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THE RUSSIAN INVASION OF UKRAINE AND ITS IMPACT ON DIGITALIZED SMALL FIRMS IN CENTRAL AND WEST ASIA: EVIDENCE FROM RAPID SURVEYS

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Abstract

The Russian invasion of Ukraine disrupted a V-shaped economic post-pandemic recovery in Central and West Asia. It affected global supply chains and slowed the region's growth momentum while adding inflationary pressures. Private businesses were adversely affected by the impact of the invasion and global sanctions against the Russian Federation, with the effects being more pronounced for micro- and small firms. As the pandemic helped create a base of digitalized firms, this paper discusses how business digitalization—and the use of digital finance—affected the operations of small firms as the impact of the invasion began to be felt. It uses a linear probability regression based on rapid business surveys conducted in seven Central and West Asian countries—Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan. The results show that digitalization has yet to allow small firms to take full advantage of the opportunities it offers for more efficient business operations. Digital finance has yet to be well accepted and used by small businesses, even those already digitalized. Micro- and small firms already digitalized can be split into two groups: those maximizing business opportunities and those suffering from global sanctions. Based on the analysis, the paper suggests four policy implications that can help promote business digitalization of small firms across the region.

Keywords: Russian invasion of Ukraine, digitalization, digital financial services, access to finance, SME development, SME policy, Central and West Asia

JEL Classification: D22, G20, L20, L50

Contents

1. INTRODUCTION

The Russian invasion of Ukraine, which started in late February 2022, interrupted the growth momentum of Central and West Asian economies that had recovered from the coronavirus (COVID-19) pandemic. Supported by widespread government assistance programs for individuals and businesses, the Central and West Asian region, which covers Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan, made a V-shape recovery from the pandemic—with their economies growing by 5.7% in 2021, up from the 2% contraction in 2020 and higher than the pre-pandemic growth rate of 4.7% in 2019 (ADB 2022a, 2022b). However, the region's growth was hit again—with inflation added—in 2022, affected by the global economic slowdown triggered by the Russian invasion and related sanctions. Growth is currently forecast to drop to 3.9% in 2022. The region's inflation rate decreased gradually to 7.3% in 2019, but rose to 7.7% in 2020 and 8.9% in 2021 from the impact of the pandemic; it is forecast to further increase to 11.5% in 2022 due to global supply chain disruptions with the Russian Federation—a major trading partner of Central and West Asian economies—along with surging food and commodity prices, and energy costs regionally.

The impact on individual economies varied greatly, presenting either new challenges or new business opportunities. For example, Armenia's economic growth was projected to increase by 7% in 2022, higher than 2021 (5.7%). The country was able to attract large firms leaving the Russian Federation and expand exports. By contrast, Tajikistan saw economic growth fall from a record 9.2% in 2021 to the 4% forecast in 2022, mainly due to disrupted imports of food and essential goods and diminished remittances from the Russian Federation as many migrant workers returned home.

The invasion thus brought some sharp, structural changes to the business environment across Central and West Asia, though not all in one direction. The impact was magnified for micro, small, and medium-sized enterprises (MSMEs), which are key drivers of economic growth across the region. They accounted for 98.9% of all enterprises, absorbed 46.1% of the workforce, and generated an average 40.7% of a country's economic output during the period 2010–2021 (Table 1). They contributed an average one-third (32.4%) of exports (by value) from 2015 to 2021—higher than the Southeast Asia average (19.2%). To strengthen the dynamism of MSMEs and create resilient, inclusive growth amid global economic uncertainty, governments need to understand what factors can help this process most effectively to better design MSME policies. Promoting digitalization is one such factor.

Mobility restrictions during the COVID-19 pandemic rapidly accelerated businesses' digital transformation, including MSMEs. Global research by the Organisation for Economic Co-operation and Development (OECD 2021) found that up to 70% of small firms had increased their use of digital technology since the pandemic started. Several benefits are considered from digitalization—online product sales (e-commerce) and online business administration. It helps MSMEs better access the information they need, strengthens their networks, offers new domestic and global market opportunities, reduces logistics and administration costs, expands funding opportunities through digital finance platforms like peer-to-peer lending, and drives more business innovation (OECD 2021).

An Asian Development Bank (ADB) report (ADB 2022c) found that, while the pandemic and mobility restrictions were an incentive for MSMEs to go digital, those that digitalized were not always successful during the pandemic.[1] Two streams of business clusters were created by the pandemic among digitally operated MSMEs—those that increased profits and those that did not. The reasons for MSMEs doing worse were likely associated with marketing, strategic, and management failures—such as products (nonessential goods and services) not aligned with demand during social restrictions, weak business models prior to starting an online business, unfamiliarity with using technology for operations, and poor cost management. The report also found limited use of digital financial services (mobile banking, peer-to-peer lending, and crowdfunding) during the pandemic—even among digitalized MSMEs—due to their unfamiliarity with the technology. Shinozaki (2022a and 2022b) found a similar trend among digitalized MSMEs in Indonesia, suggesting that more business development services and mentoring support are needed for MSME owners to properly design and manage their online business.

Digital transformation is a post-pandemic policy priority and critical for strengthening competitiveness and helping build economic resilience against shocks like the Russian invasion of Ukraine. In Central and West Asia, digitalization remains at an early stage of development, even as digital access has increased in the region.[2] An interoperable national payment system has been created in several countries.[3] Yet, digital financial services like credit, savings, insurance, and remittance services have not been well spread across the region. To use these more widely, national MSME development policies commonly promote MSME competitiveness by adopting new technology.[4] A national financial inclusion strategy exists in the Kyrgyz Republic, Tajikistan, and Uzbekistan, while a national financial education strategy is being implemented in Azerbaijan, Georgia, and Kazakhstan. The common strategic goal is to diversify financial products, including digital financial services.[5]

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[1] The report analyzed MSME survey data tracking the COVID-19 impact on their business operations in Indonesia, the Lao People's Democratic Republic, the Philippines, and Thailand over a year from March 2020.

[2] Mobile cellular subscriptions per 100 people averaged 118.3 in 2020 for Central and West Asia (Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan). An average 66.4% of the region's people used the internet in 2020 (except for the Kyrgyz Republic in 2019 and Tajikistan in 2017), based on World Bank data (https://data.worldbank.org/indicator/IT.CEL.SETS.P2).

[3] These include *ArCa* (Armenian Card, a unified card payment system launched in 2000) and *Idram* (an interoperable payment system for commercial banks) in Armenia, instant payment systems using quick response (QR) codes in Azerbaijan and Kazakhstan, *Elcard* (a national payment switch) in the Kyrgyz Republic, and *Humo* (a retail payment system) in Uzbekistan. Kazakhstan also plans to introduce a digital currency, "digital tenge."

[4] MSME policies in Central and West Asia: Small and Medium Entrepreneurship Development Strategy 2020–2024 in Armenia, SME Roadmap for 2017–2020 in Azerbaijan, SME Development Strategy 2021–2025 in Georgia, Development Concept of SMEs for 2030 in Kazakhstan, National Development Strategy for 2018–2040 in the Kyrgyz Republic, National Development Strategy for 2030 in Tajikistan, and Strategy for Five Priority Areas of Development for 2017–2021 in Uzbekistan. ADB Asia Small and Medium-Sized Enterprise Monitor 2022 Volume I.

[5] National Financial Inclusion Strategies in Central and West Asia: Strategy for Improving Financial Inclusion for 2022–2026 in the Kyrgyz Republic, National Strategy for Financial Inclusion for 2022–2026 in Tajikistan, and National Strategy for Increasing Financial Inclusion for 2021–2023 in Uzbekistan. National Financial Education Strategies in Central and West Asia: Strategic Roadmap for Development of Financial Services for 2017–2020 (includes "financial literacy" pillar) in Azerbaijan, National Strategy of Financial Education 2016 in Georgia, and Concept of Improving Financial Literacy for 2020–2024 in Kazakhstan. ADB Asia Small and Medium-Sized Enterprise Monitor 2022 Volume I.

This paper raises fundamental questions about "digitalization." How would it work best for a company maintaining and growing its business during crises and global economic uncertainty? How could it strengthen MSME dynamism? Are there specific conditions or challenges in adapting digitalization to sustain business growth?

As the pandemic built a foundation to some extent for digitalizing businesses in the region, this paper examines how digitalized small firms performed 6 months after the invasion and assesses the extent to which digitalization could handle the challenges brought by the global sanctions against the Russian Federation or create business opportunities. It uses regression models based on data from the seven MSME surveys conducted during the period from July 2022 to August 2022, covering Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan. It also discusses policy implications on promoting the digital transformation for MSMEs and how to deal with related challenges to build more resilient growth.

Section 2 summarizes national policy responses or "anti-crisis actions" to support MSMEs affected by the invasion in the region. Section 3 explains the methodology and data used for analyses. Section 4 discusses the findings from the surveys and econometric analyses in terms of revenues, employment, wages, and financial conditions, addressing digitally operated small firms, followed by associated policy implications. Section 5 concludes.

Table 1: MSMEs in Central and West Asia

Region	Country	Number of MSMEs (% of total)	Employed by MSMEs (% of total)	MSME Contribution to GDP[d] (%)	MSME Exports (% of total values)	MSME Bank Loans to Total (%)	MSME Bank Loans to GDP (%)
Central and West Asia	Armenia	99.8	68.7	26.3	17.7	31.6	16.8
	Azerbaijan	99.7	42.1	16.7	…	26.7	4.8
	Georgia	99.7	62.8	60.8	55.8	19.8	14.1
	Kazakhstan	99.8	39.3	33.5	…	20.0	4.6
	Kyrgyz Republic	98.2	49.3	42.8	27.3	76.8	19.3
	Tajikistan	98.6	20.4	59.4	…	16.0	2.5
	Uzbekistan	99.3	74.4	54.9	20.0	18.2	8.1
	(average, 2010–2021)[a]	98.9	46.1	40.7	32.4	31.4	9.0
South Asia	(average, 2010–2021)[b]	99.6	76.6	16.3	47.0	15.2	6.2
Southeast Asia	(average, 2010–2021)[c]	97.7	67.3	40.8	19.2	15.6	14.2

GDP = gross domestic product; MSME = micro, small, and medium-sized enterprise.

[a] Regional average during 2010–2021 for the number of MSMEs, those employed by MSMEs, and MSME contribution to GDP; 2015–2021 for MSME exports and MSME bank loans.

[b] Average of latest available data for the number of MSMEs and those employed by MSMEs; regional average during 2010–2020 for MSME contribution to GDP; data during fiscal year 2013–2020 for India only; regional average during 2015–2021 for MSME bank loans to total; 2015–2020 for MSME bank loans to GDP.

[c] Regional average during 2010–2021 for the number of MSMEs, those employed by MSMEs, MSME contribution to GDP, and MSME bank loans; 2010–2020 for MSME exports.

[d] Based on GDP for the Kyrgyz Republic, Tajikistan, and Uzbekistan; gross value added for Armenia, Azerbaijan, Georgia, and Kazakhstan.

Notes: Data in 2020 for Armenia, Azerbaijan, and Georgia; 2021 for Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan (except MSME bank loans: 2021 for all countries). South Asia includes Bangladesh, India, Nepal, Pakistan, and Sri Lanka; Southeast Asia includes Association of Southeast Asian Nations (ASEAN) countries; reporting countries only.

Source: Data from Asian Development Bank (ADB) Asia SME Monitor 2022 database.

2. NATIONAL ANTI-CRISIS ACTIONS

The fundamental cause and effect differs between the COVID-19 crisis and the shocks related to the Russian invasion of Ukraine. The epidemic directly attacked people, and each government took quarantine measures and lockdowns to protect people from the pandemic, causing supply chain disruptions and economic and business contractions. Travel bans, border closures, business closures, and mobility restrictions were all attributed to the country's policy decision; hence, the governments introduced timely economic stimulus packages to reduce the negative effects from quarantine measures, which led to a relatively smooth economic recovery from the pandemic in Central and West Asia.

By contrast, the region's economic shocks that started in February 2022 arose from an external factor—the Russian invasion of Ukraine. Supply chain disruptions and the slowed growth momentum with inflationary pressures in the region were not triggered by the national policy decision but by sanctions against the Russian Federation. The magnitude of the economic impact is affected by the extent to which the country relies on the Russian economy. Hence, the Russian invasion of Ukraine elicited different reactions by different countries in Central and West Asia. Roughly, they fell into two groups—(i) West Asian countries (Armenia, Azerbaijan, and Georgia) with no comprehensive anti-crisis plan, and (ii) Central Asian countries (Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan) that prepared a set of action plans to protect people and businesses from the economic damage caused by the invasion and associated sanctions against the Russian Federation.[6]

In Armenia, the invasion impact was limited and in fact opened up business opportunities. The Russian Federation is its largest trading partner—with 28% of Armenian exports heading to the Russian Federation in 2021 and 33% of its imports coming from the Russian Federation. Around half (54%) of inward remittances emanated from the Russian Federation in 2021. However, due to tightened restrictions on Armenian migrant workers in the Russian Federation, personal remittances sharply decreased, shifting instead to the United States (US), which accounted for 46% of its inward remittances as of July 2022. Armenian banks were not affected by the global sanctions like the Russian Federation's disconnection from SWIFT. Rather, several Russian-based firms and individuals opened bank accounts in Armenia. And as travel restrictions from the Russian Federation to Europe rose, Armenia benefited from an increase in tourism (41.5% of its tourists came from the Russian Federation in 2021 and this continued to rise in 2022). Armenian exports also benefited as Russian importers looked to increase supply from Armenia. All this contributed to Armenian economic growth in 2022.

Azerbaijan has no comprehensive anti-crisis plan as the economic damage from the invasion was limited. Revenues from its oil industry gained from high oil prices, temporarily covering the impact from lower inward remittances, supply chain disruptions, and higher inflation. However, from a long-term perspective over food supplies, the government has taken specific measures to support farmers and agribusiness, including MSMEs. It is offering cash handouts to farmers, financial assistance to buy fertilizers, concessional leasing of agricultural machinery (50% subsidies), and tax exemptions for agricultural production. Given the high inflation, the government also increased the monthly minimum wage by 20%.

[6] This section summarizes the key findings from ADB's Asia Small and Medium-Sized Enterprise Monitor 2022 Volume I and Volume II.

Georgia also has no national anti-crisis plan, while Enterprise Georgia (a policy implementing agency) established an export assistance program for small and medium-sized enterprises (SMEs—there is no microenterprises category), given the reduction in foreign trade affected by the invasion. The program has three components: (i) product licensing and certification set to international standards, (ii) product branding, and (iii) expanding its global marketplaces—promoting quality exports to trading partners outside the Russian Federation or Ukraine.

Kazakhstan is being hit primarily from the global sanctions against the Russian Federation, with gross domestic product (GDP) growth forecast to slow from 4.3% in 2021 to 3% in 2022 (ADB 2022a). The Russian Federation was the source of 42% of the country's imports. Sanctions immediately created supply disruptions in food and commodities, forcing the country to seek alternative partners for imports. US sanctions on Russian banks—Sberbank, Alfa Bank, and VneshTorgBank (VTB)—in April 2022 affected businesses that use their Kazakhstan branches. Most MSMEs were forced to change bank accounts to other commercial banks. Some Russian Federation- and Belarus-based firms relocated to Kazakhstan, opening bank accounts in Kazakhstan banks; but this threatens secondary sanctions on Kazakhstan banks. The government acted quickly to respond to the damage and potential damage caused by the sanctions against the Russian Federation by establishing an anti-crisis command center in March 2022. Several assistance measures for domestic firms, including MSMEs and farmers, are being discussed—such as increased subsidies for agriculture-related insurance, concessional leasing of agricultural machinery, and other financial assistance.

In the Kyrgyz Republic, like other neighboring countries, the economy is closely linked to the Russian Federation and Ukraine through trade: In 2021, 24% of Kyrgyz exports and 34% of its imports were with the Russian Federation. With potential trade losses and supply chain disruptions being critical issues, the government quickly responded with an anti-crisis action plan in March 2022. It involved three major pillars: (i) food security and price stability (for example, providing seeds and fertilizers to farmers, diversifying sources for importing crops and fuel, and financial assistance for farmers and agribusinesses); (ii) social protection and safety nets (like increasing allowances, pensions, and safety net programs); and (iii) MSME employment (such as support for returning migrant workers looking for jobs, deregulating entrepreneurship development, refinancing for agricultural producers and agriculture value chain development, and currency risk sharing for MSME exporters).

Tajikistan relies heavily on the Russian Federation for exports, labor, and remittances. Global sanctions immediately hit the economy, leading to the government's Anti-Crisis Action Plan in March 2022. The plan covers (i) social protection for the poor and vulnerable (cash transfers), (ii) food security (securing food stock and providing seeds and fertilizers to farmers), and (iii) SMEs hit hard by sanctions on the Russian Federation (returning migrant workers to receive vocational training; and concessional loans offered to SMEs in agriculture, trade, and services).

Uzbekistan also suffered from the invasion and resultant sanctions. The Russian Federation was the main trading partner with Uzbekistan—since 2021, it has been the People's Republic of China (PRC)—and main destination of Uzbekistan migrant workers, with inward remittances accounting for over 11% of GDP, the highest among Central and West Asian economies. Sanctions hit the economy with supply chain disruptions, high inflation, and reduced inward remittances. In response, from March 2022 to May 2022, the government quickly took countercyclical measures focusing on (i) food security and price stability (importing wheat from Kazakhstan and exempting value-added taxes and customs duties on essential food products), (ii) social protection assistance (cash transfers to the vulnerable population), and (iii) business and

job support (financial assistance for entrepreneurs and providing self-employment opportunities for the unemployed and returning migrant workers). Many foreign information technology (IT) specialists have moved to Uzbekistan since early 2022 (on government-issued special three-year IT visas), and many Russian and Belarusian tourists have visited Uzbekistan, benefiting tourism and IT sectors.

With these two country groups, this study includes analysis of MSME operations by country group with and without anti-crisis plans.

3. METHODOLOGY AND DATA

The literature analyzing the impact of economic sanctions against the Russian Federation includes Dreger et al. (2016) and Sedrakyan (2022). The former used cointegrated vector autoregression (VAR) models to estimate the impact of economic sanctions and oil prices on the Russian Federation's ruble. A sharp ruble depreciation against the US dollar occurred with the conflict between the Russian Federation and Ukraine in 2014, but the results showed that the ruble depreciation was largely caused by the oil price decline rather than sanctions associated with the conflict, suggesting that the short-term effect of sanctions was likely limited in the Russian economy. Sedrakyan (2022) used gravity models of bilateral trade and direct investment to estimate the spillovers of sanctions into third-party countries. The results indicated that the Western and US sanctions against the Russian Federation from 2014 to 2018 largely contracted the Russian Federation's international trade and investment capacities to 27 transition economies, negatively affecting neighboring countries' economies. This revealed strong economic ties between the Russian Federation and countries in the former Soviet Union.

From a different angle, this paper focuses on the spillovers of what was brought by the Russian invasion of Ukraine (including sanctions) into businesses in neighboring Central and West Asian countries, addressing digitalized small firms, by using a linear probability regression. The study uses data obtained from rapid MSME surveys conducted from 25 July 2022 to 24 August 2022 in seven Central and West Asian countries (Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan). The survey questionnaire was delivered online to MSMEs through survey partners, including government authorities, chambers of commerce, and SME associations.[7]

[7] The following were survey partners: for Armenia, the European Union-funded Increased Resilience of Syrian Armenians and Host Population (IRIS) program, Impact Hub Armenia Social Innovation Development Foundation (Impact Hub Yerevan), Chamber of Commerce and Industry, European Business Association of Armenia, American Chamber of Commerce in Armenia; for Azerbaijan, the Small and Medium Business Development Agency, American Chamber of Commerce in Azerbaijan, National Confederation of Entrepreneurs' (Employers') Organizations; for Georgia, the Small and Medium Enterprises Development Association, Georgian Chamber of Commerce and Industry, Auditing and Consulting Firm "Loialte"; for Kazakhstan, the "DAMU" Entrepreneurship Development Fund, National Chamber of Entrepreneurs; for the Kyrgyz Republic, the Chamber of Commerce and Industry, JIA Business Association, Association of Legal Entities "International Business Council," Association of Suppliers (Manufacturers And Distributors), Union of Banks of Kyrgyzstan, American Chamber of Commerce in the Kyrgyz Republic, Kyrgyz Union of Industrialists and Entrepreneurs, Association for the Development of the Agro-Industrial Complex, Association of Guarantee Funds and Entrepreneurs; for Tajikistan, the Chamber of Commerce and Industry, National Association of Small and Medium Business, American Chamber of Commerce in Tajikistan, National Association of Business Women of Tajikistan, LLC micro credit deposit organization "FAZOS"; and for Uzbekistan, the Chamber of Commerce and Industry of Uzbekistan, Association of Private Travel Organizations, Association of Textile and Clothing and Knitwear Enterprises, Association of Exporters.

The analysis uses reclassified survey data by firm size (micro and small [MS] firms and medium-sized and large [ML] firms), broad business categories (agriculture, manufacture, and services), and country grouping (West Asian and Central Asian countries). The firm classification refers to the employment threshold as defined nationally, which differs by country but is more unified in West Asia (Table 2). Armenia, Azerbaijan, Kazakhstan, and the Kyrgyz Republic have micro, small, and medium-sized enterprise categories. But Georgia and Tajikistan define SMEs with no microenterprise category. Uzbekistan has only two categories for micro and small firms. To unify firm size across countries, the analysis focuses on two broad categories—MS and ML. Similarly, industry classifications differ by country. To compensate for this, sector data were reclassified based on the standardized industry classification ADB uses in its Asia SME Monitor database (Table 3). As discussed in Section 2, countries were also reclassified into two groups—(i) West Asian countries (Armenia, Azerbaijan, and Georgia) without comprehensive anti-crisis plans, and (ii) Central Asian countries (Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan) that initiated anti-crisis plans.

The same survey questionnaire was used across countries to collect comparative MSME data (except for country-specific data such as company location). The questionnaire was translated into three languages—English, Russian, and the language of countries surveyed. It had four components: (i) a company profile (a firm's primary business, location, operating period, employment, wage per employee, annual revenue, engagement of e-commerce, and exposure to global business); (ii) business conditions after the Russian invasion of Ukraine in February 2022 (changes in business environment, sales revenue, employment, wage payments, and fiscal and funding conditions); (iii) business concerns of MSMEs and likely actions should the invasion and associated sanctions continue throughout 2022; and (iv) the policy support measures MSMEs feel they need to maintain their business amid the global economic uncertainty accelerated by the invasion.

Table 2: MSME Definitions Used for Firm Classification, Employment Grouping

Item	Micro	Small	Medium	Large	Remarks
Armenia	0–9	10–49	50–249	250 and more	
Azerbaijan	1–10	11–50	51–250	251 and more	
Georgia		up to 49	50–250	251 and more	
Kazakhstan	up to 14	15–99	100–249	250 and more	
Kyrgyz Republic	up to 14	15–50	51–200	201 and more	Agriculture and manufacturing.
	up to 7	8–15	16–50	51 and more	Services.
Tajikistan		up to 49	50–200	201 and more	Agriculture.
		up to 29	30–100	101 and more	Other sectors.
Uzbekistan	1–5	6–25			Wholesale and retail trade.
	1–10	11–25			Arts, entertainment, and recreation.
	1–10	11–100			Transportation and storage; accommodation and food services.
	1–20	21–25			Financial and insurance services; education.
	1–20	21–50			Agriculture; power supply; water supply; professional services; management services; other services.
	1–20	21–100			Motor vehicle repair; information and communications; health and social services.
	1–20	21–200			Mining and quarrying; manufacturing; construction.

MSME = micro, small, and medium-sized enterprise.

Note: Data for number of employees follow national MSME definitions.

Source: Data from ADB Asia SME Monitor 2022 database.

Table 3: Industry Classification

Broad Category	Industry Classification
Agriculture	Agriculture, forestry, and fisheries
Manufacture	Manufacturing
	Construction
Services	Wholesale and retail trade (including repair of motor vehicles and motorcycles)
	Essential services (including electricity, gas, steam, and air conditioning supply; water supply [including sewerage, waste management, and remediation activities]; financial and insurance activities; and human health and social work activities)
	Transport and storage
	Accommodation and food service activities
	Information and communications technology
	Professional, scientific, and technical activities
	Education
	Arts, entertainment, and recreation
	Other service activities (including mining and quarrying, real estate activities, and administrative and support service activities)

Notes: The standardized industry classification was modified, grouping some service subsectors into "essential services," given the similar characteristics based on essential needs for people's living. Mining, real estate, and administrative services were combined with "other services" due to their small sample size.

Source: Author.

3.1 Data Structure

Because of the nature of online surveys, samples were not selected randomly and did not follow the existing national statistics framework; thus, they may have a self-selection problem and nonresponse bias. Due to the need for a snapshot assessing the impact of the Russian Federation's invasion on domestic businesses and to find the policies needed, online surveys were the best option to hear what MSMEs had to say even before the full impact was felt.

There were 903 completed responses from firms across the seven countries, but the sample size varied by country—21 firms from Armenia, 83 from Azerbaijan, 144 from Georgia, 112 from Kazakhstan, 392 from the Kyrgyz Republic, 30 from Tajikistan, and 121 from Uzbekistan. This made it difficult to analyze data by country. Thus, the analysis focused on pooling data as regional firm data. There may be different effects among countries, especially between those with and without anti-crisis policy plans. The study incorporates a binary variable into the analysis to see the difference between the two groups: Group A (West Asia: Armenia, Azerbaijan, and Georgia) with 248 samples and Group B (Central Asia: Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan) with 655 samples.

As the study uses the pooling data, a weighting adjustment cannot be used to minimize possible bias. To understand the extent of the bias, the distribution of the unweighted survey samples was compared with existing national statistics frameworks (Table 4). The enterprise data aggregated the official number of MSMEs from the national statistics offices for the latest available year (2020 or 2021) and were recalculated as percentage shares by firm size (MS and ML), business sector (agriculture, manufacture, and services), and region (capital city and other regions).[8]

[8] The national MSME definition varies by country (Table 2), but by reclassifying them into two categories (MS and ML), firms with around 50 employees were roughly categorized as MS and those with over 50 employees as ML.

Micro and small firms were underrepresented by 8.4 percentage points for the survey data, while medium-sized and large firms were overrepresented by an equal 8.4 percentage points. There were some differences between MSME surveys and national statistics. By sector, the difference was 26.6% overrepresentation in agriculture, 1.6% overrepresentation in manufacture, and 28.2% underrepresentation in services. The difference in manufacture was limited. By region, the difference was 11.2% overrepresentation in regions outside the capital city. These differences should be considered when interpreting estimate results.

By firm size, 90.7% of respondents (819 firms) owned micro and small firms, with the rest owning medium-sized and large firms. By sector, 47.8% of surveyed firms were in services, followed by 33.6% in agriculture and 18.6% in manufacture. By region, 26% of those surveyed operated in the capital city and 74% in other regions.[9]

Table 4: Comparison between Surveys and National Statistics Distribution

Item	MSME Surveys	Share (%) (1)	National Statistics	Share (%) (2)	Gap (1)–(2)
By Firm Size	903	100.0	2,477,396	100.0	–
Micro and small	819	90.7	2,455,697	91.1	(8.4)
Medium and large	84	9.3	21,699	0.9	8.4
By Sector	903	100.0	…	100.0	–
Agriculture	303	33.6	…	7.0	26.6
Manufacture	168	18.6	…	17.0	1.6
Services	432	47.8	…	76.0	(28.2)
By Region	903	100.0	…	100.0	–
Capital city	235	26.0	…	37.2	(11.2)
Other regions	668	74.0	…	62.8	11.2

MSME = micro, small, and medium-sized enterprise.

Note: Data for national statistics refer to: (i) Armenia: Statistical Committee of the Republic of Armenia (Armstat) data in 2020; (ii) Azerbaijan: State Statistical Committee of the Republic of Azerbaijan data in 2020; (iii) Georgia: Annual Statistical Survey of Enterprises data in 2020; (iv) Kazakhstan: Bureau of National Statistics data in 2021; (v) the Kyrgyz Republic: National Statistics Committee of the Kyrgyz Republic data in 2021; (vi) Tajikistan: Agency on Statistics under President of the Republic of Tajikistan data in 2021; and (vii) Uzbekistan: State Committee on Statistics of Uzbekistan data in 2021.

Source: Author's calculations based on MSME survey data and ADB Asia SME Monitor 2022 database.

Digitally operated firms—those selling goods and services online (e-commerce)—accounted for 19.4% of the firms surveyed (Table 5). By firm size, they accounted for 18.7% of micro and small firms and 26.2% of medium-sized and large firms; digitalization was likely more advanced in larger firms. By sector, firms in wholesale and retail trade used e-commerce most (22.9% of digitally operated firms), followed by manufacturing (selling their products online; 16.6%) and agriculture (selling products online; 12.6%).

As for country distribution, Georgia accounted for 35.4% of the digitally operated firms surveyed, followed by Kazakhstan (18.9%), Azerbaijan (16.6%), Uzbekistan (12.6%), the Kyrgyz Republic (9.1%), Tajikistan (4.0%), and Armenia (3.4%). By country group, Group A (West Asia) accounted for 55.4% and Group B (Central Asia) 44.6%.

Mostly young firms operated their business online: 44.6% of digitally operated firms had been operating for 5 years or less, followed by those operating for between 6 and 10 years (25.1%), 11–15 years (16%), 16–30 years (13.1%), and over 30 years (1.1%).

[9] Capital cities: Yerevan in Armenia, Baku in Azerbaijan, Tbilisi in Georgia, Astana in Kazakhstan, Bishkek in the Kyrgyz Republic, Dushanbe in Tajikistan, and Tashkent in Uzbekistan.

Slightly less than half (44%) of the digitally operated firms surveyed were internationalized firms—those participating in global supply chains or engaged in export and import business. The remaining 56% were focused domestically. By ownership, 33.7% were female-led, with the remaining 66.3% being led by a male.

Table 5: Profile of Digitally Operated Firms (%)

Digitally operated firms to total	**19.4**	**Digitalized micro and small firms**	**18.7**
		Digitalized medium-sized and large firms	**26.2**
By Country	**100.0**	**Internationalization**	**100.0**
Armenia	3.4	Internationalized firms	44.0
Azerbaijan	16.6	Domestically focused firms	56.0
Georgia	35.4	**Ownership (gender)**	**100.0**
Kazakhstan	18.9	Male-led firms	66.3
Kyrgyz Republic	9.1	Female-led firms	33.7
Tajikistan	4.0		
Uzbekistan	12.6		
Operating Period	**100.0**		
0–5 years	44.6		
6–10 years	25.1		
11–15 years	16.0		
16–30 years	13.1		
Over 30 years	1.1		

Notes: Digitally operated firms are firms engaged in online selling of goods and services or e-commerce. Internationalized firms are those participating in global supply chains or engaged in export and import business. Female-led firms are firms with a female owner or managed by a female. Data as % share to total digitally operated firms for the items "By Country," "Operating Period," "Internationalization," and "Ownership (gender)."

Source: Author's calculations based on MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan conducted from 25 July 2022 to 24 August 2022.

3.2 Regression Models

The study uses a linear probability model (LPM) to estimate the impact of the Russian invasion of Ukraine on digitally operated firms, addressing MS firms in seven Central and West Asian countries. There are several pros and cons to choosing a binary regression model: LPM or probit and logit regression models. This study chose the LPM because it is more convenient and easier to interpret, computationally less intensive, and reveals similar marginal effects to its nonlinear counterparts (Shinozaki and Rao 2021). The result of probit models is attached in Appendix 2 as a robustness test.

The LPM considered seven core factors affecting MSME operations: (i) industry sector; (ii) business location (capital city or outside region); (iii) operating period; (iv) digitalization in operations; (v) business ownership (gender); (vi) global business exposure; and (vii) firm size (employment group). Given the pooling data used for estimates, a binary country group variable (Groups A and B) was added to the model to see the difference in the impact by the level of government intervention. These are the independent variables that explain the impact on four areas of MSME operations: (i) sales revenue; (ii) employment; (iii) wage payments; and (iv) financial condition. These are the binary dependent variables for estimation (Table 6). The model is described by

$$Y_i = \alpha + \beta\, Ind_i + \gamma\, Cnt_i + \delta\, Reg_i + \zeta\, Ops_i + \phi\, Dig_i + \psi\, Wom_i + \eta\, GVC_i + \tau\, MSME_i + \epsilon \quad (1)$$

where Y_i is a binary dependent variable denoting the performance of observed firm *i* at the time of the survey (July 2022–August 2022), or how revenues, employment, wage payments, and financial conditions affected business performance around 6 months after the invasion began in February 2022. Ind_i is the vector of categories for industry classification (agriculture, manufacture, and the nine categories of services described in Table 3) using "agriculture, forestry, and fisheries" as base. Cnt_i is the vector of categories for the country where firm *i* is located, with "Kazakhstan" as base. Reg_i is a binary variable that takes the value one if firm *i* operates in the capital city and zero if firm *i* operates outside of the capital (mostly rural areas). Ops_i is the vector of categories for years in operation after the establishment of firm *i* at the time of the survey, with "0–5 years" as base. Dig_i is a binary variable that takes the value one if firm *i* is engaged in online selling of goods and services (e-commerce) and zero if not. Wom_i is a binary variable that takes the value one if the owner of firm *i* is a "woman" and zero if the owner is a "man." GVC_i is a binary variable that takes the value one if firm *i* is involved in a global supply chain or export/import business and zero otherwise. $MSME_i$ is a binary variable that takes the value one if firm *i* is a "micro or small enterprise" and zero if the establishment is a "medium-sized or large enterprise." And ϵ is a residual. Robust standard errors, calculated in the way known as the Huber/White/sandwich estimator, are incorporated into the formula to correct heteroscedasticity of the errors.

Y (impact on business performance) comprises four areas with six dimensions that indicate the level of a firm's resilience to the change in business environment due to the Russian invasion of Ukraine and associated global sanctions (Table 6). The same set of the estimate is done by country group (A and B) as well to see the difference in impact. *Y* is also estimated for digitally operated firms in the following model:

$$Y_d = \alpha + \beta\, Ind_d + \gamma\, Cnt_d + \delta\, Reg_d + \zeta\, Ops_d + \psi\, Wom_d + \eta\, GVC_d + \tau\, MSME_d + \epsilon \quad (2)$$

where Y_d is a binary dependent variable denoting the performance of observed digitally operated firm *d* at the time of the survey. Independent variables used in Model (2) refer to the same definitions described in Model (1). The estimates show specific impacts on digitally operated firms. This model is also done by country group (A and B).

Table 6: Areas for Impact Analysis

Area (4)	Dimension (6)	Definition
1. Revenue	Revenue 1	Firm's income/revenue condition 1. Absolutely no income/revenue or not at the time of the survey.
	Revenue 2	Firm's income/revenue condition 2. An income/revenue decrease as compared to January 2022 (before the invasion) or not.
2. Employment	Employment	Firm's employment condition assessed by a decrease or increase in employees (including no change) from January 2022.
3. Wage payments	Wage 1	Firm's wage/salary payment condition to employees 1. Absolutely no wage payments to employees or not at the time of the survey.
	Wage 2	Firm's wage/salary payment condition to employees 2. A decrease in the total wage payments from January 2022 or not.
4. Financial condition	Finance	Firm's financial condition assessed as already having no cash/savings or running out of cash/funds in 3 months at the time of the survey.

Source: Author.

4. FINDINGS FROM THE SURVEYS AND ECONOMETRIC ANALYSES

The surveys show that the Russian invasion of Ukraine led to several changes in the business environment in Central and West Asia. Operations were continuing in 88.3% of surveyed firms at the time of the survey (July 2022–August 2022), but 7.2% reported limited operations (4.7% less than 50% operational) and 4.5% closed temporarily due to the negative effects of the invasion and associated sanctions. Two groups of firms appeared 6 months after the invasion: those maximizing business opportunities and those adversely affected by the invasion and sanctions. Firms that found the business environment was better than before the invasion comprised a small fraction of the firms surveyed (6%). Many reported that business conditions were unchanged (43%), with those reporting a business environment worse than before comprising a remarkable 29.4% of the firms surveyed. These faced rising production costs (29.4% of firms surveyed) and administrative costs (11.9%) and increased product selling prices to maintain their business (15.0%). While more than 90% of the surveyed firms did not feel a drop in domestic (90.4%) and foreign demand (93.2%), 14.4% reported logistics problems (delayed deliveries to customers), and 7.2% had production and supply chains disrupted, with 5.1% facing contract cancellations. So how could digitally operated firms survive? Were there any differences between digitalized and nondigitalized firms? What key factors helped maintain and grow businesses during the invasion crisis? Does digitalization of business operations and administration—including finance—help firms survive a crisis?

The surveys found that digitally operated firms faced different issues, but the change in business environment was more pronounced in MS firms, negatively affecting 36.6% of digitalized MS firms, 12.8 percentage points higher than nondigitalized MS firms (23.8%) (Figure 1A). This could be because a large share (44.0%) of digitally operated firms are internationalized—those participating in global supply chains or trading in exports and imports, with the Russian Federation being a major trading partner.[10] Due to the reliance on imported goods for production, digitally operated MS firms had to deal with large increases in production and operating costs, and responded by sharply raising selling prices—19.4% of digitalized MS firms raised prices, 9.3 percentage points higher than those that were not digitalized (10.2%). The logistics issue (delayed product delivery) was also serious for digitally operated MS firms (16.6%, or 6.5 percentage points higher than nondigitalized MS firms). A fall in domestic and foreign demand was relatively limited for digitally operated MS firms.

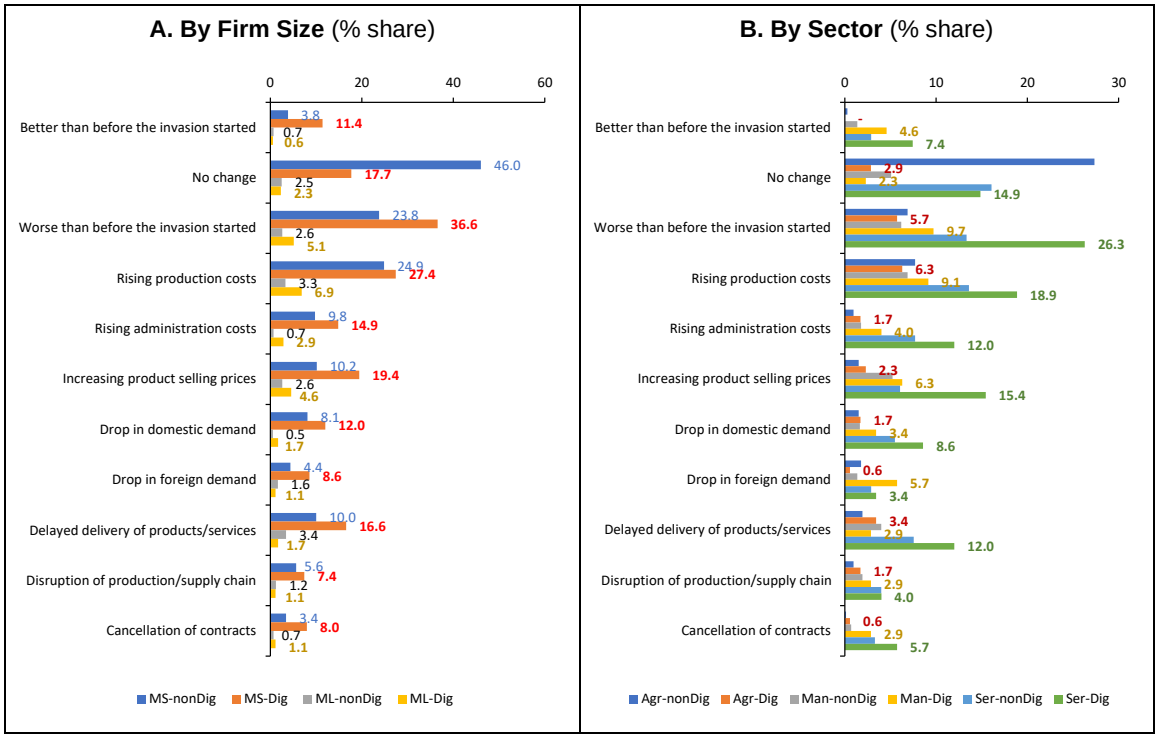
There was a group of digitally operated MS firms that reported a better business environment than before the invasion, accounting for 11.4% of digitalized MS firms, 7.6 percentage points higher than nondigitalized MS firms (3.8%), although they were a small fraction (Figure 1A).

By sector, a relatively higher share of firms reported a better business environment in digitally operated manufacture (4.6%) and service firms (7.4%) than in those not digitalized (Figure 1B). But a relatively larger share reporting worse conditions was also identified in digitalized service firms (26.3%), 13.0 percentage points higher than in those not digitalized. They faced higher operating costs, which led to higher selling prices. By contrast, digitalized agribusinesses that reported worse business conditions (5.7%) were fewer than those not digitalized (6.9%). Those facing hikes in production costs and price increases were limited. Their reliance on domestic markets and

[10] For nondigitalized firms, the share of internationalized firms was 22.1%.

government support may be one of the reasons. For ML firms, the impact on business operations was relatively limited.

Figure 1: Business Environment after the Russian Invasion of Ukraine



Agri = agriculture, Dig = digitally operated firms, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, NonDig = nondigitally operated firms, Ser = services.

Notes: Data as percentage share of each group (Dig and NonDig). There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for the period 25 July 2022–24 August 2022.

The LPM estimates showed more detailed analysis on the impact on digitalized firms in terms of sales revenue, employment, wages, and finance. Formula (1) was used to estimate the overall impact on surveyed firms where "digitalization" is one of the factors affecting its operations 6 months after the invasion, which estimates three models (overall effect, and the impacts on firms in country groups A and B) (Appendix 1A–1C). Formula (2) was used to estimate the impact on digitalized firms with three models (overall effect, and the impacts on digitalized firms in country groups A and B) and one model for nondigitalized firms for comparison (Appendix 1D–1G). Each model estimates six dimensions that affect a firm's resilience to the impact of the invasion and associated sanction measures.[11]

[11] The six dimensions are binary dependent variables: (i) *revenue1* denotes a dummy variable taking the value one for a firm with no income/revenue at the time of the survey and zero for a firm with income/revenue; (ii) *revenue2* denotes a dummy variable taking the value one for a firm with an income/revenue decrease as compared to January 2022 (before the Russian invasion) and zero for a firm with an income/revenue increase or no change; (iii) *employment* denotes a dummy variable taking the value one for a firm with a decrease in the number of employees as compared with January 2022 and zero for a firm with an increase or no change in the number of employees; (iv) *wage1* is a dummy variable taking the value one for a firm with no wage payments to employees at the time of the survey

4.1 Impact on Firm Revenue

The LPM regression result (*revenue1* and *revenue2*: see Appendix 1A) found several sectors facing sharp revenue losses at the time of the survey. They were directly or indirectly affected by a slowing Russian economy and the impact of related sanctions—while some were related to chronic national and global problems. The estimates showed that manufacture (manufacturing and construction), wholesale and retail trade, essential services, transport and storage, professional/technical services, education, and other services were more likely to see a revenue decrease than agriculture (the base for comparison) (1%, 5%, or 10% significance level). The essential services include electricity and gas supply, water supply, financial services, and healthcare services—those that are essential for people's living. Firms in water supply have a chronic problem across Central Asia—water shortages accelerated by climate change will eventually affect agricultural production and hydropower generation (World Bank 2016, 2019). Water scarcity may increase the dependence on food and energy imports, and the sanctions on the Russian Federation will increase import costs further with an added currency risk. The LPM estimates on firms with no revenue (due to temporary business closures) were not statistically significant in any business sector.

As compared to base country Kazakhstan, firms' revenue losses were less likely in Armenia, Azerbaijan, the Kyrgyz Republic, and Uzbekistan (1% or 5% significance level). Zero-revenue firms were also less likely in the Kyrgyz Republic (5% significance level). Firms operating for more than 6 years were less likely to have no revenue than young firms operating for up to 5 years (5% significance level). In other words, young firms were more likely to be forced to close temporarily, thus receiving no revenue. Internationalized firms saw their revenue drop significantly due to the sanctions on the Russian Federation and currency depreciation compared to purely domestic firms (5% significance level).

Against these conditions, digitally operated firms were less likely to have zero revenue than those not digitalized (10% significance level). But those that did had more severe revenue losses as many relied on international trade (10% significance). By country group, digitalized firms in Group B (Central Asia) were more likely to have revenue losses—11.8 percentage points more than nondigitalized firms (10% significance level) (Appendix 1C). Estimates on the revenue of digitalized firms in Group A (West Asia) were not statistically significant (Appendix 1B). The LPM estimates also did not show statistically significant results for revenue conditions by location (capital city base or other regions), gender of ownership, or firm size (Appendix 1A). But MS firms in Group A were more likely to have no revenue than ML firms (10% significance level).

For digitally operated firms (Appendix 1D), revenue losses were more likely in transport and storage (73.1 percentage points higher) and manufacture (30.7 percentage points higher) than in digitalized agribusinesses (the base for comparison) at the 1% or 5% significance level. For nondigitalized firms (Appendix 1G), more sectors (manufacture, wholesale and retail trade, and professional/technical services) likely faced more revenue losses than agriculture (1% or 5% significance level), while accommodation and food services, and information and communications technology (ICT) were less likely to have no revenue than agriculture, suggesting they benefited somewhat from

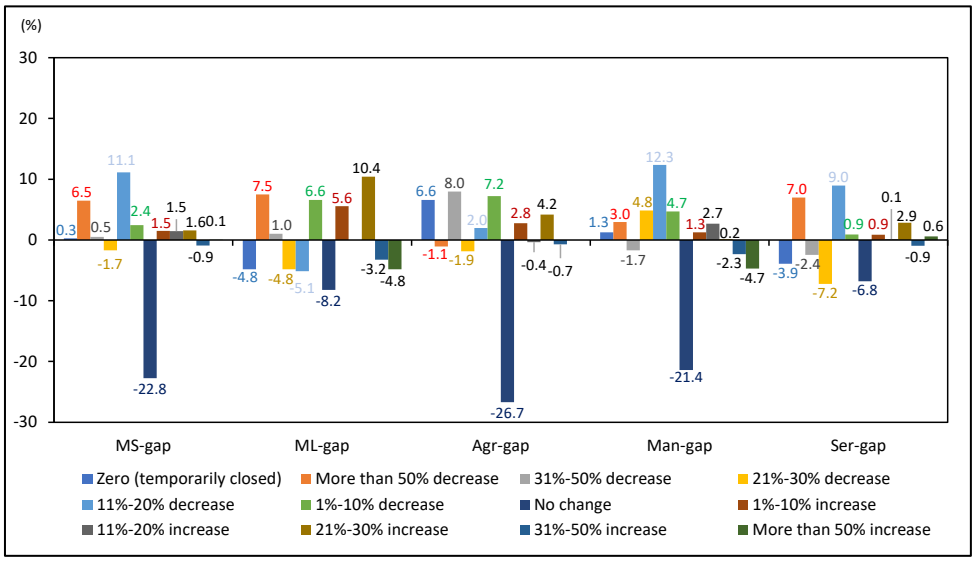
and zero for a firm that paid wages to employees; (v) *wage2* is a dummy variable taking the value one for a firm with a decrease in the total wage payments to employees as compared to January 2022 and zero for a firm with an increase or no change in wage payments; and (vi) *finance* denotes a dummy variable taking the value one for a firm with no cash/savings at the time of the survey or running out of cash/funds in 3 months and zero for a firm that reported having enough savings, liquid assets, and other contingency finance to maintain business at the time of the survey.

the global sanctions on the Russian Federation—for example, increased tourist and/or IT expert inflows from the Russian Federation and Belarus in some countries. Female-led digitalized firms were less likely to see no income than male-led ones (6.9 percentage points lower at the 10% significance level). Digitalized firms using digital financial services (like mobile banking, peer-to-peer lending, and crowdfunding) were less likely to see a revenue decrease than those not using digital finance (30.9 percentage points lower at the 10% significance level).

For digitalized firms in Group A, older firms were more likely to see revenue losses than young firms (24.8 percentage points higher in firms that were 11–15 years old at the 10% significance level and 60.3 percentage points higher in firms over 31 years old at the 1% significance level) (Appendix 1E). For those in Group B, firms engaged in essential services were more likely to see revenue losses than digitalized agribusinesses (1% significance level) (Appendix 1F).

The LPM estimates on revenue by firm size were not statistically significant in digitalized firms, but a descriptive analysis provides a more detailed picture (Figure 2). The response ratio gap in revenue between digitally operated firms and nondigitally operated firms by firm size and business sector is calculated as the share of digitally operated firms minus that of nondigitalized firms to their respective populations, where a positive value indicates a higher percentage share in digitalized firms, and a negative value indicates a lower percentage share than in nondigitalized firms.

Figure 2: Revenue—Digitally Operated Enterprises



Agri = agriculture, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, Ser = services.

Notes: The gap is calculated as the share of digitally operated firms minus that of nondigitally operated firms. There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Digitally operated MS firms that reported “no change” were likely a smaller fraction than those not digitalized. Rather, the two streams of profitable and unprofitable firms appear among digitalized MS firms after the invasion (11.1 percentage points higher for firms with an 11%–20% drop in income and 4.5 higher for those with up to a 30% income increase) (Figure 2). Digitalized ML firms followed the same pattern but had more mixed results in profitability. By sector, two types of business groups were more evident in digitally operated agriculture and manufacture firms selling products online. In Central Asia, irrigated agriculture is costly due to the scarcity of water, limited access to imported fertilizers, and high energy costs (due to the sanctions on the Russian Federation), contributing to higher selling prices. Some firms supplying the domestic market were profitable, while others that did not manage costs well became unprofitable. Many digitally operated firms in manufacturing exported goods, mainly to the Russian Federation as a major trading partner. Those that successfully diversified trade destinations outside the Russian Federation gained. For digitally operated services, cost management was pivotal in terms of profitability.

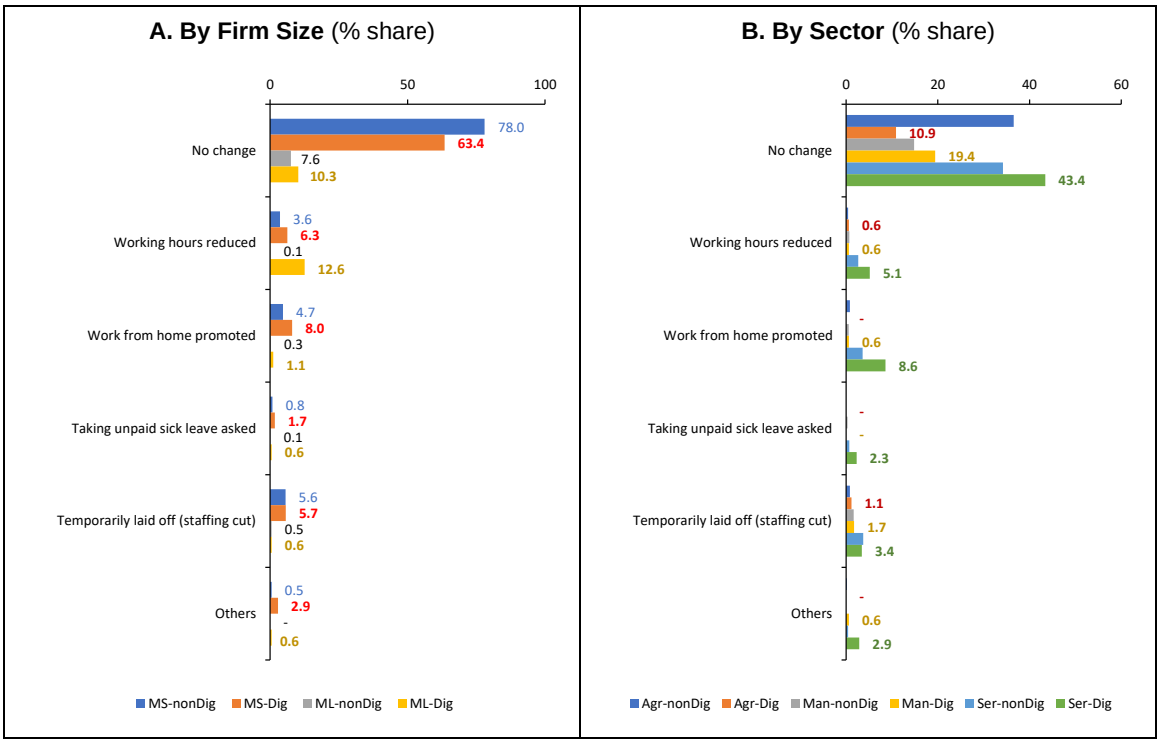
4.2 Employment

At the time of the surveys, most MS firms reported no change in working conditions (63.4% of digitally operated MS firms and 78% of nondigitalized MS firms). Nonetheless, some tried reducing operating costs by reducing working hours (6.3%) and allowing work-from-home arrangements (8%), especially digitally operated MS firms (Figure 3A). By sector, digitally operated firms in services initiated cost-saving activities more widely than those in agriculture or manufacture (5.1% reduced working hours, 8.6% promoted work from home, 2.3% applied unpaid sick leave, and 3.4% temporarily cut staff). Those that successfully managed costs were more profitable (Figure 3B).

The LPM estimates (*employment*: Appendix 1A) showed that staffing cuts were more likely for firms in professional/technical services than in agriculture-based firms (10% significance level). By country, firms in Armenia and Uzbekistan were less likely to reduce the number of employees than those in Kazakhstan (1% or 5% significance level); in other words, firms in Kazakhstan likely used temporary layoffs more than other countries. Also, internationalized firms were more likely to cut staff than domestically focused firms (5% significance level). Firms that used digital financial services were more likely to temporarily cut staff to secure working capital (5% significance level). The estimate on the staffing cuts of digitalized firms was not statistically significant.

By country group, Group A firms in wholesale and retail trade, essential services, transport and storage, accommodation and food services, and entertainment services were less likely to cut staff than agricultural firms. Financial services are a part of the essential services. Russian-based firms and individuals coming to Central and West Asia and opening bank accounts, as well as tourist inflows from the Russian Federation, may have contributed. In Group B, estimates on firms’ staffing cuts were not statistically significant.

Figure 3: Working Environment after the Russian Invasion of Ukraine



Agri = agriculture, Dig = digitally operated firms, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, NonDig = nondigitally operated firms, Ser = services.

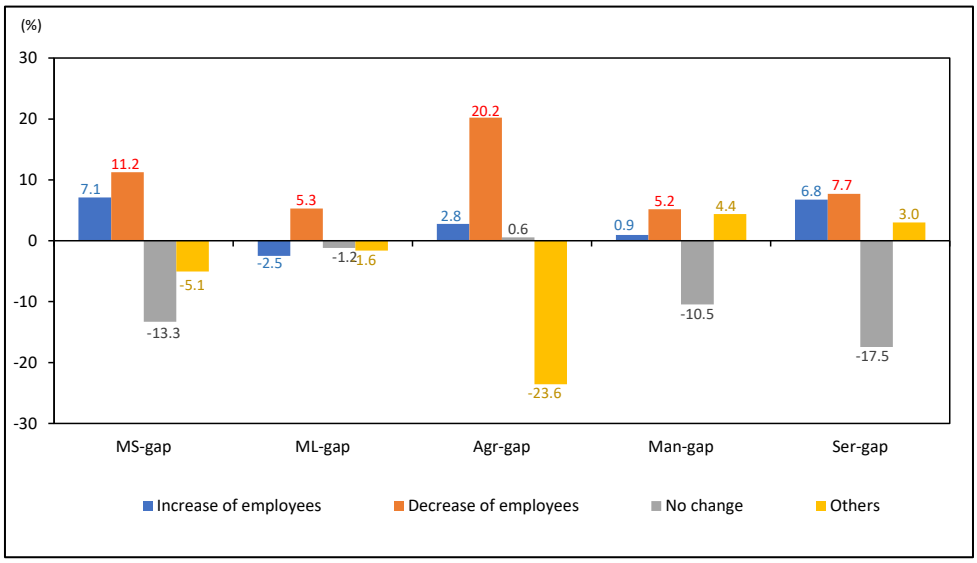
Notes: Data as percentage share of each group (Dig and NonDig). There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

When focusing on digitally operated firms, internationalized firms were more likely to cut staff than domestically focused firms (18.3 percentage points higher at the 5% significance level). Meanwhile, older firms (those operating for over 31 years) were less likely to cut staff than young firms up to 5 years old. Both Group A and Group B firms followed (5% or 10% significance level).

By firm size, figures were not statistically significant. The gap analysis provides the employment conditions by firm size (Figure 4). Digitally operated MS firms were more likely to cut employees (+11.2 percentage points for staffing cuts). Digitally operated agribusinesses, manufacture, and services followed, but it was more pronounced in agriculture (+20.2 for staffing cuts). The number of employees increased in digitalized service firms (in wholesale and retail trade, and ICT) (+6.8 for staff increases) in response to demand (more tourist inflows).

Figure 4: Employment—Digitally Operated Enterprises



Agri = agriculture, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, Ser = services.

Notes: The gap is calculated as the share of digitally operated firms minus that of nondigitally operated firms. There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

4.3 Wage Payments

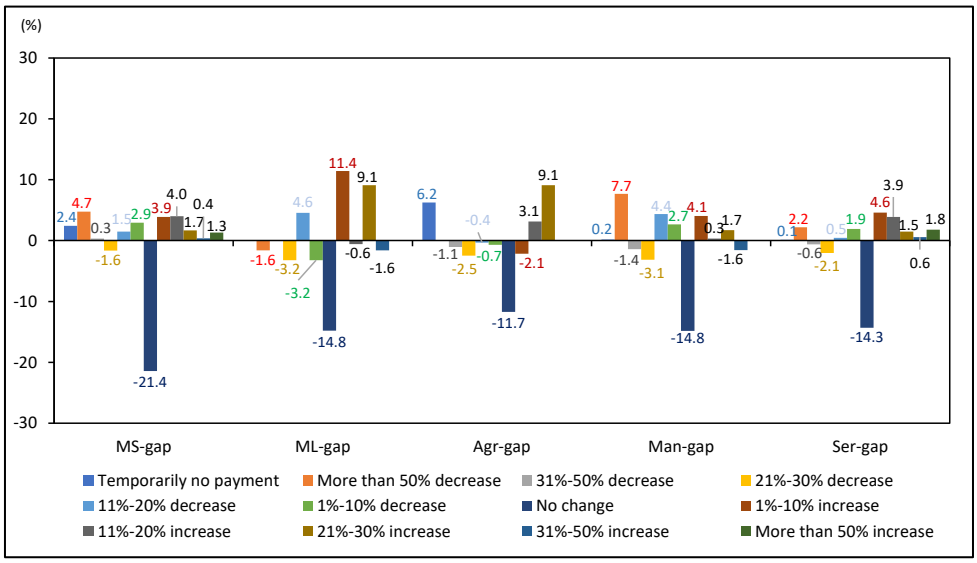
Cutting wages also helped cut costs in the firms surveyed. The LPM result (*wage1* and *wage2*: Appendix 1A) indicated that many of the firms surveyed used wage cuts. Those in manufacture, essential services, professional/technical services, education, and other services were more likely to reduce wage payments to employees than those in agriculture (base) (1%, 5%, or 10% significance level). Internationalized firms and MS firms followed (both 5% significance level). Those in professional/technical services were also more likely to save on wages due to temporary business closures (10% significance level).

By country, firms in Armenia, Azerbaijan, Georgia, the Kyrgyz Republic, and Uzbekistan were less likely to reduce wages than those in Kazakhstan (base) (1% significance level). Firms operating for 11–30 years followed (1% significance level). The estimates suggest that firms in Kazakhstan and younger firms (up to 5 years) were more likely forced to cut wages.

Digitalized firms were less likely to stop paying wages than nondigitalized firms (10% significance level). Although more likely to cut staff, they seemed to secure wage payments for the remaining staff. Firms that used digital financial services tended to cut wages more than those not using digital finance (1% significance level), as they faced fiscal problems.

By country group, firms that stopped paying wages or cut wages were more likely in Group B (Central Asia) than Group A (West Asia). While MS firms were more likely to cut wages than ML firms in Group A (1% significance level), they were more likely to stop paying wages in Group B (10% significance level) (Appendix 1B and 1C).

Figure 5: Wage Payments—Digitally Operated Enterprises



Agri = agriculture, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, Ser = services.

Notes: The gap is calculated as the share of digitally operated firms minus that of nondigitally operated firms. There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Digitalized firms with or without wage cuts depend somewhat on business profitability. The gap analysis identified two groups of digitalized firms: those reducing wage payments and those increasing wages regardless of firm size or sector (Figure 5). The shares of digitalized firms that increased payments were more likely in ML firms (+11.4 for firms with up to a 10% wage increase) and agriculture (+9.1 for firms with a 21%–30% wage increase). Digitalized agribusinesses and manufacture firms had higher shares of firms with no wage payments (+6.2 for agriculture) and those cutting more than 50% (+7.7 for manufacture), respectively.

4.4 Financial Conditions

Fiscal Condition

The Russian invasion of Ukraine and global sanctions against the Russian Federation damaged many firms' revenues and led many to cut staff and wages to cover surging production and operating costs. Some firms in Central and West Asia, however, took advantage of new opportunities in financial services and tourism, but they remained a small fraction. Digitalized firms were less likely to lose revenue or close temporarily. But those involved in international trade affected by sanctions lost more income and cut more staff than nondigitalized firms. Most firms surveyed struggled to survive 6 months into the invasion and tried several cost management techniques, as many started facing insufficient finance to operate.

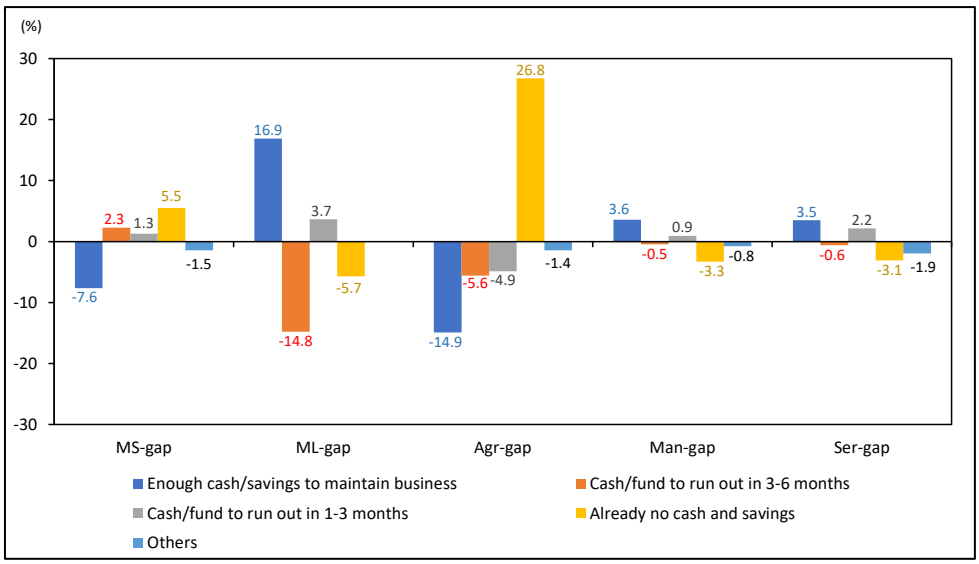
The LPM estimates (*finance*) found MSMEs faced a difficult financial ("fiscal") situation—either out of cash and savings or running out in 3 months from the time of the survey—in manufacture (11.3 percentage points higher than agriculture [base]), wholesale and retail trade (15.2 higher), accommodation and food services

(19.3 higher), education (19.7 higher), entertainment services (20.3 higher), and other services (17.9 higher) at the 1%, 5%, or 10% significance level (Appendix 1A). By country, firms in Uzbekistan were more likely to face financial problems than those in Kazakhstan, the Kyrgyz Republic, Tajikistan, Armenia, and Azerbaijan (1%, 5%, or 10% significance level; the figure for Georgia was not statistically significant). Young firms (up to 5 years) were more likely to face working capital shortages than older firms.

Female-led digitalized firms were more likely to have no cash and savings or a shortage of finance in 3 months, 12.7 percentage points higher than male-led digitalized firms (10% significance level) (Appendix 1D). Digitally operated firms using digital financial services followed, 50.2 percentage points higher than digitalized firms not using digital finance (1% significance level). The lack of finance was more serious in digitalized MS firms, 32.4 percentage points higher than digitalized ML firms (5% significance level). Digitalized firms facing financial problems tended to use digital finance to strengthen their working capital.

According to gap analysis, the share of digitalized MS firms with no cash and savings was 5.5 percentage points higher than that of nondigitalized MS firms, while the share of digitalized ML firms with sufficient cash and savings was 16.9 percentage points higher than that of those not digitalized—but those running out of funds within 3 months had a 3.7% higher share than those not digitalized (Figure 6). By sector, digitalized agribusinesses had more serious financial problems—the share of those without cash or savings was 26.8 percentage points higher than that of nondigitalized agribusinesses. For digitalized firms in manufacture and services, the share of those reporting enough cash and savings was around 3.5 percentage points higher than that of those not yet digitalized.

Figure 6: Financial Conditions—Digitally Operated Enterprises



Agri = agriculture, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, Ser = services.

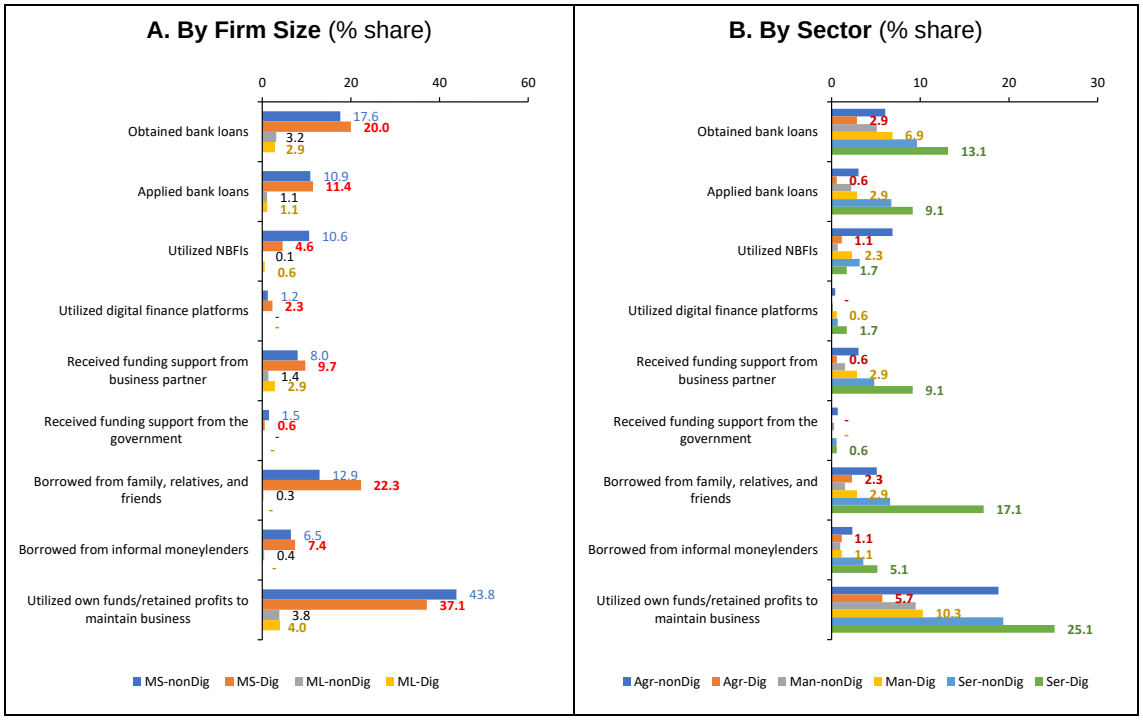
Notes: The gap is calculated as the share of digitally operated firms minus that of nondigitally operated firms. There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Funding

The Russian invasion of Ukraine happened just as economies were recovering from the impact of the COVID-19 pandemic in Central and West Asia. Nationally, financial assistance programs for individuals and businesses continued into 2022—including concessional lending programs (subsidized loans) and special credit guarantees. To minimize the impact of the invasion and related sanctions, governments—beginning March 2022—offered additional assistance such as cash handouts to farmers and agribusinesses including MSMEs (Azerbaijan), subsidies for agriculture (Kazakhstan), concessional loans (refinancing facility) for agricultural producers and currency risk-sharing for MSME exporters (the Kyrgyz Republic), concessional loans to SMEs hit hardest by sanctions on the Russian Federation (Tajikistan), and financial assistance for entrepreneurs and those self-employed (Uzbekistan). Nevertheless, the firms surveyed faced financial problems, especially MS firms, even those already digitalized. There were many sectors facing more serious financial shortages than agriculture (base), but digitalized agribusinesses had severe financial issues. What are the major funding sources for MSMEs in Central and West Asia? How could firms raise working capital to survive during the crisis? How did digitalized firms fare (Figure 7)?

Figure 7: Funding after the Russian Invasion of Ukraine



Agri = agriculture, Dig = digitally operated firms, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, NonDig = nondigitally operated firms, Ser = services.

Notes: Data as percentage share of each group (Dig and NonDig). There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Overall, most firms continued to rely on their own funds, retained profits, or money borrowed from family, relatives, and friends. The latter was more evident among digitalized MS firms (22.3%) than nondigitalized MS firms (12.9%) (Figure 7A). Backed by government assistance programs (subsidized loans and credit guarantees), the share of firms that received bank loans was relatively high (20% for digitalized MS firms and 17.6% for nondigitalized MS firms). The share using digital finance platforms was higher among digitalized firms (2.3%) than those not digitalized (1.2%), but it was a very small share. By sector, the pattern was similar (Figure 7B).

The use of digital technology has been increasing across Central and West Asia. National payment systems now exist in most countries, but digital financial services like credit, savings, insurance, and remittances have yet to be utilized widely in the region, as the survey findings showed.

4.5 Policy Implications

Concerns of Digitalized Small Firms

The surveys asked firms what the major concerns and obstacles they faced were, including those digitally operated and those nondigitalized (Figure 8).

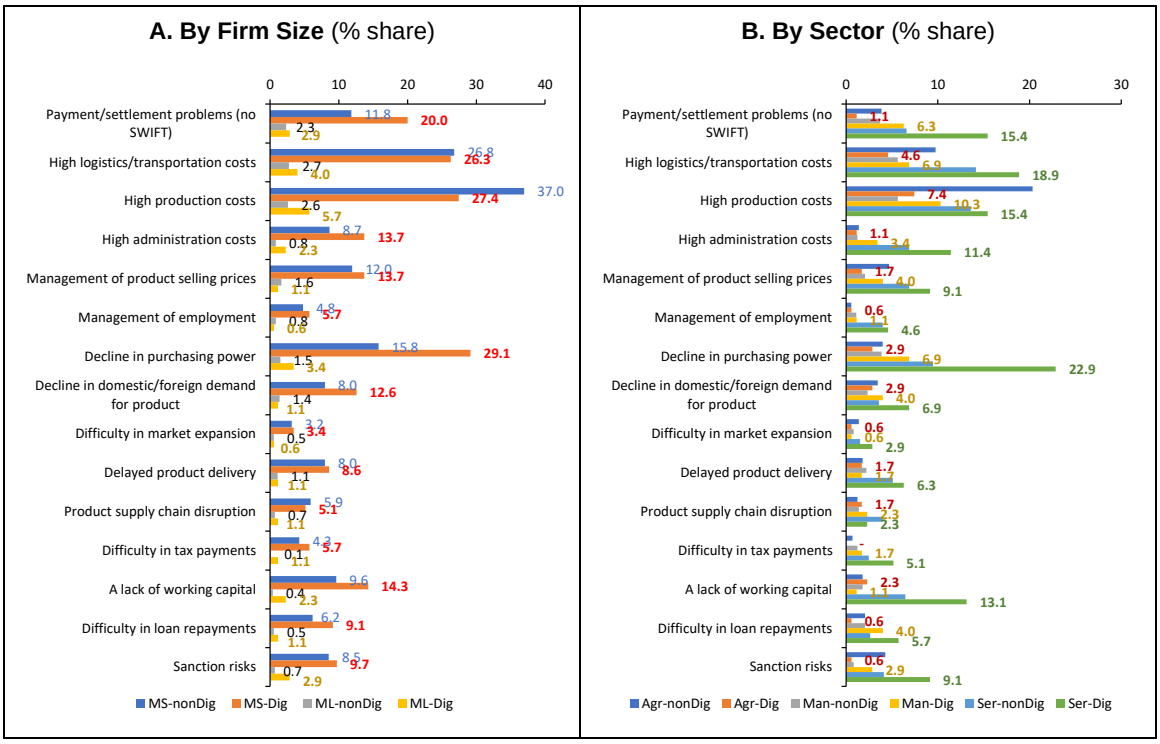
For digitalized MS firms, the top concern was a decline in purchasing power (29.1%), which was 13.3 percentage points higher than for nondigitalized MS firms (Figure 8A). Respondents felt that a prolonged invasion and sanctions would further increase inflation and the downside risks facing the economy, more seriously reducing household income and living standards, which in turn raises the risk of a continuing sharp drop in sales revenue.

This was followed by operational concerns: 27.4% worried about high production costs like higher prices for primary products; 26.3% high logistics and transportation costs; 20% payment and settlement problems due to the ban on SWIFT transfers from the Russian Federation; 14.3% a lack of working capital; and 13.7% high administration costs and managing product price increases. Payment problems and high administrative costs were cited more by digitalized MS firms than those not digitalized (8.2 and 5.1 percentage points higher, respectively).

A decline in domestic and foreign demand for their products and “sanction risks” also concerned MS firms, especially those that were digitalized (12.6%, or 4.6 percentage points higher than nondigitalized MS firms over the decline in demand; and 9.7%, slightly higher [+1.2] than nondigitalized MS firms for potential sanction risks). Firms were worried that the increased number of Russian-based firms and individuals moving into their economies and the new bank accounts opened would increase the risk of local banks being added to global sanction lists.

Other concerns included difficulty in loan repayments (9.1%), delayed product delivery (8.6%), employment management such as ensuring employees get paid (5.7%), tax payments (5.7%), supply chain disruptions (5.1%), and barriers to market expansion (3.4%). There was little difference between digitally operated service firms and digitalized MS firms in general (Figure 8B).

Figure 8: Concerns and Obstacles Faced by MSMEs



Agri = agriculture, Dig = digitally operated firms, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, NonDig = nondigitally operated firms, Ser = services.

Notes: Data as percentage share of each group (Dig and NonDig). There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

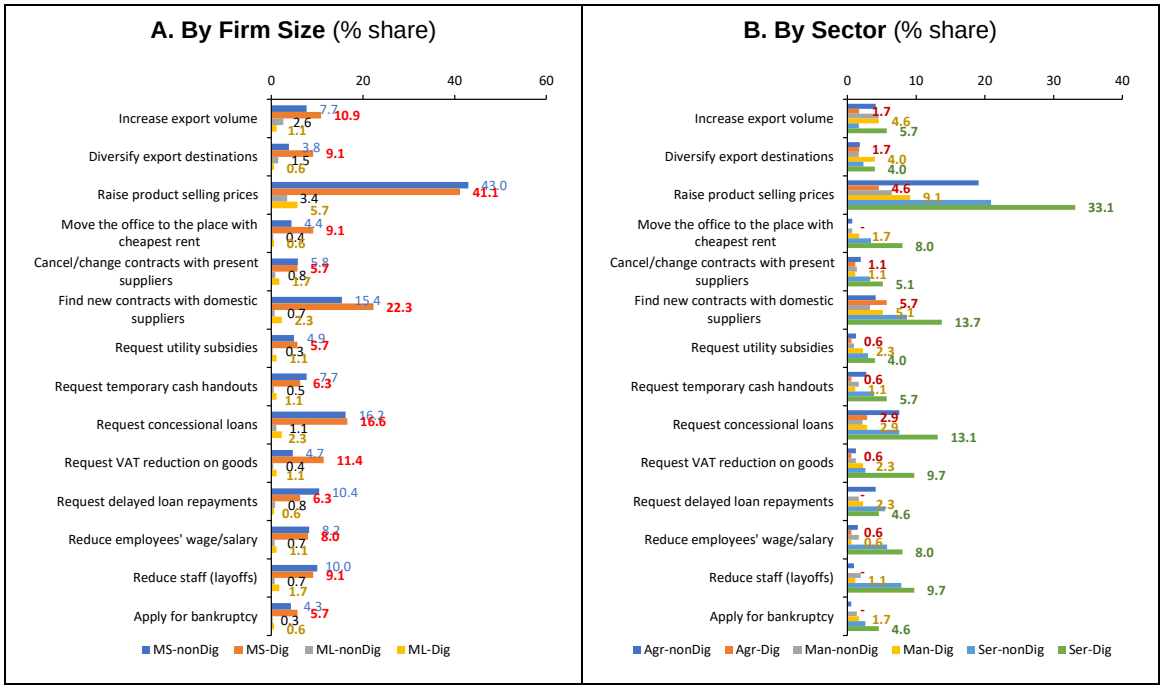
Actions Considered by Digitalized Small Firms

In response to their worries, the firms surveyed considered taking counteractions (Figure 9).

For digitally operated MS firms, the top actions considered were related to “marketing” matters: increase of selling prices (41.1% of digitalized MS firms); finding new contracts with domestic suppliers (22.3%, or 6.9 percentage points higher than nondigitalized MS firms); increase of export volumes (10.9%, 3.2 percentage points higher); diversifying export destinations (9.1%, 5.3 percentage points higher); and cancellation or renegotiation of contracts with current suppliers (5.7%) (Figure 9A). This was followed by adjustments to internal control and management systems: finding lower-cost office space (9.1%, 4.7 percentage points higher); layoffs (cutting staff) (9.1%); reducing employee wages/salaries (8%); and applying for bankruptcy (5.7%). Firms also wanted the support from government and financial authorities: (in order of preference) concessional loans (16.6%); reduced value-added tax (VAT) on goods (11.4%, 6.8 percentage points higher); temporary cash handouts (6.3%); delayed loan repayments (6.3%); and utility subsidies (5.7%).

The top five options considered by digitalized firms in services were: (i) increasing product selling prices (33.1%, 12.3 percentage points higher than nondigitalized services firms); (ii) finding new contracts with domestic suppliers (13.7%, 5.1 percentage points higher); (iii) requesting concessional loans (13.1%, 5.6 percentage points higher); (iv) requesting reduced VAT on goods (9.7%, 7.1 percentage points higher); and (v) laying off staff (9.7%, 1.9 percentage points higher) (Figure 9B).

Figure 9: Actions Considered by MSMEs



Agri = agriculture, Dig = digitally operated firms, Man = manufacture, ML = medium-sized and large firms, MS = micro and small firms, MSME = micro, small, and medium-sized enterprise; NonDig = nondigitally operated firms, Ser = services.

Notes: Data as percentage share of each group (Dig and NonDig). There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Policies Desired by Digitalized Small Firms

There were nonfinancial and financial policy measures that digitally operated firms were hoping for at the time of the survey—with data based on "strongly needed" answers out of the five choices (Figure 10).[12]

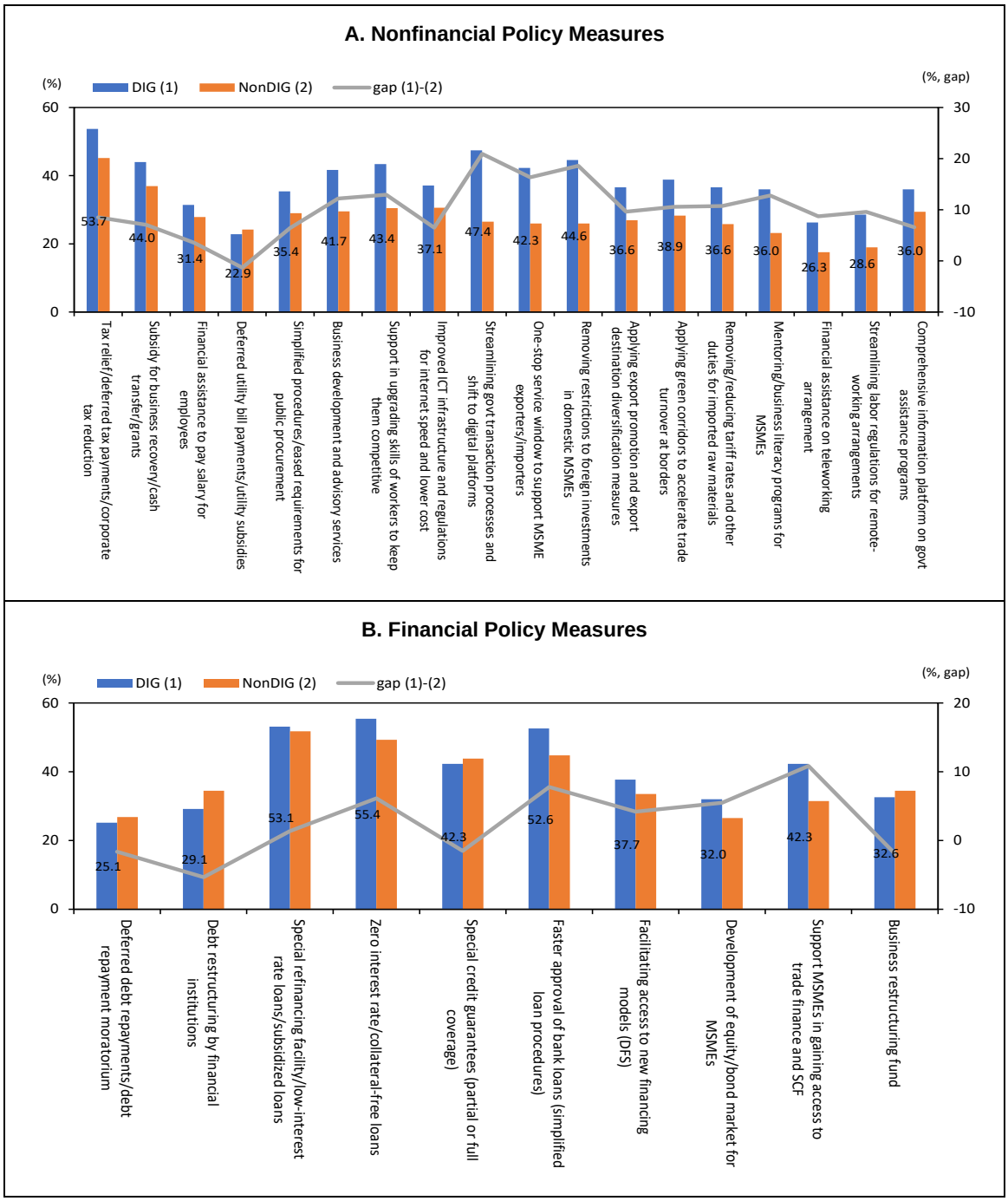
[12] The five were "strongly needed," "somewhat needed," "neutral," "somewhat not needed," and "least needed."

For nonfinancial policies, the top measure desired was “tax relief,” including deferred tax payments and reduced corporate income tax (53.7% of digitally operated firms, 8.5 percentage points higher than nondigitalized firms). This was followed by “streamlining government transaction processes and shift to digital platforms” (47.4%, 20.9 percentage points higher). Also, 37.1% were looking for “improved ICT infrastructure and regulations for internet speed and lower cost” (6.5 percentage points higher than for those not digitalized)—digital infrastructure development recently picked up under national financial inclusion strategies in several Central and West Asian countries (see footnote 5).

Other nonfinancial policy measures digitalized firms wanted (in order of preference) were: removing restrictions on foreign investments in domestic MSMEs (44.6%, 18.6 percentage points higher); subsidies for business recovery/cash transfer/grants (44%, 7.1 percentage points higher); support to upgrade worker skills (43.4%, 12.9 percentage points higher); one-stop service windows for MSME exporters/importers (42.3%, 16.3 percentage points higher); business development and advisory services (41.7%, 12.2 percentage points higher); using green corridors to accelerate trade at borders (38.9%, 10.6 percentage points higher); measures to promote exports and diversify destinations (36.6%, 9.7 percentage points higher); removing/reducing tariff rates and other duties for imported raw materials (36.6%, 10.8 percentage points higher); mentoring/business literacy programs for MSMEs (36%, 12.8 percentage points higher); creating a comprehensive information platform on government assistance programs (36%, 6.6 percentage points higher); simplified procedures and requirements for public procurement (35.4%, 6.5 percentage points higher); financial assistance to pay salaries (31.4%, 3.6 percentage points higher); streamlining labor regulations for remote-working arrangements (28.6%, 9.6 percentage points higher); and financial assistance for teleworking arrangements (26.3%, 8.7 percentage points higher).

For financial policy measures, the top measure desired was zero interest and collateral-free loans (55.4%, 6.1 percentage points higher), followed by: special refinancing facilities or low-interest and subsidized loans (53.1%, 1.4 percentage points higher); faster bank loan approvals (simplified loan procedures) (52.6%, 7.8 percentage points higher); support for MSMEs in gaining access to trade and supply chain finance (42.3%, 10.8 percentage points higher); special credit guarantees (42.3%, 1.5 percentage points lower); access to new financing models (digital financial services) (37.7%, 4.2 percentage points higher); creating a business restructuring fund (32.6%, 1.9 percentage points lower); developing MSME equity/bond markets (32%, 5.5 percentage points higher); debt restructuring (29.1%, 5.3 percentage points lower); and deferred debt repayments or a debt repayment moratorium (25.1%, 1.7 percentage points lower). Digitally operated firms wanted quick, low-cost finance for working capital during crises.

Figure 10: Policy Measures Desired by MSMEs



DFS = digital financial services; DIG = digitally operated firm; ICT = information and communications technology; MSME = micro, small, and medium-sized enterprise; NonDIG = nondigitalized firm; SCF = supply chain finance.

Notes: Based on answers "strongly needed." The gap is calculated as the share of digitally operated firms minus that of nondigitally operated firms. There were 903 valid samples—21 for Armenia, 83 for Azerbaijan, 144 for Georgia, 112 for Kazakhstan, 392 for the Kyrgyz Republic, 30 for Tajikistan, and 121 for Uzbekistan. There were 819 MS firms and 84 ML firms. There were 303 firms in agriculture, 168 in manufacture, and 432 in services. There were 175 digitally operated firms and 728 nondigitalized firms.

Source: Calculations based on pooling data from MSME surveys in Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan for 25 July 2022–24 August 2022.

Lessons from the Survey Findings and Regression Models

Following the Russian invasion of Ukraine, the region's economic growth was forecast to slow down with higher inflation in 2022. Sanctions against the Russian Federation and currency depreciation disrupted global supply chains, limited crop and essential goods imports, reduced demand for exports, and delayed (or suspended) foreign trade payments. This adversely affected private sector business operations, especially for smaller firms, due to surging production and operating costs.

The LPM showed that many business sectors—including manufacture, wholesale and retail trade, essential services, transport and storage, professional/technical services, education, and other services—faced sharp revenue losses after the invasion started in February 2022. Exporters and importers saw large drops in revenue with the Russian Federation being a major trading partner. Younger firms (aged up to 5 years) also faced sharp income losses. To keep businesses operating during this new crisis, firms took some drastic steps to cut costs—temporary staffing cuts and reduced wage payments. After 6 months, many firms lacked sufficient funds to continue operations.

Digitally operated firms could avoid having no revenue or temporary closures. But, as many trade internationally, they had to deal with higher income losses than those that were not digitalized. This led them to lay off employees more than nondigitalized firms to save costs—this was more prevalent in MS firms.

Two groups were identified 6 months after the invasion: MSMEs grasping business opportunities (profitable firms) and those adversely affected by the invasion and global sanctions (unprofitable firms) (Figure 11). For digitalized MS firms selling online, those in agriculture and manufacturing were hit harder.

In Central Asia, agricultural production has faced several issues—such as water scarcity for irrigated fields (cotton, for example), difficulty in obtaining imported fertilizers, and high energy and transportation costs (due to sanctions)—which contributed to raising product prices. Those capturing domestic market needs and/or receiving government assistance maintained profitability, while those that could not manage costs became unprofitable.

Many digitalized manufacture firms export to the Russian Federation as a major trading partner. Those focusing on domestic markets or diversifying exports away from the Russian Federation gained.

Among nondigitalized firms, more sectors than in digitalized firms (manufacture, wholesale and retail trade, and professional/technical services) suffered from revenue losses. The impact was less severe in some sectors like accommodation and food services, and ICT. They likely benefited from the sanctions on the Russian Federation—there were more tourist and/or IT expert inflows from the Russian Federation and Belarus in some countries.

By country group, digitalized firms in Group B (Central Asia) were likely to see more revenue losses than those that were not digitalized.

Layoffs occurred in several sectors, especially in services like professional/technical services, but differed by country group. Group A layoffs were likely limited to firms in wholesale and retail trade, essential services, transport and storage, accommodation and food services, and entertainment services—as Russian firms and individuals moving to the region and opening bank accounts to avoid sanctions, as well as greater tourist inflows from the Russian Federation and Belarus, lowered the need for job-cutting.

Digitally operated MS firms cut more staff, especially those trading internationally. But for those in digitalized services, new jobs were created in sectors like wholesale and retail trade, and ICT, backed by the demand associated with tourist inflows, among others.

Wage cuts were more prevalent in MS firms—young and internationalized firms. Digitalized firms with or without wage cuts likely depended on profitability. Firms that stopped wage payments or cut wages were less likely to be found among Group A countries.

Firms that had no cash and savings or would run out in 3 months were in manufacture, wholesale and retail trade, accommodation and food services, education, entertainment services, and other services—more likely in digitalized MS and younger firms. There were just a few digitalized firms in manufacture and services that had enough cash and savings.

Government emergency assistance programs established during the pandemic continued in most countries. Also, the invasion-related anti-crisis plans were in Group B countries—cash transfers and concessional loans for agribusinesses and MSMEs. New programs were implemented beginning March 2022, but financial conditions remained problematic for those surveyed, especially MS firms, and for those that had been digitalized.

As for funding sources, most firms still relied on their own funds, retained profits, or money borrowed from family, relatives, and friends. But government financial assistance (subsidized loans and credit guarantees) increased the number of firms surveyed receiving bank loans. Digitally operated firms used more digital finance platforms than those not digitalized, but it was still just a small share. Digitalized firms experiencing fiscal problems tended to use digital finance for working capital.

The surveyed firms generally felt that drops in domestic and foreign demand would be limited, but their top concern, especially for digitalized MS firms, was a decline in purchasing power. A long invasion (and sanctions) will increase the risk of higher inflation and further economic damage—lowering household purchasing power, and increasing the risk that MSMEs will have reduced sales revenue over the longer term.

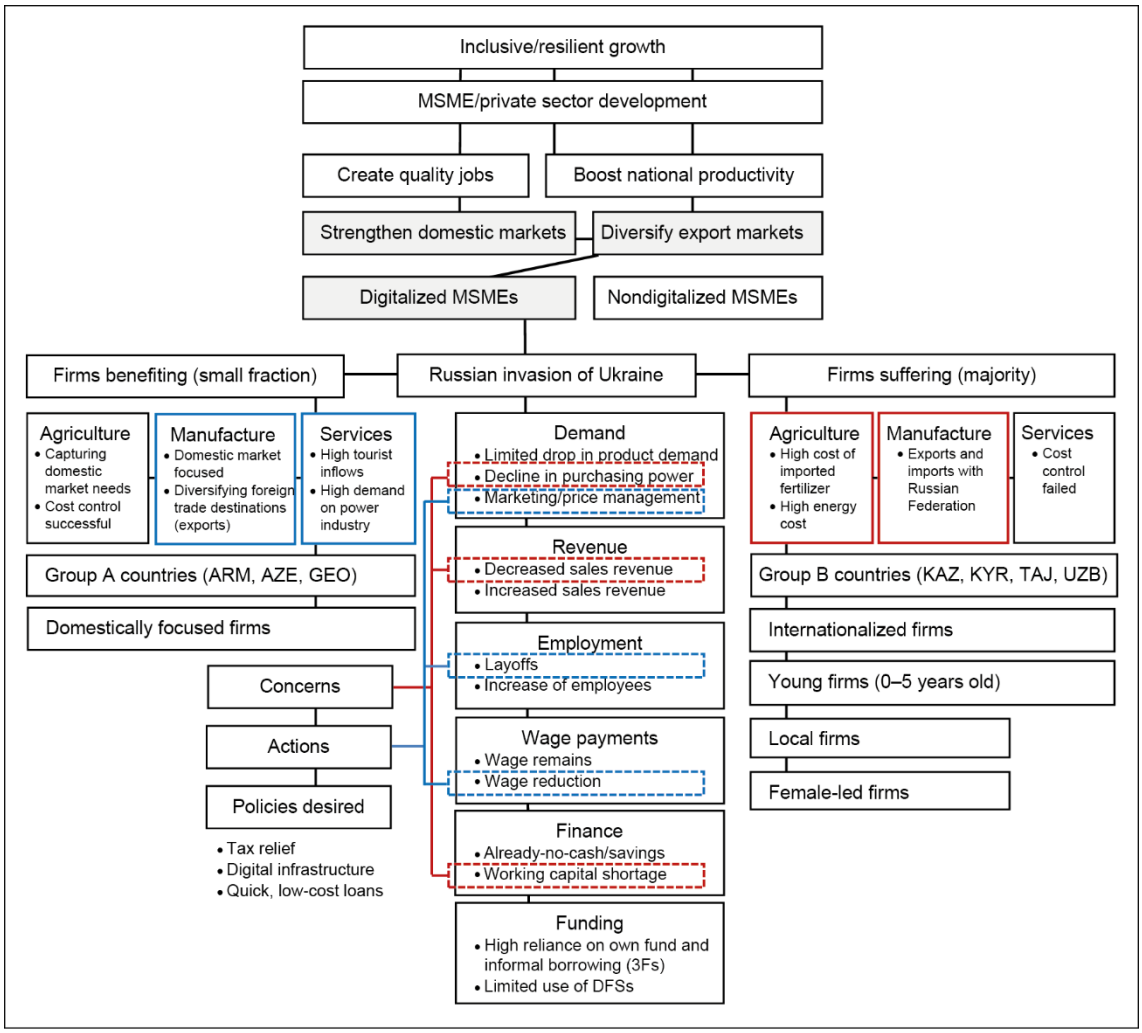
This caused firms to worry more about operational matters—high production and operating costs, a lack of working capital, and managing product selling prices. This was more pronounced among digitalized MS firms.

Another concern was a “sanction risk,” due to increasing inflows of Russian-based firms and individuals and the new bank accounts opened in local banks—increasing the risk that they would be added to those facing global sanctions.

Digitally operated MS firms felt they needed to act on marketing (top priority)—managing product pricing, selecting new domestic suppliers, and diversifying export destinations. For internal controls, layoffs and reducing wages were among priority actions contemplated.

The surveys also found that digitally operated firms wanted nonfinancial policies like tax relief, including deferred tax payments and reduced corporate income tax (top choice), followed by government assistance to digitize. They also wanted improved ICT infrastructure and regulations on internet speed and lower subscription costs so they can swiftly enter the e-commerce industry. Also, digitally operated firms wanted the government to support their access to quick, low-cost finance for working capital.

Figure 11: Impact of the Russian Invasion of Ukraine on Digitalized MSMEs—Evidence from Surveys and Linear Probability Models



ARM = Armenia; AZE = Azerbaijan; DFS = digital financial service; 3Fs = friends, family, fools; GEO = Georgia; KAZ = Kazakhstan; KYR = Kyrgyz Republic; MSME = micro, small, and medium-sized enterprise; TAJ = Tajikistan; UZB = Uzbekistan.

Source: Author.

Policies to Help Digitalize Business

Several policy implications from the study findings can help promote business digitalization for MSMEs in Central and West Asia:

- Strengthen domestic commodity markets through business cluster development:

  Digitalizing operations alone will not necessarily help export-oriented businesses as their operating costs increased markedly from the global sanctions on the Russian Federation. The LPM found that internationalized firms faced sharp revenue losses, forcing them to lay off workers and cut wages, particularly in digitalized smaller firms. By contrast, firms focused on domestic markets and/or successfully managed rising costs could even grow during the invasion crisis. Firms need a feasible business model before taking their business online, closely monitoring the current business environment and adapting their business strategy accordingly. High operating costs came from

excessive reliance on imported inputs for production and high energy/transportation costs. Targeting more domestic clients and better using domestic inputs for production can help when external costs are too high or rising. Improving and strengthening domestic commodity markets by developing business clusters can better localize inputs and link production segments.

- Diversify exports using a national branding strategy:

  With many MSMEs, especially digitalized firms, involved in global supply chains or international trade in the region, a firm's export strategy should address marketing and cost management. It is critical for firms to strengthen their own product branding—and use more domestic inputs—to diversify export markets globally. The government should develop a national branding strategy to accelerate the process.

- Assist the MSME digital transformation by promoting the use of technologies in operations, linked to entrepreneurship development:

  Many MSMEs are in low-technology industries or distributive trade. Their business operations and administration are typically based on cash. They are unfamiliar with technologies needed to start and manage an online business. Digitalization offers several benefits to startups and entrepreneurs. Literacy programs and advisory services should be well designed and offered to growth-oriented MSMEs—including young and women entrepreneurs. The assistance should help guide the transfer and adoption of new technology, as well as research and development (R&D).

- Diversify alternative financing options by developing market-based financing and digital finance platforms, along with strengthening financial education for MSMEs:

  The LPM indicated that working capital shortages were a serious problem for digitally operated smaller firms to survive under the invasion impact. Government financial assistance gradually improved MSME access to bank credit, but more diversified financing options are needed to fill unmet financing needs in an era of global uncertainty. In Central and West Asia, firms do not apply digital finance solutions sufficiently, in part due to their lack of basic knowledge on digital finance. Also, given that financial systems rely on subsidies, market-based financing like capital markets remains underdeveloped. Kazakhstan has a dedicated MSME equity market—the Alternative Board under the Kazakhstan Stock Exchange, launched in June 2017. Equity crowdfunding has developed in some developing Asian countries like Thailand—but not in Central and West Asia. Financial literacy and education programs—on digital and alternative finance—should be well designed and implemented following a national strategy. Countries with no national financial inclusion strategy may consider including this in their national strategic plans.

5. CONCLUSION

The Russian invasion of Ukraine started during the economic recovery from the COVID-19 pandemic in Central and West Asia. It disrupted global supply chains, slowed growth momentum, and added to inflation. Private businesses were adversely affected by the impact of the invasion and global sanctions, which was more pronounced for smaller firms.

With the pandemic helping build a base for digitalizing businesses, this paper has discussed how business digitalization and the use of digital finance affected MSME operations during the first 6 months of the invasion and related sanctions. The LPM regressions and survey findings conducted for the seven Central and West Asian countries indicated that digitalization remains at an early stage for MSMEs operating in the region. Digitally operated MS firms fell into two groups: those maximizing business opportunities and those that suffered from the Russian invasion and global sanctions. Cost management was key to helping businesses survive and grow. Digital finance has yet to be well accepted by MSMEs, even if digitalized.

Based on the analysis, the paper provides four policy implications to promote MSME business digitalization in the region: (i) developing domestic commodity markets through business clustering; (ii) expanding and diversifying exports using a national branding strategy; (iii) linking the digital transformation with entrepreneurship development; and (iv) creating alternative financing options—including digital finance platforms—by strengthening financial education for MSMEs.

Online rapid surveys were used to assess MSME conditions 6 months after the invasion began to consider possible support packages for Central and West Asian economies. Due to the nature of online surveys, samples were not selected randomly. To understand the extent of possible bias, the study calculated the gap between survey data and existing national statistics frameworks—thus readers should interpret the findings carefully given the data structure. A follow-up study will consider the improved data for more accurate analysis.

Across the region, digital infrastructure development has only taken off recently under several national financial inclusion strategies. Business digitalization offers several benefits for MSMEs—accessing better information, broadening MSME networks, creating new market opportunities nationally and globally, optimizing logistics and administration costs, broadening funding opportunities (digital finance platforms), and allowing greater business innovation. Given the impact of the invasion and sanctions, these benefits have yet to materialize in most digitally operated firms, especially MSMEs. This paper provides a first step toward designing evidence-based policies that support the region’s MSMEs.

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APPENDIX 1: IMPACT OF RUSSIAN INVASION OF UKRAINE ON MSMEs—LINEAR PROBABILITY MODELS

A. Overall

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.005285	0.2258***	0.04792	-0.06013**	0.09443**	0.1129**
	[0.0299]	[0.0588]	[0.0390]	[0.0252]	[0.0465]	[0.0541]
Wholesale and retail trade	-0.01045	0.2496***	-0.01803	-0.01898	0.04988	0.1516***
	[0.0162]	[0.0497]	[0.0238]	[0.0163]	[0.0308]	[0.0490]
Essential services	-0.006792	0.1682*	-0.003951	-0.04989	0.1553*	0.02093
	[0.0470]	[0.0914]	[0.0628]	[0.0343]	[0.0793]	[0.0875]
Transport and storage	-0.01886	0.2119*	-0.04706	-0.04343	0.05744	0.02184
	[0.0409]	[0.1081]	[0.0517]	[0.0429]	[0.0795]	[0.1104]
Accommodation and food services	-0.05015	0.17	-0.00994	-0.03756	0.01475	0.1930**
	[0.0458]	[0.1103]	[0.0596]	[0.0544]	[0.0808]	[0.0901]
Information and communications technology	-0.03717	0.1338	-0.05161	-0.01847	0.0488	0.06809
	[0.0540]	[0.1103]	[0.0716]	[0.0669]	[0.0956]	[0.1103]
Professional, scientific, and technical activities	0.1306	0.2798**	0.1971*	0.1845*	0.1969**	0.138
	[0.0949]	[0.1155]	[0.1077]	[0.1008]	[0.0994]	[0.1061]
Education	-0.02194	0.2434**	0.141	0.05317	0.2570**	0.1967**
	[0.0542]	[0.1201]	[0.1024]	[0.0812]	[0.1164]	[0.0944]
Arts, entertainment, and recreation	0.004291	0.06303	-0.006754	0.07116	0.159	0.2027*
	[0.0786]	[0.1505]	[0.0850]	[0.0975]	[0.1383]	[0.1175]
Other services	0.01904	0.2003***	0.0472	0.03772	0.2520***	0.1791***
	[0.0388]	[0.0702]	[0.0465]	[0.0442]	[0.0634]	[0.0607]
Country (base—Kazakhstan)						
Armenia	-0.07068	-0.3822***	-0.2067***	-0.1286	-0.4024***	-0.3074**
	[0.0706]	[0.1192]	[0.0706]	[0.0784]	[0.1141]	[0.1204]
Azerbaijan	-0.02343	-0.2289***	-0.08027	-0.0269	-0.3328***	-0.3566***
	[0.0414]	[0.0778]	[0.0538]	[0.0451]	[0.0671]	[0.0710]
Georgia	0.06018	-0.03534	0.007371	0.08305*	-0.1623***	-0.08524
	[0.0378]	[0.0658]	[0.0492]	[0.0446]	[0.0626]	[0.0543]
Kyrgyz Republic	-0.06429**	-0.1592**	-0.07494	-0.09348**	-0.2644***	-0.2182***
	[0.0319]	[0.0661]	[0.0497]	[0.0384]	[0.0640]	[0.0563]
Tajikistan	0.07841	0.02906	0.02521	-0.01867	-0.09701	-0.2447**
	[0.0717]	[0.1025]	[0.0827]	[0.0564]	[0.1013]	[0.1090]
Uzbekistan	-0.02241	-0.1703**	-0.1113**	-0.04574	-0.4151***	0.1114*
	[0.0318]	[0.0749]	[0.0531]	[0.0354]	[0.0596]	[0.0609]
Location (base—capital city)						
Regions (outside of capital city)	0.002943	0.02203	-0.01701	0.01751	0.0523	-0.0157
	[0.0253]	[0.0462]	[0.0323]	[0.0239]	[0.0382]	[0.0411]
Operating period (base—0–5 years)						
6–10 years	-0.04754**	-0.002206	0.0436	-0.008195	-0.0557	-0.005617
	[0.0232]	[0.0469]	[0.0341]	[0.0264]	[0.0387]	[0.0430]
11–15 years	-0.05150**	-0.02359	-0.007211	-0.05640**	-0.1325***	-0.05149
	[0.0238]	[0.0497]	[0.0319]	[0.0226]	[0.0393]	[0.0483]
16–30 years	-0.05110**	0.05638	-0.02433	-0.05351***	-0.1030***	-0.007403
	[0.0224]	[0.0513]	[0.0291]	[0.0204]	[0.0396]	[0.0489]
31 years and above	-0.02628	0.0674	-0.02582	-0.05470**	-0.08167	-0.2732***
	[0.0405]	[0.0989]	[0.0447]	[0.0219]	[0.0681]	[0.0920]
Gender of owner (base—male owner)						
Female	-0.02252	-0.01305	0.03264	0.007067	-0.003438	0.04463
	[0.0183]	[0.0387]	[0.0237]	[0.0193]	[0.0295]	[0.0360]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.02225	0.09894**	0.07926**	-0.006086	0.08309**	-0.0292
	[0.0249]	[0.0466]	[0.0357]	[0.0238]	[0.0397]	[0.0425]
Digitalization (base—nondigitalized firms)						
Digitally operated firms[2]	-0.04159*	0.07709*	0.04149	-0.04101*	-0.02135	-0.02422
	[0.0226]	[0.0458]	[0.0342]	[0.0246]	[0.0392]	[0.0407]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.04756**	0.1413	0.3263**	0.03635	0.5699***	0.2911**
	[0.0238]	[0.1416]	[0.1398]	[0.0666]	[0.1260]	[0.1198]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.01827	0.09778	-0.02843	0.04284***	0.07300**	0.2264***
	[0.0233]	[0.0637]	[0.0431]	[0.0159]	[0.0362]	[0.0602]
Constant	0.1082*	0.3046***	0.1337*	0.08497	0.2864***	0.4960***
	[0.0571]	[0.1079]	[0.0735]	[0.0524]	[0.0887]	[0.0981]
N	903	903	903	903	903	888
Pseudo R-square	0.08075	0.1076	0.1098	0.1333	0.2238	0.1443

[1] Firms participating in global supply chains or engaged in export/import business.

[2] Firms engaged in online selling or e-commerce.

Note: Robust standard errors in brackets.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

B. Overall—Group A (Armenia, Azerbaijan, and Georgia)

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.1144	0.08315	-0.07425	-0.1883**	-0.172	0.1209
	[0.0877]	[0.1203]	[0.0948]	[0.0887]	[0.1112]	[0.1180]
Wholesale and retail trade	-0.1035	-0.0902	-0.2171*	-0.1118	-0.1391	-0.02551
	[0.0879]	[0.1437]	[0.1171]	[0.1010]	[0.1240]	[0.1447]
Essential services	-0.08657	-0.08293	-0.2557**	-0.1311	-0.05725	0.1999
	[0.1058]	[0.1574]	[0.1038]	[0.1048]	[0.1406]	[0.1480]
Transport and storage	-0.06726	0.06058	-0.1940*	-0.1161	-0.1178	-0.02134
	[0.1218]	[0.1958]	[0.1026]	[0.1254]	[0.1477]	[0.1971]
Accommodation and food services	-0.1306	0.03735	-0.2381***	-0.06674	0.01306	0.1906
	[0.1176]	[0.1894]	[0.0862]	[0.1436]	[0.1702]	[0.1819]
Information and communications technology	-0.0908	-0.1293	-0.1856	-0.1389	-0.2487*	0.06823
	[0.1189]	[0.1789]	[0.1177]	[0.1268]	[0.1366]	[0.1752]
Professional, scientific, and technical activities	-0.0347	-0.002013	0.08984	-0.04872	-0.162	-0.02977
	[0.1440]	[0.1913]	[0.1596]	[0.1434]	[0.1606]	[0.1979]
Education	-0.1450*	0.06084	0.03083	0.07372	0.08318	0.086
	[0.0868]	[0.2240]	[0.1939]	[0.1820]	[0.2049]	[0.1752]
Arts, entertainment, and recreation	-0.06362	0.07815	-0.2046**	0.04117	0.05514	0.07503
	[0.1463]	[0.2236]	[0.0984]	[0.1753]	[0.1979]	[0.1798]
Other services	-0.0847	-0.06186	-0.1137	-0.09712	-0.07255	0.0719
	[0.0878]	[0.1250]	[0.0970]	[0.0959]	[0.1193]	[0.1100]
Country (base—Armenia)						
Azerbaijan	0.02603	0.1731	0.1455**	0.09816	0.06599	-0.07732
	[0.0812]	[0.1339]	[0.0714]	[0.0953]	[0.1123]	[0.1464]
Georgia	0.09245	0.2651*	0.2069***	0.1771*	0.14	0.1389
	[0.0943]	[0.1367]	[0.0760]	[0.1066]	[0.1244]	[0.1417]
Location (base—capital city)						
Regions (outside of capital city)	0.02373	0.05122	-0.07131	0.01184	0.03498	-0.005238
	[0.0486]	[0.0789]	[0.0545]	[0.0453]	[0.0652]	[0.0718]
Operating period (base—0–5 years)						
6–10 years	-0.07579	0.1045	0.0594	-0.01337	0.02433	0.08496
	[0.0502]	[0.0882]	[0.0649]	[0.0590]	[0.0748]	[0.0788]
11–15 years	-0.1152***	0.1719*	0.1038	-0.1079**	-0.08982	-0.05604
	[0.0434]	[0.0981]	[0.0771]	[0.0431]	[0.0737]	[0.1023]
16–30 years	-0.08042	0.1434	-0.02876	-0.1221***	-0.07883	0.003141
	[0.0516]	[0.1032]	[0.0581]	[0.0470]	[0.0755]	[0.1047]
31 years and above	-0.1534***	0.05484	-0.1458***	-0.1298**	0.07074	-0.4976***
	[0.0566]	[0.3137]	[0.0488]	[0.0593]	[0.2485]	[0.0983]
Gender of owner (base—male owner)						
Female	-0.03779	0.03528	0.05974	0.04592	0.08486	0.1432*
	[0.0493]	[0.0778]	[0.0592]	[0.0546]	[0.0684]	[0.0737]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.02123	-0.02269	0.01912	-0.0101	-0.04106	-0.031
	[0.0428]	[0.0809]	[0.0545]	[0.0497]	[0.0648]	[0.0750]
Digitalization (base—nondigitalized firms)						
Digitally operated firms[2]	-0.04843	0.05162	0.07077	-0.07376	-0.01077	-0.04015
	[0.0408]	[0.0693]	[0.0510]	[0.0454]	[0.0591]	[0.0653]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.1337*	-0.01059	0.3269	0.06307	0.1642	0.2597
	[0.0691]	[0.2119]	[0.2158]	[0.1609]	[0.2274]	[0.2483]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.04207*	0.1598	-0.002056	0.05717	0.2033***	0.2512**
	[0.0245]	[0.0971]	[0.0682]	[0.0369]	[0.0539]	[0.0992]
Constant	0.1519	0.05295	0.04504	0.08525	0.03365	0.2282
	[0.1307]	[0.1924]	[0.1331]	[0.1464]	[0.1661]	[0.2048]
N	248	248	248	248	248	238
Pseudo R-square	0.08959	0.08702	0.1233	0.1407	0.1401	0.1679

[1] Firms participating in global supply chains or engaged in export/import business.

[2] Firms engaged in online selling or e-commerce.

Note: Robust standard errors in brackets.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

C. Overall—Group B (Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan)

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	0.0332	0.2051***	0.05448	-0.003944	0.1621***	0.08884
	[0.0311]	[0.0719]	[0.0444]	[0.0202]	[0.0542]	[0.0647]
Wholesale and retail trade	0.008854	0.2939***	0.01305	0.008773	0.08677***	0.1966***
	[0.0128]	[0.0536]	[0.0224]	[0.0110]	[0.0313]	[0.0525]
Essential services	0.02913	0.1789	0.0969	-0.01745	0.1741*	-0.1883*
	[0.0603]	[0.1216]	[0.0963]	[0.0147]	[0.1015]	[0.1037]
Transport and storage	-0.02014	0.2353*	-0.02201	-0.02756*	0.1181	0.0391
	[0.0159]	[0.1314]	[0.0721]	[0.0164]	[0.1077]	[0.1410]
Accommodation and food services	-0.02894	0.192	0.09718	-0.04196**	-0.05726	0.2057**
	[0.0264]	[0.1446]	[0.0890]	[0.0204]	[0.0552]	[0.1011]
Information and communications technology	-0.04406	0.2463*	-0.05224	0.04848	0.2217	0.02801
	[0.0308]	[0.1483]	[0.1131]	[0.0970]	[0.1529]	[0.1509]
Professional, scientific, and technical activities	0.2264	0.3479**	0.1455	0.3414**	0.3274**	0.2243*
	[0.1480]	[0.1511]	[0.1548]	[0.1585]	[0.1434]	[0.1157]
Education	0.02732	0.2970**	0.1651	0.02133	0.2882**	0.2444**
	[0.0744]	[0.1463]	[0.1217]	[0.0754]	[0.1388]	[0.1116]
Arts, entertainment, and recreation	-0.03525	-0.2009	0.1536	-0.03921	0.02653	0.3687***
	[0.0342]	[0.1667]	[0.1806]	[0.0322]	[0.1892]	[0.0868]
Other services	0.06285	0.3312***	0.1021	0.1032*	0.4281***	0.2781***
	[0.0505]	[0.0971]	[0.0638]	[0.0611]	[0.0921]	[0.0799]
Country (base—Kazakhstan)						
Kyrgyz Republic	-0.0496	-0.07322	-0.05906	-0.07674**	-0.1968***	-0.1862***
	[0.0311]	[0.0717]	[0.0524]	[0.0372]	[0.0700]	[0.0625]
Tajikistan	0.06999	0.06466	0.05089	-0.037	-0.08959	-0.2002*
	[0.0708]	[0.1092]	[0.0844]	[0.0599]	[0.1035]	[0.1137]
Uzbekistan	-0.01516	-0.1493*	-0.1323**	-0.0393	-0.4152***	0.1480**
	[0.0303]	[0.0824]	[0.0575]	[0.0334]	[0.0663]	[0.0690]
Location (base—capital city)						
Regions (outside of capital city)	-0.02331	-0.03669	-0.003084	0.002885	0.02389	-0.01297
	[0.0313]	[0.0573]	[0.0422]	[0.0284]	[0.0473]	[0.0513]
Operating period (base—0–5 years)						
6–10 years	-0.02382	-0.04179	0.04806	0.006477	-0.07459*	-0.039
	[0.0251]	[0.0563]	[0.0426]	[0.0266]	[0.0447]	[0.0523]
11–15 years	-0.01237	-0.06372	-0.01467	-0.01717	-0.1226**	-0.0424
	[0.0282]	[0.0594]	[0.0368]	[0.0249]	[0.0476]	[0.0558]
16–30 years	-0.01656	0.04292	-0.008922	-0.01452	-0.08341*	-0.003976
	[0.0250]	[0.0618]	[0.0366]	[0.0220]	[0.0481]	[0.0570]
31 years and above	0.02325	0.06882	0.009322	-0.004445	-0.06789	-0.2066*
	[0.0458]	[0.1129]	[0.0539]	[0.0229]	[0.0729]	[0.1065]
Gender of owner (base—male owner)						
Female	-0.02335	-0.03218	0.01168	-0.01591	-0.03064	0.007469
	[0.0176]	[0.0459]	[0.0252]	[0.0171]	[0.0315]	[0.0431]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.02934	0.1801***	0.1243***	-0.01623	0.1410***	0.01707
	[0.0281]	[0.0592]	[0.0475]	[0.0230]	[0.0541]	[0.0534]
Digitalization (base—nondigitalized firms)						
Digitally operated firms[2]	-0.03223	0.1176*	0.01406	-0.0176	-0.03704	-0.005092
	[0.0242]	[0.0607]	[0.0498]	[0.0269]	[0.0532]	[0.0512]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.0208	0.2456	0.3107*	-0.00544	0.7888***	0.3267**
	[0.0206]	[0.1533]	[0.1792]	[0.0148]	[0.0507]	[0.1406]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.001209	0.09848	-0.04356	0.03644*	0.04725	0.2504***
	[0.0346]	[0.0821]	[0.0571]	[0.0199]	[0.0538]	[0.0753]
Constant	0.09519	0.2801**	0.1035	0.05214	0.2466**	0.4317***
	[0.0671]	[0.1299]	[0.0912]	[0.0514]	[0.1134]	[0.1184]
N	655	655	655	655	655	650
Pseudo R-square	0.09713	0.1533	0.1284	0.1583	0.3399	0.1644

[1] Firms participating in global supply chains or engaged in export/import business.

[2] Firms engaged in online selling or e-commerce.

Note: Robust standard errors in brackets.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

D. Digitally Operated Firms, Total

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.008247	0.3073**	-0.00562	-0.02617	0.2194**	0.04468
	[0.0820]	[0.1427]	[0.1120]	[0.0767]	[0.1053]	[0.1254]
Wholesale and retail trade	-0.09163	0.1619	-0.09038	0.02536	0.07845	0.05543
	[0.0710]	[0.1608]	[0.1242]	[0.0822]	[0.1095]	[0.1333]
Essential services	-0.08612	0.1493	0.0884	-0.03807	0.1614	0.1298
	[0.0675]	[0.1859]	[0.1642]	[0.0696]	[0.1317]	[0.1778]
Transport and storage	-0.07993	0.7312***	0.1879	0.06183	0.2636	0.1504
	[0.0916]	[0.2059]	[0.3151]	[0.1143]	[0.3008]	[0.3841]
Accommodation and food services	-0.01256	0.05042	0.001367	-0.04246	0.2813	0.08075
	[0.1455]	[0.2313]	[0.1573]	[0.1427]	[0.2082]	[0.1997]
Information and communications technology	0.04039	0.1578	-0.08145	0.1014	0.3486*	-0.01252
	[0.1511]	[0.2181]	[0.1293]	[0.1578]	[0.2004]	[0.1856]
Professional, scientific, and technical activities	-0.1114	-0.02735	0.3683	0.1861	0.2434	0.1912
	[0.0758]	[0.2719]	[0.2304]	[0.1803]	[0.1906]	[0.2151]
Education	-0.1222	0.2886	0.09116	0.1162	0.2823	0.3561
	[0.0794]	[0.2279]	[0.2140]	[0.1731]	[0.2168]	[0.2155]
Arts, entertainment, and recreation	-0.1013	0.08515	0.1	0.05842	0.3966	0.163
	[0.0712]	[0.2669]	[0.1931]	[0.1686]	[0.2468]	[0.1855]
Other services	-0.07255	0.2636	0.1533	0.01058	0.3467**	0.3601***
	[0.0878]	[0.1733]	[0.1494]	[0.1040]	[0.1470]	[0.1302]
Country (base—Kazakhstan)						
Armenia	-0.009277	-0.1794	-0.3544**	-0.1142	-0.26	-0.4747**
	[0.0475]	[0.2634]	[0.1589]	[0.0893]	[0.2283]	[0.1934]
Azerbaijan	0.01498	-0.1498	0.02151	0.03316	-0.1091	-0.3795***
	[0.0719]	[0.1502]	[0.1059]	[0.0766]	[0.1213]	[0.1269]
Georgia	0.02627	-0.04141	0.1375	0.07885	0.02156	-0.07822
	[0.0528]	[0.1280]	[0.0975]	[0.0763]	[0.1170]	[0.0980]
Kyrgyz Republic	-0.02174	0.1499	0.05503	-0.01304	0.1594	-0.1829
	[0.0462]	[0.1413]	[0.1353]	[0.0573]	[0.1529]	[0.1443]
Tajikistan	0.1231	-0.02756	0.1201	-0.04512	0.1095	-0.2507
	[0.1306]	[0.2258]	[0.1479]	[0.0738]	[0.2120]	[0.2117]
Uzbekistan	-0.09045	-0.02247	0.05933	-0.004336	-0.2378*	0.158
	[0.0580]	[0.1701]	[0.1532]	[0.0719]	[0.1269]	[0.1292]
Location (base—capital city)						
Regions (outside of capital city)	0.03698	0.0969	-0.0159	0.07689*	0.08045	0.03507
	[0.0450]	[0.0943]	[0.0705]	[0.0431]	[0.0808]	[0.0783]
Operating period (base—0–5 years)						
6–10 years	-0.01584	0.05603	0.08415	-0.02196	0.02386	0.1213
	[0.0522]	[0.1057]	[0.0924]	[0.0597]	[0.0990]	[0.0866]
11–15 years	-0.07294*	0.01757	-0.01629	-0.1044**	-0.2002**	0.002848
	[0.0372]	[0.1206]	[0.0870]	[0.0442]	[0.0826]	[0.1096]
16–30 years	-0.05965	-0.04697	0.07717	-0.07542*	-0.07211	-0.00253
	[0.0400]	[0.1419]	[0.1214]	[0.0455]	[0.1243]	[0.1233]
31 years and above	-0.003709	-0.2301	-0.3524**	-0.0288	0.02269	-0.6643***
	[0.0605]	[0.5080]	[0.1393]	[0.0616]	[0.4792]	[0.1379]
Gender of owner (base—male owner)						
Female	-0.06886*	-0.002729	0.06075	0.0216	0.03453	0.1274*
	[0.0394]	[0.0929]	[0.0712]	[0.0464]	[0.0796]	[0.0734]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.03997	0.0857	0.1827**	-0.06334	0.09902	0.02109
	[0.0351]	[0.0886]	[0.0754]	[0.0434]	[0.0834]	[0.0842]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.08344	-0.3086*	0.03506	-0.1111	0.1111	0.5017***
	[0.0715]	[0.1594]	[0.1873]	[0.0978]	[0.2604]	[0.1578]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.02647	0.1614	0.02447	0.04378	0.1335	0.3241**
	[0.0301]	[0.1319]	[0.1139]	[0.0347]	[0.0842]	[0.1284]
Constant	0.1159	0.2294	-0.03635	0.002803	-0.09185	0.2741
	[0.1072]	[0.2576]	[0.2008]	[0.1162]	[0.1901]	[0.2090]
N	175	175	175	175	175	174
Pseudo R-square	0.1381	0.1406	0.1154	0.1394	0.1908	0.2885

[1] Firms participating in global supply chains or engaged in export/import business.

Notes: Robust standard errors in brackets. Digitally operated firms are firms engaged in online selling of goods and services or e-commerce.
*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

E. Digitally Operated Firms—Group A (Armenia, Azerbaijan, and Georgia)

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.01685	0.3	0.04732	-0.05829	0.1638	0.1972
	[0.1573]	[0.1922]	[0.1412]	[0.1393]	[0.1765]	[0.1877]
Wholesale and retail trade	-0.09695	-0.03566	-0.1108	0.0263	0.148	0.02634
	[0.1334]	[0.2135]	[0.1522]	[0.1534]	[0.1743]	[0.2040]
Essential services	-0.08541	-0.07676	0.06346	-0.03888	0.2531	0.31
	[0.1233]	[0.2425]	[0.1800]	[0.1231]	[0.2010]	[0.2362]
Transport and storage	-0.05837	0.8174***	0.0953	0.08424	0.3198	0.1298
	[0.1633]	[0.2330]	[0.3225]	[0.1791]	[0.3417]	[0.3777]
Accommodation and food services	0.01814	-0.006204	-0.1125	0.003575	0.3757	0.1273
	[0.2014]	[0.2941]	[0.1099]	[0.2061]	[0.2654]	[0.2876]
Information and communications technology	0.1711	0.184	-0.1085	0.2509	0.1793	0.01425
	[0.2770]	[0.2799]	[0.1665]	[0.2745]	[0.3339]	[0.2603]
Professional, scientific, and technical activities	-0.07284	-0.06547	0.338	0.09629	0.1864	0.09111
	[0.1191]	[0.2962]	[0.2871]	[0.1430]	[0.1910]	[0.3410]
Education	-0.0774	0.2522	0.2439	0.2657	0.2331	0.1616
	[0.1171]	[0.2971]	[0.3764]	[0.2790]	[0.2737]	[0.3248]
Arts, entertainment, and recreation	-0.09297	0.1579	0.01439	0.164	0.4768	0.1303
	[0.0982]	[0.3370]	[0.1920]	[0.2753]	[0.3199]	[0.3063]
Other services	-0.1275	0.1333	0.2548	-0.05512	0.2737	0.3939**
	[0.1096]	[0.2232]	[0.1764]	[0.1327]	[0.1939]	[0.1790]
Country (base—Armenia)						
Azerbaijan	0.08909	0.09587	0.3362*	0.2067	0.06524	0.04062
	[0.0973]	[0.2518]	[0.1986]	[0.1325]	[0.2215]	[0.2631]
Georgia	0.1129	0.1532	0.5224**	0.2676*	0.1984	0.3094
	[0.0850]	[0.2719]	[0.2264]	[0.1371]	[0.2524]	[0.2827]
Location (base—capital city)						
Regions (outside of capital city)	0.05962	0.2039	-0.0593	0.05379	0.08094	0.1704
	[0.0748]	[0.1272]	[0.0959]	[0.0692]	[0.1045]	[0.1166]
Operating period (base—0–5 years)						
6–10 years	0.009623	0.1369	0.1432	0.04203	0.1122	0.2786**
	[0.0778]	[0.1654]	[0.1301]	[0.0905]	[0.1397]	[0.1207]
11–15 years	-0.08267	0.2484*	-0.07208	-0.09251	-0.1576	0.01407
	[0.0656]	[0.1452]	[0.0994]	[0.0687]	[0.1141]	[0.1532]
16–30 years	-0.04473	0.1558	0.2357	-0.01698	0.1256	0.006624
	[0.0868]	[0.2232]	[0.2101]	[0.1103]	[0.1900]	[0.1830]
31 years and above	0.007354	0.6030***	-0.4230**	0.03716	0.8055***	-0.5541***
	[0.0761]	[0.2086]	[0.1796]	[0.1094]	[0.1948]	[0.1485]
Gender of owner (base—male owner)						
Female	-0.07915	0.06556	0.04772	0.04742	0.1068	0.1469
	[0.0792]	[0.1485]	[0.1005]	[0.0910]	[0.1265]	[0.1196]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.0083	0.05883	0.2044*	-0.03109	0.02433	0.1074
	[0.0566]	[0.1439]	[0.1118]	[0.0698]	[0.1204]	[0.1192]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.1296	-0.3415	0.2164	-0.2028	0.09793	0.6235***
	[0.1547]	[0.2252]	[0.2590]	[0.1846]	[0.3339]	[0.2243]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.005812	0.1313	0.1598	0.07799	0.3097**	0.2795
	[0.0522]	[0.1622]	[0.1431]	[0.0665]	[0.1233]	[0.1802]
Constant	0.03352	-0.02236	-0.5322	-0.2357	-0.4784	-0.2673
	[0.1612]	[0.3888]	[0.3227]	[0.2064]	[0.3286]	[0.3858]
N	97	97	97	97	97	96
Pseudo R-square	0.1606	0.2215	0.228	0.1648	0.2276	0.3196

[1] Firms participating in global supply chains or engaged in export/import business.

Notes: Robust standard errors in brackets. Digitally operated firms are firms engaged in online selling of goods and services or e-commerce.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

F. Digitally Operated Firms—Group B (Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan)

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	0.04703	0.3666	-0.02699	0.0383	0.2718*	0.09892
	[0.0393]	[0.2436]	[0.2012]	[0.0447]	[0.1358]	[0.1910]
Wholesale and retail trade	-0.03731	0.2968	-0.04119	0.06453	0.02164	0.251
	[0.0743]	[0.3042]	[0.2513]	[0.0654]	[0.1613]	[0.2245]
Essential services	-0.05205	0.6291***	0.3427	-0.02228	0.1717	0.017
	[0.0733]	[0.2291]	[0.3817]	[0.0730]	[0.2131]	[0.3088]
Accommodation and food services	-0.0595	0.1706	0.4767	-0.1116	-0.02167	0.4037*
	[0.0556]	[0.4991]	[0.4288]	[0.0885]	[0.2233]	[0.2314]
Information and communications technology	-0.03276	0.2354	-0.2087	-0.06531	0.4623*	0.2204
	[0.0461]	[0.3688]	[0.2478]	[0.0672]	[0.2690]	[0.2489]
Professional, scientific, and technical activities	-0.08751	0.197	0.3975	0.4359	0.4997	0.6731***
	[0.0794]	[0.4595]	[0.5209]	[0.3444]	[0.3493]	[0.2404]
Education	-0.1206	0.5067	-0.08459	-0.1141	0.2857	0.8206***
	[0.0893]	[0.3373]	[0.2468]	[0.0832]	[0.3605]	[0.2838]
Arts, entertainment, and recreation	-0.04587	-0.0988	0.3908	-0.008824	0.3124	0.4257*
	[0.0941]	[0.4958]	[0.4191]	[0.0840]	[0.4983]	[0.2446]
Other services	0.1417	0.3267	-0.0972	0.2237	0.3888	0.5655**
	[0.2064]	[0.3382]	[0.2413]	[0.1765]	[0.3070]	[0.2409]
Country (base—Kazakhstan)						
Kyrgyz Republic	-0.02529	0.1435	0.1086	-0.01684	0.2459	-0.0694
	[0.0381]	[0.1570]	[0.1411]	[0.0430]	[0.1760]	[0.1733]
Tajikistan	0.1183	-0.2275	0.07648	-0.05223	0.09507	-0.2311
	[0.1219]	[0.2823]	[0.1593]	[0.0599]	[0.2476]	[0.2455]
Uzbekistan	-0.03986	-0.04537	-0.06532	0.0003301	-0.2744*	0.3734**
	[0.0527]	[0.2332]	[0.2050]	[0.0482]	[0.1580]	[0.1754]
Location (base—capital city)						
Regions (outside of capital city)	0.04817	-0.135	0.07699	0.1496	0.1116	-0.1286
	[0.0834]	[0.1405]	[0.1067]	[0.0940]	[0.1661]	[0.1070]
Operating period (base—0–5 years)						
6–10 years	-0.07433	-0.008009	0.05404	-0.1416*	-0.08398	-0.02596
	[0.0604]	[0.1696]	[0.1437]	[0.0753]	[0.1611]	[0.1443]
11–15 years	-0.08808	-0.1671	0.1375	-0.1931*	-0.3395**	-0.02661
	[0.0666]	[0.2411]	[0.1916]	[0.1024]	[0.1613]	[0.1579]
16–30 years	-0.05266	-0.1465	-0.02377	-0.09329*	-0.2357	-0.01307
	[0.0414]	[0.2097]	[0.1472]	[0.0546]	[0.1876]	[0.1727]
31 years and above	0.0309	-1.2437***	-0.6570*	-0.06493	-0.7808**	-0.5828*
	[0.0682]	[0.2227]	[0.3829]	[0.0838]	[0.2951]	[0.3230]
Gender of owner (base—male owner)						
Female	-0.02991	-0.06086	-0.009497	0.04321	0.06165	0.1648
	[0.0316]	[0.1434]	[0.1056]	[0.0425]	[0.1280]	[0.1093]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.0552	0.1454	0.1814*	-0.09984	0.1315	0.1302
	[0.0427]	[0.1330]	[0.1035]	[0.0664]	[0.1602]	[0.1189]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.02375	-0.03402	-0.3508	0.05931	0.2646	0.5260**
	[0.0658]	[0.1498]	[0.2207]	[0.0618]	[0.2001]	[0.2307]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.01576	0.09832	-0.1331	-0.05576	0.05241	0.3898*
	[0.0365]	[0.2490]	[0.2129]	[0.0544]	[0.1533]	[0.2082]
Constant	0.06761	0.4232	0.08987	0.06687	0.006003	0.079
	[0.1084]	[0.4819]	[0.3857]	[0.1013]	[0.3342]	[0.3502]
N	78	78	78	78	78	78
Pseudo R-square	0.2415	0.2421	0.2334	0.3931	0.2957	0.3858

[1] Firms participating in global supply chains or engaged in export/import business.

Notes: Robust standard errors in brackets. Digitally operated firms are firms engaged in online selling of goods and services or e-commerce.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 1 *table continued*

G. Nondigitalized Firms

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.0291	0.1654**	0.06333	-0.08080***	0.03023	0.1132*
	[0.0364]	[0.0699]	[0.0421]	[0.0308]	[0.0538]	[0.0628]
Wholesale and retail trade	-0.004536	0.2765***	0.003434	-0.02608	0.05405*	0.1814***
	[0.0176]	[0.0534]	[0.0218]	[0.0170]	[0.0327]	[0.0535]
Essential services	0.0006631	0.1434	-0.05371	-0.0668	0.1276	-0.02677
	[0.0701]	[0.1165]	[0.0636]	[0.0496]	[0.1088]	[0.1133]
Transport and storage	-0.02281	0.1408	-0.05953	-0.05553	0.02357	0.002441
	[0.0455]	[0.1162]	[0.0534]	[0.0479]	[0.0842]	[0.1150]
Accommodation and food services	-0.08610**	0.1936	-0.02041	-0.03995	-0.1168	0.2149**
	[0.0357]	[0.1312]	[0.0657]	[0.0562]	[0.0757]	[0.1046]
Information and communications technology	-0.1207***	0.1051	-0.001289	-0.0848	-0.05964	0.09428
	[0.0376]	[0.1290]	[0.0966]	[0.0776]	[0.0973]	[0.1436]
Professional, scientific, and technical activities	0.1913	0.3648***	0.1424	0.1739	0.1853	0.1129
	[0.1271]	[0.1216]	[0.1257]	[0.1249]	[0.1234]	[0.1249]
Education	-0.02877	0.1716	0.1465	0.02251	0.2088	0.09963
	[0.0765]	[0.1524]	[0.1232]	[0.0944]	[0.1472]	[0.1109]
Arts, entertainment, and recreation	0.1046	0.1078	-0.03258	0.09504	0.0486	0.3005*
	[0.1424]	[0.1719]	[0.0421]	[0.1388]	[0.1456]	[0.1755]
Other services	0.02047	0.1216	-0.006658	0.04124	0.1705**	0.09184
	[0.0501]	[0.0831]	[0.0480]	[0.0548]	[0.0742]	[0.0738]
Country (base—Kazakhstan)						
Armenia	-0.1237	-0.5471***	-0.2085**	-0.1378	-0.4904***	-0.2999**
	[0.1043]	[0.1376]	[0.0896]	[0.1083]	[0.1494]	[0.1448]
Azerbaijan	-0.04587	-0.2482***	-0.1255*	-0.03659	-0.3908***	-0.3755***
	[0.0514]	[0.0956]	[0.0646]	[0.0575]	[0.0824]	[0.0897]
Georgia	0.07661	-0.04537	-0.05991	0.1009*	-0.2325***	-0.1164*
	[0.0533]	[0.0837]	[0.0597]	[0.0606]	[0.0788]	[0.0698]
Kyrgyz Republic	-0.06894	-0.2410***	-0.1424**	-0.09309*	-0.3822***	-0.2649***
	[0.0425]	[0.0800]	[0.0562]	[0.0481]	[0.0749]	[0.0660]
Tajikistan	0.07265	0.01725	-0.02083	0.003161	-0.1611	-0.2751**
	[0.0869]	[0.1155]	[0.1008]	[0.0738]	[0.1202]	[0.1257]
Uzbekistan	-0.01338	-0.2329***	-0.1769***	-0.04581	-0.4777***	0.06651
	[0.0395]	[0.0872]	[0.0587]	[0.0428]	[0.0707]	[0.0724]
Location (base—capital city)						
Regions (outside of capital city)	-0.01707	-0.01087	-0.02209	-0.005636	0.0412	-0.04071
	[0.0317]	[0.0565]	[0.0384]	[0.0288]	[0.0447]	[0.0517]
Operating period (base—0–5 years)						
6–10 years	-0.06209**	-0.04831	0.03227	-0.007009	-0.08680**	-0.05522
	[0.0269]	[0.0548]	[0.0366]	[0.0304]	[0.0430]	[0.0510]
11–15 years	-0.05030*	-0.02787	-0.009593	-0.04391*	-0.1237***	-0.06477
	[0.0291]	[0.0564]	[0.0339]	[0.0265]	[0.0446]	[0.0551]
16–30 years	-0.05493**	0.06752	-0.03243	-0.05012**	-0.1105**	-0.01079
	[0.0274]	[0.0575]	[0.0290]	[0.0244]	[0.0437]	[0.0542]
31 years and above	-0.03017	0.07525	-0.01837	-0.04931*	-0.09736	-0.2710***
	[0.0457]	[0.1029]	[0.0453]	[0.0260]	[0.0652]	[0.0982]
Gender of owner (base—male owner)						
Female	-0.01213	-0.008804	0.02718	0.004675	-0.01629	0.02737
	[0.0217]	[0.0438]	[0.0237]	[0.0219]	[0.0313]	[0.0422]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.02429	0.07112	0.04018	0.01288	0.06421	-0.05955
	[0.0347]	[0.0580]	[0.0399]	[0.0306]	[0.0488]	[0.0531]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	-0.05490*	0.2704*	0.4239***	0.07829	0.6995***	0.1948
	[0.0318]	[0.1468]	[0.1605]	[0.0881]	[0.1114]	[0.1619]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.006786	0.05605	-0.03994	0.05031**	0.04662	0.1966***
	[0.0315]	[0.0739]	[0.0491]	[0.0211]	[0.0448]	[0.0697]
Constant	0.1422*	0.4530***	0.2189**	0.09365	0.4453***	0.6111***
	[0.0749]	[0.1296]	[0.0853]	[0.0628]	[0.1074]	[0.1175]
N	728	728	728	728	728	714
Pseudo R-square	0.1056	0.1176	0.1329	0.1503	0.2751	0.1339

[1] Firms participating in global supply chains or engaged in export/import business.

Notes: Robust standard errors in brackets. Nondigitalized firms are firms not engaged in online selling or e-commerce (traditional business).
*** p < 0.01, ** p < 0.05, * p < 0.10.

APPENDIX 2: IMPACT OF RUSSIAN INVASION OF UKRAINE ON MSMEs—PROBIT MODELS (ROBUSTNESS TEST)

A. Overall

Variables	(1) revenue1	(2) revenue2	(3) employment	(4) wage1	(5) wage2	(6) finance
Industry (base—agriculture, forestry, and fisheries)						
Manufacture	-0.03217	0.5978***	0.3475	-0.6179*	0.5164***	0.3099*
	[0.2639]	[0.1512]	[0.2184]	[0.3223]	[0.1911]	[0.1589]
Wholesale and retail trade	-0.1461	0.6607***	-0.03137	-0.2176	0.3373*	0.4040***
	[0.3144]	[0.1324]	[0.2356]	[0.3436]	[0.1824]	[0.1348]
Essential services	0.01263	0.4482*	0.2126	-0.5342	0.8042***	0.04359
	[0.4036]	[0.2342]	[0.3238]	[0.5418]	[0.2748]	[0.2459]
Transport and storage	-0.1336	0.5616**	-0.2314	-0.4074	0.4028	0.05775
	[0.5312]	[0.2614]	[0.4453]	[0.5653]	[0.3183]	[0.2620]
Accommodation and food services	-0.4608	0.4509	-0.02315	-0.2952	0.1806	0.6139*
	[0.5316]	[0.2756]	[0.4277]	[0.4748]	[0.3551]	[0.3208]
Information and communications technology	-0.1862	0.3574	-0.1611	-0.1824	0.2791	0.1858
	[0.5112]	[0.3008]	[0.4283]	[0.4684]	[0.3519]	[0.3150]
Professional, scientific, and technical activities	0.6802	0.7567**	0.8828**	0.6935	0.7825**	0.4016
	[0.4541]	[0.3443]	[0.3993]	[0.4583]	[0.3838]	[0.3590]
Education	-0.199	0.6502**	0.7004*	0.1723	1.0356***	0.6371*
	[0.5847]	[0.3241]	[0.3810]	[0.4807]	[0.3474]	[0.3803]
Arts, entertainment, and recreation	-0.01404	0.1652	0.006118	0.3833	0.7476*	0.6484
	[0.6390]	[0.3884]	[0.5826]	[0.5769]	[0.4161]	[0.4612]
Other services	0.1131	0.5274***	0.3333	0.1456	0.9825***	0.5509***
	[0.3112]	[0.1869]	[0.2629]	[0.3130]	[0.2140]	[0.2079]
Country (base—Kazakhstan)						
Armenia	-0.5511	-1.0352***	-1.2367**	-0.7031	-1.2686***	-0.9842***
	[0.5696]	[0.3415]	[0.5588]	[0.5242]	[0.3897]	[0.3570]
Azerbaijan	-0.1921	-0.6049***	-0.4124	-0.1639	-1.0207***	-1.0889***
	[0.3315]	[0.2042]	[0.2641]	[0.3174]	[0.2342]	[0.2264]
Georgia	0.4061	-0.1019	0.02125	0.4208*	-0.3971**	-0.3387*
	[0.2607]	[0.1731]	[0.2071]	[0.2410]	[0.1784]	[0.1967]
Kyrgyz Republic	-0.8953**	-0.4233**	-0.6326***	-1.5584***	-0.8691***	-0.6956***
	[0.3486]	[0.1782]	[0.2420]	[0.4333]	[0.1916]	[0.1989]
Tajikistan	0.4076	0.07214	0.08668	-0.1547	-0.1434	-0.7478***
	[0.3735]	[0.2845]	[0.3318]	[0.4726]	[0.2915]	[0.2867]
Uzbekistan	-0.184	-0.4538**	-0.5937**	-0.5026	-1.5415***	0.364
	[0.3383]	[0.1986]	[0.2556]	[0.3811]	[0.2536]	[0.2319]
Location (base—capital city)						
Regions (outside of capital city)	0.0176	0.06063	-0.09257	0.1128	0.232	-0.07256
	[0.1969]	[0.1221]	[0.1586]	[0.2128]	[0.1427]	[0.1343]
Operating period (base—0–5 years)						
6–10 years	-0.4538**	-0.01557	0.262	0.02866	-0.1853	-0.007274
	[0.2277]	[0.1266]	[0.1632]	[0.2100]	[0.1482]	[0.1359]
11–15 years	-0.4213*	-0.07313	-0.07744	-0.5994**	-0.5794***	-0.1309
	[0.2488]	[0.1358]	[0.1938]	[0.3012]	[0.1702]	[0.1417]
16–30 years	-0.5352*	0.1499	-0.302	-0.9905**	-0.4235**	-0.005993
	[0.2924]	[0.1379]	[0.2285]	[0.4577]	[0.1726]	[0.1453]
31 years and above	-0.1698	0.1735	-0.3293	0	-0.2487	-0.7386**
	[0.5663]	[0.2721]	[0.5513]	[.]	[0.3565]	[0.2922]
Gender of owner (base—male owner)						
Female	-0.269	-0.03373	0.2217	0.03536	-0.02956	0.1353
	[0.2012]	[0.1045]	[0.1509]	[0.1943]	[0.1284]	[0.1114]
Internationalization (base—noninternationalized firms)						
Internationalized firms[1]	-0.2186	0.2685**	0.4828***	-0.09624	0.3224**	-0.1199
	[0.2146]	[0.1267]	[0.1615]	[0.2277]	[0.1458]	[0.1349]
Digitalization (base—nondigitalized firms)						
Digitally operated firms[2]	-0.4032*	0.2073*	0.2129	-0.3886*	-0.07745	-0.06191
	[0.2144]	[0.1217]	[0.1491]	[0.2094]	[0.1397]	[0.1311]
Digital financial services (DFS) (base—firms not using DFS)						
Firms using DFS	0	0.3694	1.4456***	0.2106	1.6645***	0.8924**
	[.]	[0.3711]	[0.3860]	[0.7134]	[0.3958]	[0.4272]
Enterprise classification (base—medium-sized and large firms)						
Micro and small firms	0.1968	0.2593	-0.1856	0	0.4948*	0.7016***
	[0.3172]	[0.1648]	[0.2129]	[.]	[0.2543]	[0.1760]
Constant	-1.2270**	-0.5172*	-1.2510***	-0.9666**	-1.1309***	0.02039
	[0.4906]	[0.2860]	[0.3847]	[0.3973]	[0.3664]	[0.3100]
N	890	903	903	793	903	888

[1] Firms participating in global supply chains or engaged in export/import business.

[2] Firms engaged in online selling or e-commerce.

Note: Standard errors in brackets.

*** p < 0.01, ** p < 0.05, * p < 0.10.

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Appendix 2 *table continued*

B. Marginal Effects—Digitalization

Item	Delta-method					
	Margin	Std. Err.	z	P>z	[95% Conf.	Interval]
(revenue1)						
Digitally operated firms (1)	0.025494	0.0112212	2.27	0.023	0.003501	0.047487
Nondigitally operated firms (2)	0.0417397	0.0080367	5.19	0.000	0.025988	0.057491
(1) - (2)	-0.0162457					
(revenue2)						
Digitally operated firms (3)	0.5799613	0.0401456	14.45	0	0.501277	0.658645
Nondigitally operated firms (4)	0.4511327	0.0188509	23.93	0	0.414186	0.48808
(3) - (4)	0.1288286					
(wage1)						
Digitally operated firms (5)	0.0237293	0.0108312	2.19	0.028	0.002501	0.044958
Nondigitally operated firms (6)	0.0335543	0.0082339	4.08	0	0.017416	0.049693
(5) - (6)	-0.009825					