level was around 60% for all four countries (Figure 9). The average proportion of firms with a formal strategy and their own website, run by women, that changed their manufacturing and service delivery and applied online business activity, are the highest in the sample of 2021 as well.

Figure 8: Share of Firms that Adapted (Adjusted or Converted) Production Due to COVID-19

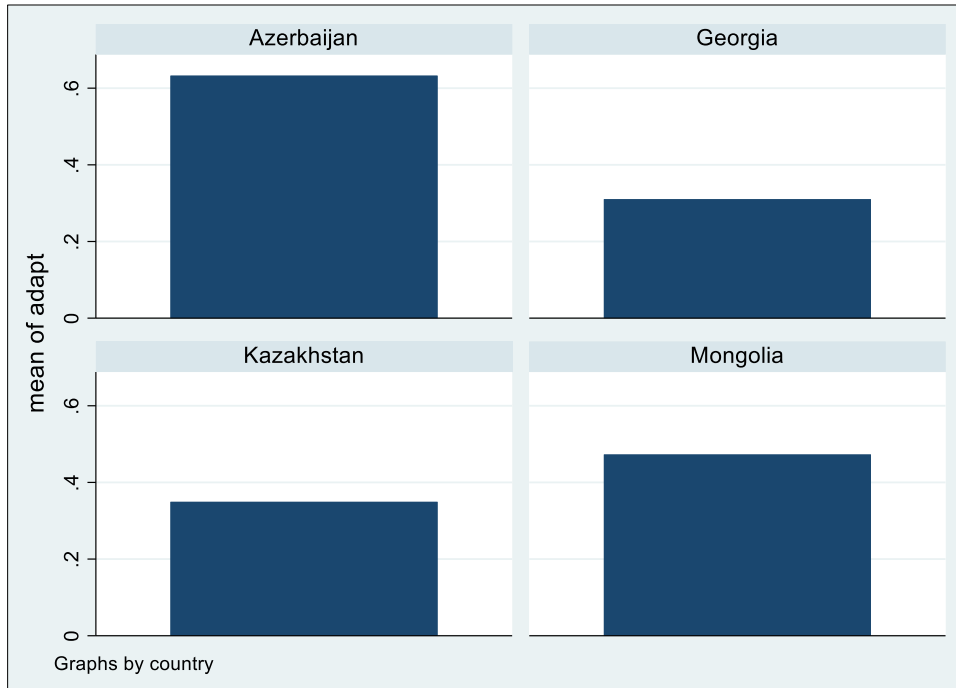
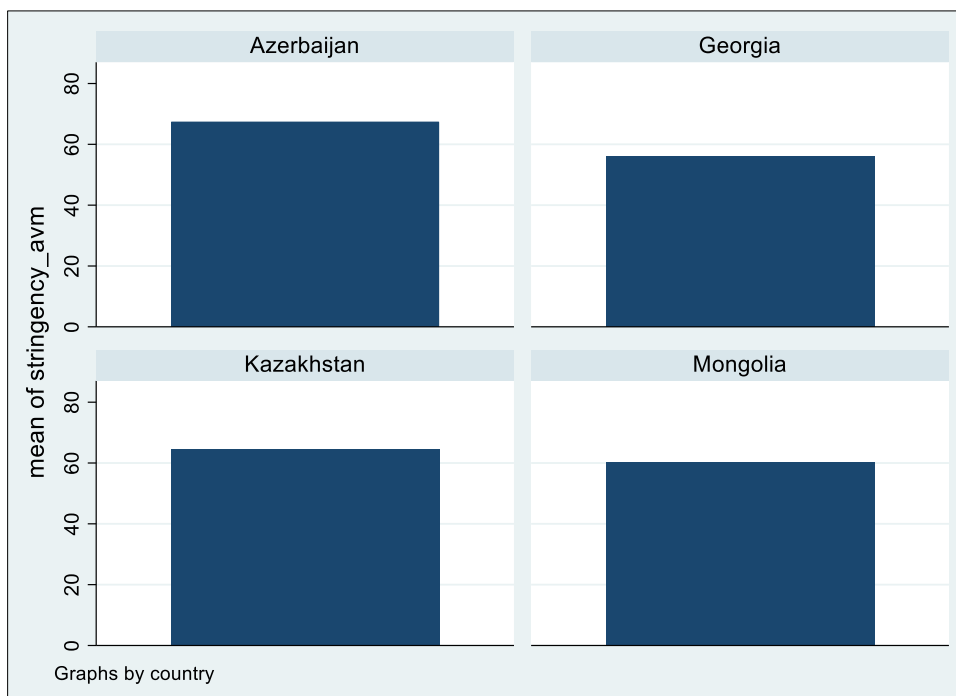


Figure 9: Average Stringency Index (from 0 to 100; 100 = strictest)



At the same time, compared to the other samples, the sample from 2021 includes firms whose managers have the least experience on average, and the firms with the lowest average share of direct exports and foreign capital among the samples. The average lowest proportions of firms located in the official capital city, had loans in financial

institutions, and received government support are also calculated for the sample of 2021. The proportion of firms that have managed to transform their production and/or service delivery in the pandemic increased, on average, from 29% to 46% and 44% in 2021 and in the second wave, respectively. The decline from 23% to 18%, on average, in the share of firms that started or increased online business activity in the second wave could be due to a gradual decrease in firms' need for remote work and online business arrangements after the lifting of quarantine and lockdown measures.

4. METHODOLOGY

This study examines the determinants of firms' adaptability or resilience to pandemic conditions. Two dependent variables are used as indicators of flexibility—that is, the ability of firms to resist or adapt to the COVID-19 crisis—and these dependent variables are discrete, taking the value 0 or 1. The binary response probit regression model is a suitable method to measure the probability that a firm will be able to adjust its activities to the changed conditions (Eq. 1):

$$P(y_i = 1|x_i) = F(\beta_0 + \beta_1 \textit{Stringency Index} + \dots + \beta_k x_k) \quad (1)$$

where y_i is the discrete dependent variable that measures the production adaptability of a firm to the COVID-19 outbreak; it indicates whether a firm has the ability or flexibility to adjust or transform its operations, business, or processes to pandemic conditions. Production adaptability is equal to 1 if the observed firm partially or fully has adjusted or converted its production or the services it offers in response to the COVID-19 outbreak.

Stringency Index and x_k are the set of covariates, or explanatory variables, that are assumed to explain the probability that the firm will adapt, adjust, or change its business and other activities in response to pandemic conditions. We use 16 explanatory variables in our models to track changes in business processes made by firms during the COVID-19 pandemic. The explanatory variables fall within three groups according to their characteristics. Explanations for dependent and explanatory variables are presented in Table 3.

Firms' adaptability may differ depending on firm characteristics such as size, age, location, industry, and managerial and ownership differences. Firm-specific explanatory variables include size, age, location, and industry of the observed firm. We employ dummy variables for size and industry of firms retrieved from the respective categorical variables. We use four dummy variables for different firm sizes—micro, small, medium, and large—and five dummies to indicate the industry in which the firms operate. Firm age is measured by the number of years since the firm began its operations. The dummy variable for firm location is 1 if the firm is located in the official capital city, and 0 otherwise. We also include country dummies to identify differences in firm adaptability across countries.

It is assumed that women and/or experienced managers might be more successful managers in times of crisis. The gender and experience of a top manager in the industry, expressed in years, are used as additional management characteristics. Firm innovativeness, the presence of their own website, an official strategy, and foreign capital can also be associated with their ability to adapt to changes in the external environment. Some of the observed firms have introduced innovation processes, exported their products directly, and have their own website and a formal business strategy. Explanatory variables reflecting these firm characteristics were included to

assess how these firms coped with the pandemic. Including these variables into our models helps us determine whether the possession of such characteristics helps firms respond better to the consequences of the COVID-19 than their counterparts. We expect these characteristics to be associated with more adaptive action, because we consider them as outcomes of the capacity and skills of managers and owners.

Table 3: Description of Variables

Dependent Variable	
Production Adaptability	Has this firm adjusted or converted, partially or fully, its production or the services it offers in response to the COVID-19 outbreak? (no – 0, yes – 1)
Explanatory Variables	
<i>Firm characteristics</i>	
Firm age	Number of years from the year the firm began operations to 2020
Capital city	Location of the firm is in the official capital city (no – 0, yes – 1)
Share of direct export	Share of direct exports to total sales (in %)
Innovation in process	The firm has introduced any new or improved processes during the last three years (no – 0, yes – 1)
Use of website	At the present time, the firm has its own website (no – 0, yes – 1)
Firm strategy	The firm has a formalized, written business strategy with clear key performance indicators (no – 0, yes – 1)
<i>Manager characteristics</i>	
Experience of manager	Number of years of experience of the top manager in the sector
Gender of manager	0 – if manager is male, 1 – if manager is female
Foreign ownership	Percentage of the firm owned by private foreign individuals, companies, or organizations (in %)
Firm size	1 – micro; 2 – small; 3 – medium; 4 – large
Sector	1 – Food; 2 – Retail; 3 – Manufacturing, garments; 4 – Metal, machinery, and equip. mineral; 5 – Services
<i>Other explanatory variables</i>	
Access to financing	The firm has a line of credit or a loan from a financial institution at the date of Baseline Survey (0 – no; 1 – yes)
Government support	Since the outbreak of COVID-19, firm has received any national or local government support in response to the crisis (0 – no; 1 – yes)
Stringency index	Stringency index (Hale et al. 2021) calculated for the period from 1 January 2020 to the interview date of the Follow-up Survey.
Transport	How much of an obstacle is transport to operations of the firm? 1 – no obstacle; 2 – minor obstacle; 3 – moderate obstacle; 4 – major obstacle; 5 – very severe obstacle

Source: The World Bank, Enterprise Surveys (<http://www.enterprisesurveys.org>; accessed 10 October 2021).

It can be assumed that foreign owners may be better able to deal with the consequences of the COVID-19 crisis, as they have the advantage of using connections and resources from abroad. Differences between firms in terms of participation of foreign capital in the ownership structure are controlled by the foreign ownership variable. This continuous variable indicates the percentage owned by foreign private individuals, companies, or organizations, and takes a value from 0 to 100.

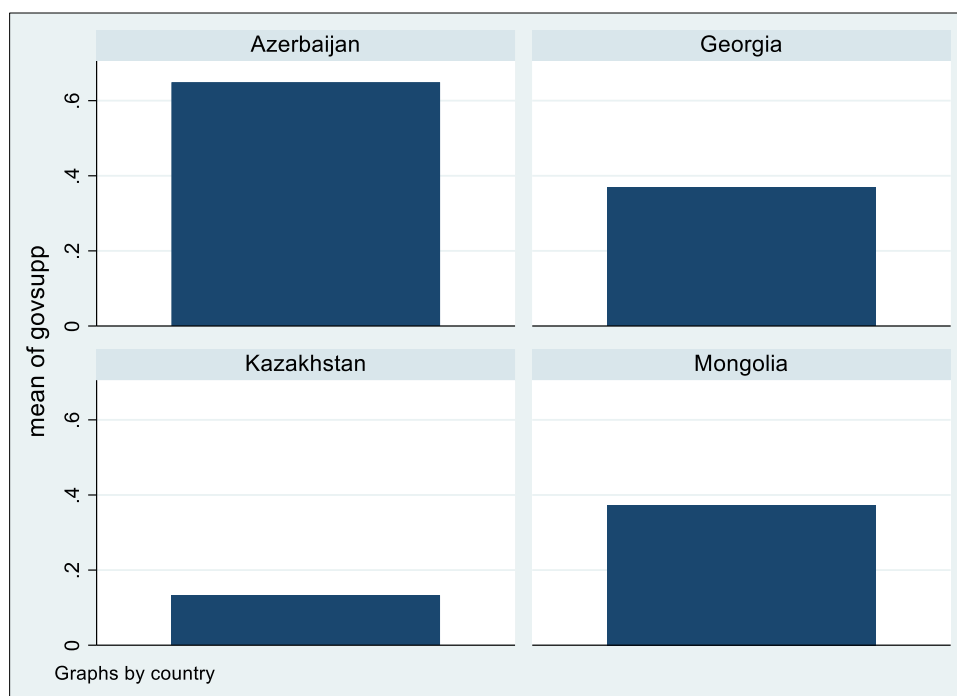
Firm innovativeness is also assumed to be an important determinant of firms' adaptability. We therefore use a dummy for firm innovativeness, which is equal to 1, if the firm has introduced new or improved process during last 3 years before the crisis, and 0 otherwise; these processes include methods of manufacturing products or

offering services; logistics, delivery, or distribution methods for inputs, products, or services; or supporting activities for processes. To measure the ability of exporter firms to perform direct export operations in a changing environment, we include a percentage of direct exports in total sales in the last completed month as an explanatory variable. We expect firms that are active in innovation to be more likely to adapt to the harsh environment caused by the COVID-19.

Existence of website may signify firm digitalization level and is an important means of outreach for firms in term of sales during the pandemic. To measure firm digitalization level, we use a dummy variable that equals 1 if the firm has its own website, and 0 otherwise. The firm strategy dummy is equal to 1 if the firm has a formalized, written business strategy with clear key performance indicators, and 0 otherwise.

The availability of external resources such as loans or government support can enhance a firm’s ability to cope with the negative impacts of a pandemic. At the same time, it is important to recognize whether loans and government support were provided to firms that are innovative, flexible, and resilient to crisis conditions. We also include two exogenous dummies, government support and access to financing, to assess how these environmental factors related with ability of the firm to deal with outbreaks differently. The dummy variable for government support is set equal to 1 if the firm received government support or expected to receive it in the next 3 months from the state or local government due to the COVID-19 crisis. Most firms received support from Azerbaijan (over 60%), and the least government support was reported in Kazakhstan (less than 20%) (Figure 10). The dummy for access to financing takes the value of 1 if the firm currently has a line of credit or a loan from a financial institution, and 0 otherwise.

Figure 10: Share of Firms that Received Government Support



Instability caused by external shocks can force firms to change their operations in response. Outbreaks, restrictions, and quarantines during the pandemic, as well as vaccination processes as an exogenous shock significantly affect firm activities. The COVID-19 pandemic is forcing companies to move their businesses to the domestic market, online sales, remote operations, and innovation. The average of the stringency index is used to evaluate the impact of pandemic conditions on firm adaptability. The average of the stringency index is calculated based on the Oxford COVID-19 Government Response Tracker (OxCGRT) Indicators for the period from 1 January 2020 to the interview date of the Follow-up Survey. The stringency index calculation methodology is described by Hale et al. (2021). The index indicates the severity of restrictions on the mobility and activities of people and firms. The calculation of the index is based on recommendations and requirements for the closure of workplaces, schools, universities, and public transport; restrictions on leaving home, meetings and public events, and domestic and international travel; and the presence of public information campaigns (Hale et al. 2021). The index takes a value from 0 to 100. The closer the index value is to 0, the less stringent were the restrictions applied, so the closer the index value is to 100, the stricter the restrictions.

Another independent variable is also used to account for the impact of transport obstacles on the firm's current operations during a pandemic. The variable indicates the degree of transport obstacles that could adversely affect the current operations of the firm, and it takes values from 1 to 5, with 1 denoting no transport obstacles and 5 very severe obstacles.

5. EMPIRICAL RESULTS

Estimation results on coefficients are presented in Table 4, and the results of the estimated coefficients are presented in Tables 4.A (Appendix). Table 4 reports the marginal effects based on estimations of the Eq. (1) for six samples and the results for the probit models on probability of production adjustments by firms as a response to pandemic conditions.

The stringency index has a significant positive impact pooled, but a negative impact in the 2020 and wave II subsamples. As the stringency of COVID-19 restrictions increases, the probability of production adaptation in the pooled sample increases significantly, but decreases in the 2020 and wave II samples. It should be noted that, in wave II, an increase in the index by 1% leads to an increase in the likelihood of adaptation by 45%. This finding suggests that, after unexpected economic effects in 2020, firms gradually adapted to the new realities, with this higher adaptability appearing in 2021 surveys.

If the firm has adopted a strategy, has its own website, and is younger, then these significantly increase the probability of production adaptability. Potentially, use of a website and existence of a strategy indicate firm communication and network channels that might help to support production and sales in times of the uncertainty. Significant negative impacts of directly exporting and having a male head are confirmed only in the pooled sample.

Table 4: Estimation Results (Marginal Effects)

Variables	Total Sample	2020	2021	2021(*)	Wave I: Mongolia and Georgia	Wave II: Mongolia and Georgia
Stringency index	0.0490*** (0.0176)	-0.0328* (0.0199)	0.0144 (0.120)	0.00721 (0.116)	-0.126 (0.122)	-0.457* (0.268)
Use of website	0.0393* (0.0224)	0.0553* (0.0283)	0.00924 (0.0349)	0.0279 (0.0275)	0.0623* (0.0362)	0.0479 (0.0402)
Share of direct export	-0.000934* (0.000567)	-0.000669 (0.000611)	-0.00054 (0.00125)	-0.000603 (0.000721)	-0.000638 (0.000886)	-0.000624 (0.000863)
Gender of manager (1=female)	0.0399* (0.0239)	0.0473 (0.0316)	0.0225 (0.0355)	0.0462 (0.0294)	0.0176 (0.0388)	0.0190 (0.0422)
Experience of manager	-0.000982 (0.00113)	-0.00157 (0.00142)	-0.00023 (0.00177)	-0.000824 (0.00140)	-0.00142 (0.00181)	-0.00105 (0.00198)
Firm age	-0.00244** (0.00119)	-0.0039** (0.00168)	-0.00095 (0.00177)	-0.00170 (0.00145)	-0.00392* (0.00201)	-0.000527 (0.00192)
Firm strategy	0.0385* (0.0228)	0.0867*** (0.0307)	0.000662 (0.0329)	0.0268 (0.0275)	0.0755** (0.0384)	0.0630 (0.0425)
Government support	0.0341 (0.0225)	-0.00481 (0.0268)	0.110*** (0.0382)	0.0707** (0.0291)	-0.00634 (0.0340)	0.0453 (0.0374)
Foreign ownership	0.00130*** (0.000478)	0.00110** (0.000518)	0.00136 (0.00100)	0.00131** (0.000631)	0.000961 (0.000686)	0.00139* (0.000781)
Access to financing	-0.0103 (0.0216)	-0.0221 (0.0267)	0.0192 (0.0343)	0.00788 (0.0272)	-0.0326 (0.0335)	-0.00446 (0.0374)
Transport	0.0124 (0.00858)	0.0121 (0.0101)	0.00734 (0.0148)	0.00524 (0.0108)	0.0206 (0.0132)	0.00849 (0.0146)
Innovation in process	0.0721*** (0.0260)	0.0716** (0.0329)	0.0791* (0.0405)	0.0891*** (0.0327)	0.0493 (0.0405)	0.103** (0.0436)
<i>Firm size (reference category: Micro)</i>						
<i>Small</i>	0.100 (0.0743)	0.106 (0.0722)	0.119 (0.178)	0.0266 (0.112)	0.148* (0.0821)	0.00914 (0.116)
<i>Medium</i>	0.123 (0.0758)	0.107 (0.0744)	0.166 (0.179)	0.0532 (0.114)	0.159* (0.0850)	0.0305 (0.120)
<i>Large</i>	0.0581 (0.0789)	0.0622 (0.0797)	0.0744 (0.182)	-0.0551 (0.116)	0.180* (0.0937)	-0.107 (0.125)
<i>Sector (reference category: Food)</i>						
<i>Retail</i>	-0.0297 (0.0377)	0.00595 (0.0441)	-0.0937 (0.0643)	-0.0611 (0.0471)	0.0202 (0.0575)	0.0261 (0.0660)
<i>Manufacturing, Garments</i>	0.0254 (0.0354)	0.0166 (0.0429)	0.0250 (0.0572)	0.0297 (0.0432)	0.0180 (0.0560)	-0.0126 (0.0635)
<i>Metal, Machinery, and Equip. Mineral</i>	-0.0526 (0.0477)		-0.0961 (0.0614)	-0.0685 (0.0516)		
<i>Services</i>	-0.0462 (0.0342)	0.00341 (0.0397)	-0.136** (0.0586)	-0.0838** (0.0424)	0.0235 (0.0527)	-0.0119 (0.0606)
Capital city	0.00993 (0.0243)	-0.0514* (0.0281)	0.124*** (0.0437)	0.109*** (0.0326)	-0.132*** (0.0341)	0.0525 (0.0408)
Country dummy	+	+	+	+	+	+
Observations	2,146	1,182	964	1,398	748	655

Notes: Standard errors are in parentheses. ***, **, and* represent statistical significance of 1%, 5%, and 10%, respectively. Column "2021(*)" indicate the sample includes observations for 2021 and second wave of Georgia.

Receiving government support and being located in the capital city significantly increases the likelihood of production adaptability by an average of about 10% in the 2021 subsamples. This effect indicates that government support measures since the beginning of the COVID-19 pandemic have a positive impact later on. The empirical results also show that firms with foreign-owned shares tended to adjust their production partially or completely in response to the COVID-19 outbreak. The influence of foreign capital participation on the likelihood of adaptation is statistically significant and positive in almost all models.

Firms that had introduced any new or improved process during the last three years in the baseline survey appeared to have transformed their production as a response to COVID-19, as this increases the probability of production adaptability by about 7%–10%. These results are in line with our expectations that more innovative companies are more resilient to changing conditions.

The effects of location in the capital city are significant in explaining the likelihood of production adjustments or transformations during the pandemic in four models. According to the results, firms surveyed in later rounds (2021 and 2021*) are more likely to adapt their production activities compared to companies located outside the capital city. However, those interviewed in the earlier wave of the survey, on the contrary, were less likely to adapt their production activities compared to companies located outside the capital. The firm size dummies are not statistically significant, except for the results for the wave I sample. Most of the results for firm sector dummies are not statistically significant, either, except for the service sector in 2021. Most of the results for the sector-specific dummies are also not statistically significant, which indicates that the overall economy was negatively affected by COVID-19, and this negative effect was higher for firms operating in the service sector.

6. CONCLUSIONS

This study empirically investigated factors affecting firms' ability to adjust production in response to the COVID-19 outbreak. This study used firm-level survey data from the Enterprise Survey implemented by the World Bank Group, including a standard Enterprise Survey (Baseline) and two waves of Follow-up Surveys conducted in 2020 and 2021 that included questions related to the COVID-19 situation and firm behavior during the pandemic. We used data from four CAREC member countries: Azerbaijan, Georgia, Kazakhstan, and Mongolia. Using a probit model, we assessed how different factors, including firm characteristics and government policy, affected the probability that a firm would be able to adjust its activities to the changed conditions. The results indicated that firms which adapted to the COVID-19 crisis tended to be younger firms with foreign investment, that were innovative in the recent past, with a female manager, a formal firm strategy with key performance indicators, and having its own website. Overall, the findings indicate that, at later rounds of the survey, firms were adapting to the new realities. Innovation and firm strategy are important, and government support is also important, although its effect appeared later (in 2021).

APPENDIX A

Table A1: Estimation Results for Probit Models on Probability of Production Adaptation of Firms to COVID-19 (Coefficient Estimates)

Variables	Total Sample				Survey Round I:	Survey Round II:
		2020	2021	2021(*)	Mongolia and Georgia	Mongolia and Georgia
Stringency index	0.138*** (0.0500)	-0.101 (0.0613)	0.0398 (0.333)	0.0206 (0.331)	-0.388 (0.377)	-1.329* (0.785)
Use of website	0.111* (0.0632)	0.169* (0.0872)	0.0256 (0.0966)	0.0795 (0.0786)	0.192* (0.112)	0.139 (0.117)
Share of direct export	-0.00263 (0.00160)	-0.00205 (0.00188)	-0.00149 (0.00347)	-0.00172 (0.00206)	-0.00197 (0.00274)	-0.00182 (0.00252)
Gender of manager (1=female)	0.112* (0.0675)	0.145 (0.0972)	0.0624 (0.0983)	0.132 (0.0842)	0.0543 (0.120)	0.0554 (0.123)
Experience of manager	-0.00277 (0.00319)	-0.00483 (0.00437)	-0.00062 (0.00490)	-0.00235 (0.00399)	-0.00438 (0.00559)	-0.00307 (0.00577)
Firm age	-0.00688** (0.00336)	-0.0119** (0.00516)	-0.00264 (0.00490)	-0.00484 (0.00415)	-0.0121* (0.00624)	-0.00153 (0.00559)
Firm strategy	0.109* (0.0644)	0.266*** (0.0949)	0.00184 (0.0912)	0.0764 (0.0784)	0.233* (0.119)	0.183 (0.124)
Government support	0.0963 (0.0637)	-0.0147 (0.0823)	0.305*** (0.107)	0.202** (0.0836)	-0.0196 (0.105)	0.132 (0.109)
Foreign ownership	0.00367*** (0.00135)	0.00337** (0.00160)	0.00376 (0.00279)	0.00372** (0.00181)	0.00297 (0.00213)	0.00404* (0.00229)
Access to financing	-0.0289 (0.0610)	-0.0678 (0.0820)	0.0532 (0.0952)	0.0225 (0.0777)	-0.101 (0.104)	-0.0130 (0.109)
Transport	0.0350 (0.0243)	0.0371 (0.0310)	0.0203 (0.0409)	0.0150 (0.0309)	0.0635 (0.0408)	0.0247 (0.0426)
Innovation in process	0.204*** (0.0737)	0.219** (0.101)	0.219* (0.113)	0.254*** (0.0941)	0.152 (0.125)	0.300** (0.129)
Firm size (reference: Micro)						
Small	0.303 (0.244)	0.357 (0.274)	0.350 (0.561)	0.0764 (0.326)	0.550 (0.382)	0.0266 (0.339)
Medium	0.366 (0.247)	0.360 (0.279)	0.478 (0.565)	0.151 (0.330)	0.586 (0.389)	0.0879 (0.349)
Large	0.181 (0.257)	0.219 (0.297)	0.224 (0.574)	-0.166 (0.342)	0.648 (0.406)	-0.332 (0.373)
Sector (reference: Food)						
Retail	-0.0832 (0.105)	0.0183 (0.136)	-0.255 (0.176)	-0.173 (0.133)	0.0633 (0.181)	0.0750 (0.190)
Manufacturing, Garments	0.0694 (0.0969)	0.0509 (0.132)	0.0668 (0.153)	0.0812 (0.118)	0.0565 (0.177)	-0.0368 (0.186)
Metal, Machinery, and Equip. Mineral	-0.149 (0.137)		-0.262 (0.167)	-0.194 (0.147)		
Services	-0.131 (0.0960)	0.0105 (0.123)	-0.376** (0.162)	-0.239** (0.120)	0.0733 (0.166)	-0.0347 (0.177)
Capital city	0.0279 (0.0682)	-0.160* (0.0891)	0.334*** (0.116)	0.302*** (0.0890)	-0.423*** (0.116)	0.151 (0.117)
Country dummy	+	+	+	+	+	+
Constant	-9.463*** (3.386)	4.792 (3.449)	-3.122 (22.50)	-1.509 (22.30)	20.49 (20.84)	74.65* (44.60)
Observations	2,146	1,182	964	1,398	748	655
Pseudo R-squared	0.0374	0.0431	0.0703	0.0714	0.0550	0.0871
LR	103.6	61.25	92.16	132.2	49.65	75.44
P-value	0	4.56e-06	1.47e-10	0	0.000249	2.30e-08
LogLik	-1,333	-679.5	-609.1	-859.7	-426.5	-395.3

Notes: Standard errors are in parentheses. ***, **, and * represent statistical significance of 1%, 5%, and 10%, respectively. Column "2021(*)" indicates the sample includes observations for 2021 and for the second wave of Georgia.

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