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Ukraine: Firms through the War

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by



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The impact of the 2022 Russian invasion on businesses in Ukraine has resulted in significant damage to the country's private sector. This report aims to address the lack of information regarding the different effects and their channels. Eighteen percent of firms have reported experiencing damage. Additionally, limited access to finance and key export markets, along with insufficient demand and increased uncertainty, have hindered the growth of Ukrainian enterprises. Despite these challenges, Ukrainian firms that have continued to operate after the Russian invasion have shown resilience and adaptability by proactively adjusting their business strategies. This includes efforts such as seeking new customers, utilizing digital tools, and optimizing their supply chains. Based on the findings of the report, firms report needs for public support, especially for financial assistance, regulatory improvements, and better market access.¹

¹This report is intended for a broad audience and can be read in a modular way: The executive reader can find the key findings in the initial note on Main Messages, policymakers will find a complete overview of the report in the Executive Summary, and researchers will find a comprehensive coverage of the analytical work in the main body of the report.

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CHAPTER 1

Main Messages and Executive Summary

I. Main Messages

The Russian invasion has had diverse effects on businesses, causing significant damage to Ukraine's private sector. These effects can be attributed to three primary channels of transmission: disruptions in accessing domestic and international markets, interruptions in the supply of essential resources, and increased uncertainty. The extent of these impacts varies among businesses due to their sector, location, market presence, and size.

This report aims at filling the information gap on these different impacts and channels. Despite the need to improve the government support to the private sector during the invasion, knowledge about the lasting effects of the 2022 invasion on these businesses is limited. To contribute to addressing this knowledge gap, the World Bank is leading a comprehensive analytical effort, shedding light on the devastating consequences of the invasion on domestic firms and multinational corporations in Ukraine and their potential implications for improving government support programs. The primary preliminary findings and messages of this effort are the following.

Approximately 18 percent of firms reported damaged assets. Curtailed access to

finance and vital export markets, inadequate demand and heightened uncertainty hampered Ukrainian enterprises. Firms in the main active war zones in the Eastern and Southern regions experienced the most significant damages. Critical sectors for the Ukrainian economy, however, like agriculture, exhibited encouraging recovery signs by early 2023. Financial difficulties affected approximately 84 percent of firms, hampering sales, investment, and jobs. The collapse of Ukrainian exports after the invasion was related to the closure of the Russian market, and to disruptions in critical trade and logistics hubs. Approximately 43 percent of firms that closed temporarily or permanently cited insufficient demand as their main reason for closure. Increased uncertainty linked to the invasion further dampened employment and investment.

Ukrainian firms that continued operation after the Russian invasion adapted their business strategies proactively and resiliently in response to this shock, including seeking new customers, leveraging digital tools, and adopting supply chain optimization techniques. Notably, multinational corporations (MNCs) demonstrated remarkable resilience by continuing to invest in their subsidiaries in Ukraine and are foreseeing continued growth in the near future.

Firms identified three primary areas requiring increased public support: financial assistance, regulatory improvements, and market access. Among these, larger firms expressed a greater need for credit and grants to rebuild their damaged assets, with grants being particularly crucial for Eastern and Southern firms. Government assistance programs can be made more effective. Assisted firms fared better during the invasion, but only 8 percent of firms reported receiving public assistance. Awareness of government support programs needs improvement, as one in four firms was unaware of their existence. Public support during the war should also be prioritized based on the extent of damages and the relative importance of affected businesses for overall employment and sales.

Effective government support for the private sector affected by the Russian invasion of Ukraine requires a comprehensive action plan that considers the various impacts of

the conflict within the country. The Government of Ukraine has already been working on the Economic Recovery Plan and Facility, and this report emphasizes the need to include two dimensions: (a) reorganizing and revamping the portfolio of firm support programs to tailor it on the various needs of enterprises by size, typology, industry, location, systemic relevance, and extent of damages, and (b) addressing disparities in the regions, sectors, and industries most affected by the invasion.

II. Executive Summary

The Russian invasion of Ukraine in February 2022 inflicted substantial damage on the country's private sector with differing impacts across firms, sectors, and regions.

This impact unfolded primarily through three main channels: disruptions of domestic and external markets, interruptions in the access to essential resources like capital, labor, and other inputs, and heightened uncertainty. The extent of these impacts varies among businesses due to factors such as their sector, location, market presence, and size, resulting in diverse outcomes for different firms. While the private sector plays a vital role in Ukraine's economy, there is currently limited understanding of the long-term impacts of the invasion on these businesses.

To contribute to addressing this knowledge gap, the World Bank is leading a comprehensive effort to uncover the devastating consequences of the invasion on

Ukrainian firms and their potential implications for post-invasion recovery. This effort includes conducting a large in-country business pulse survey (BPS), a multinational corporation (MNCs) survey, and an innovative analysis of real time data on economic activity across multiple locations relying on satellite imagery data (refer to Box 1 in the Appendix for details about the sources of evidence). This executive summary provides the initial results from this comprehensive monitoring effort.

The Shock of the Invasion. Impacts on Ukraine's Private Sector.

The Russian invasion in February 2022 caused extensive damage to both the physical assets and human resources of Ukrainian companies. It also disrupted the acquisition of critical imported materials, as well as access to vital export markets and financing. These challenges, stemming from both the supply and demand shocks triggered by the invasion, led to a sharp downturn in economic activity.

Following the invasion, economic activity sharply declined, especially in the Eastern region. The invasion caused significant damage to infrastructure and production facilities, disrupted established logistical routes, and led to a humanitarian crisis. As a

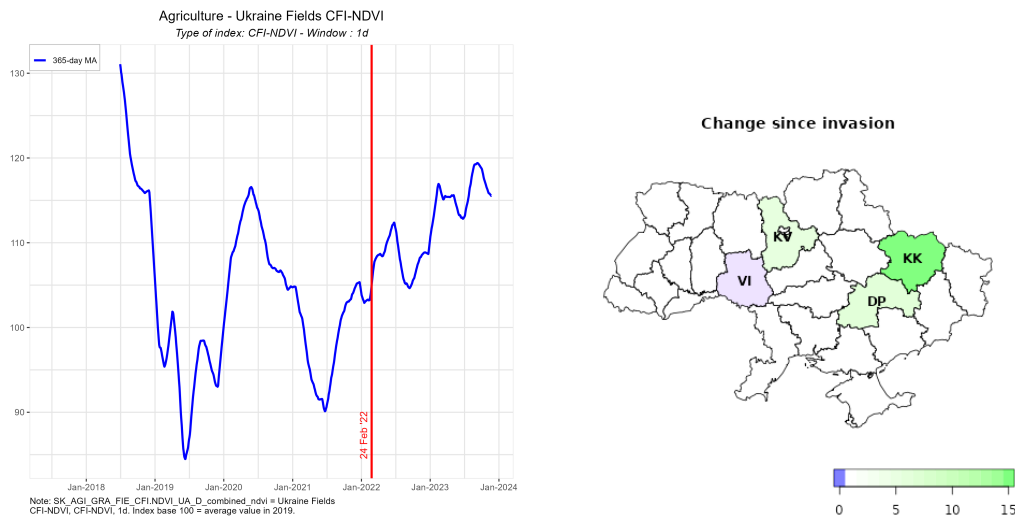
result, the Ukrainian economy contracted by 29.1 percent in 2022. Growth for 2023 is projected at 4.8 percent but its medium-term trajectory will depend on the evolution of Russia's invasion. Regionally, the invasion depressed economic activity in the East, while internal displacement incentivized production in the Western region.

Metallurgy suffered the largest damage and losses. With the two main metallurgical plants in Mariupol ruined in March 2022, Ukraine lost about 40 percent of its steel-making capacity (GMK 2022). As a result, metal production contracted by about 60 percent in 2022. Only a third of industrial firms were able to maintain a high level of capacity utilization in the regions adjacent to the frontlines (IER 2023). Despite extensive destruction in grain storage infrastructure, disruptions in transport and logistics, and the resulting output contraction in the fall out of the invasion, agriculture continues to be one of the largest contributors to employment, output, and exports (IFC 2023a).

Satellite imagery data shows early signs of recovery in certain vital sectors of the Ukrainian economy. This report utilizes innovative satellite imagery to monitor economic activity through 49 indicators, with an industry coverage accounting for up to 40 percent of Ukraine's GDP, from the period immediately after the invasion in February 2022 through early 2023 - refer to Box 1 in the Appendix for details. Satellite information on grain storage facilities and truck movements, for instance, suggests that the initial downturn of agricultural production in Spring 2022 was partly offset between the summer of 2022 and the first half of 2023 (Figure 1.4). Anecdotal evidence suggests that this upturn could have been related to the Black Sea initiative (until July 2023), use of new export routes, and on-site grain processing.

Satellite imagery also reveals that certain energy-intensive sectors, such as metal and cement, briefly resumed production in the third quarter of 2022 following the initial aftermath of the invasion. However, this tentative recovery was hindered by electricity shortages in the last quarter of 2022. Automotive production, particularly wire harnesses, which is concentrated in the West, also resumed after an initial shock. The retail sector faced significant disruption due to the Russian invasion, resulting in substantial

Figure 1.1: Planted area on fields in the main producing regions is already at pre-invasion levels



Notes. See Appendix for details on how the CFI-INDVI is constructed. Source: World Bank's staff calculations based on SpaceKnow data.

damage and a decline in demand. However, consumer spending rebounded in 2023, according to the satellite imagery data. Food processing was a major contributor to industrial output before the war, accounting for around 20 percent of output in 2022 and satisfying 90 percent of domestic demand. Vegetable oil processing, predominantly export-oriented with 85 percent of output exported, suffered significant damage with 20 percent of processing plants damaged or in occupied territories. Disrupted logistics and electricity shortages led to lower capacity utilization, with firms resorting to lower value-added exports and switching to exporting raw seeds rather than oil. At the same time, state-of-the-art large facilities reduced production, despite pre-war upgrading investments.

The invasion severely disrupted trade, transport, and logistics in the Eastern and Southern war zones. Satellite imagery data shows that these activities, particularly in the Southern Kherson Oblast, significantly declined following the invasion. Most industrial ports remain blocked and are not operating at full capacity, except for those in Crimea,

which are being used for Russian military purposes, anecdotal evidence indicates.

Since the invasion, sales have plummeted, particularly among small firms, construction and utilities businesses, and those in the active war zones in the East and South.

According to the BPS, sales in the surveyed months dropped by an average of 53 percent compared to the same month in 2021, with approximately half of the firms witnessing a 50 percent or more decline in sales. Small firms bore the brunt with a 55 percent decrease, while medium and large firms saw declines of 49 percent and 46 percent, respectively. Regionally, the East and South experienced the most significant sales drops at 70 percent and 63 percent, respectively, in contrast to the West's 39 percent decline. In terms of sectors, the construction and utilities industry faced the most substantial sales decline at 65 percent.

Firms, on average, saw a 25 percent reduction in their workforce due to the invasion, with larger firms and those in construction, utilities, and Eastern regions experiencing the most substantial declines.

The BPS results show that approximately 60 percent of firms experienced a decline in employment within a single quarter. Large firms reported the most substantial reduction in both full-time and part-time employment, with a 31 percent decrease. Like the sales decline, the construction and utilities sector witnessed the most significant reduction in employees, with a 36 percent drop. Regionally, employment suffered the greatest decline in the East, where it decreased by 37 percent. Econometric analysis also indicates a strong correlation between the reduction in the number of employees and the decline in sales — see Box 3 in the Appendix for details on the econometric methodology. Approximately 20 percent of large firms and 15 percent of Eastern firms had also to relocate due to the invasion.

Domestic firms reduced their investments, while multinational corporations (MNCs) reinvested in their Ukrainian subsidiaries to sustain operations and have plans for further expansion in the next six months.

As part of the BPS, companies were requested to disclose their investments in fixed assets, including machinery, equipment, software, and vehicles for 2021 and the period from March to December 2022. On average, in-

vestments witnessed a 76 percent decrease, with medium-sized firms experiencing the most substantial decline at 80 percent. Among sectors, construction and hospitality recorded the sharpest drops in investments, with reductions of 85 percent and 86 percent, respectively. Manufacturing reported the smallest reduction, at 56 percent. Regionally, Northern firms scaled back investments by 81 percent, while Eastern firms reduced them by 63 percent. According to the MNCs survey, multinational enterprises did not reduce their investments in fixed assets, and many even expanded them. Furthermore, half of the MNCs expressed their intention to further increase their investments in the next six months (refer to Box 2 in the Appendix for details).

Shockwaves of the 2022 Invasion. Channels of Transmission to Firms' Operations

The Russian invasion impacted Ukraine's private sector in two main ways: through demand shocks, which were driven by reduction in consumer spending and access to crucial export markets, and heightened uncertainty about sales outlook, and through supply shocks, which encompassed damage and asset theft, input shortages, logistical disruptions, and limited access to financing¹.

Demand Shocks

The primary reason for most firm closures was inadequate demand. According to the BPS, approximately 43 percent of firms that closed temporarily or permanently cited insufficient demand as their main reason for closure. Other factors contributing to business closures included security concerns (25 percent of firms), labor supply shortages (21 percent), and damages related to the invasion (19 percent).

Exporters suffered large drops in their shipments due to the interruption of key trade and logistics routes and the closure of the Russian and Belarusian markets. Accord-

¹It's worth noting that the separation of supply and demand shocks is used mainly for analytical clarity, as factors such as displacement and security concerns can affect both production and consumption simultaneously.

ing to the BPS, approximately 97 percent of surveyed firms that primarily exported to Russia or Belarus before the invasion either halted exports entirely or experienced a significant reduction. Among firms exporting to other markets, 75 percent saw a decline or cessation in their exports, while only 14 percent managed to increase their total exports.

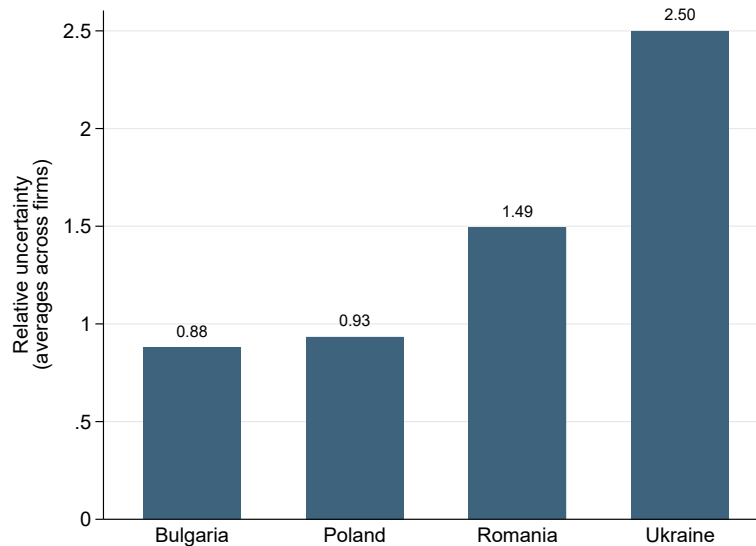
Crime disproportionately impacted the operations of large firms. Incidents such as theft, robbery, and vandalism can severely disrupt normal business activities, and concerns about safety can deter customers from patronizing businesses in high-crime areas. According to the BPS survey, only 6 percent of firms reported experiencing such crimes. However, the impact was more pronounced among large firms, with 15 percent affected, compared to 5 percent for small firms and 6 percent for medium-sized enterprises. The hospitality sector was also more affected by crime, with 10 percent of firms affected, in contrast to other sectors. Crime incidents were slightly more prevalent among firms in the East and South.

Sales uncertainty also presented significant challenges to firms' operations, particularly for small firms and firms in hospitality and construction. In times of economic shock, like the Russian invasion of Ukraine, uncertainty regarding sales prospects can lead to decreased investments, hinder hiring, and reduce consumption. To gauge this uncertainty, the report utilizes BPS data and calculates firm uncertainty as the standard deviation around expected sales change that managers expect to see during the next 12 months (Altig et al. 2020). According to the BPS, higher levels of uncertainty were observed among small firms, as well as those in the construction and hospitality sectors.

Ukrainian businesses exhibit higher uncertainty regarding their future sales compared to Central and Eastern European peers. The BPS was conducted in Bulgaria, Romania, and Poland between late 2021 and early 2022, during which questions were posed to assess sales expectations and uncertainty. Figure 1.2 illustrates the comparison of relative uncertainty -refer to notes for more details- in Ukraine in 2023 with that of

similar firms in Bulgaria, Poland, and Romania in 2022 (the latest available data year). Notably, relative uncertainty in Ukraine is at least 60 percent higher than in the comparison countries.

Figure 1.2: Sales outlook uncertainty in Ukraine is, on average, more than double that in Bulgaria, Poland, and Romania



Notes. Notes: Relative uncertainty is measured by the ratio of a firm's uncertainty to its sales expectations. To ensure accurate comparisons across countries, industries, or firms, this measure considers the average expected sales level, making it a more dependable indicator of sales uncertainty than firm-level uncertainty. **Sources:** World Bank's staff calculations based on BPS (2023) for Ukraine and BPS (2022) for Poland, Romania, and Bulgaria.

Uncertainty about future sales was associated with reduced fixed-capital investments, increased financial constraints, and declining sales. Evidence from the BPS also indicates that greater perceived sales uncertainty correlates with decreased investment in fixed capital assets. Investments in fixed assets among surveyed firms plummeted from an average of UAH 4 million in 2021 to just UAH 400,000 in 2022. Sales uncertainty was also linked to a higher likelihood of encountering financial difficulties. Uncertainty is higher for enterprises that are in financial trouble compared with those that are not in financial troubles. The evidence also suggests that uncertainty about future

sales is associated with reduced labor demand and declining current sales.

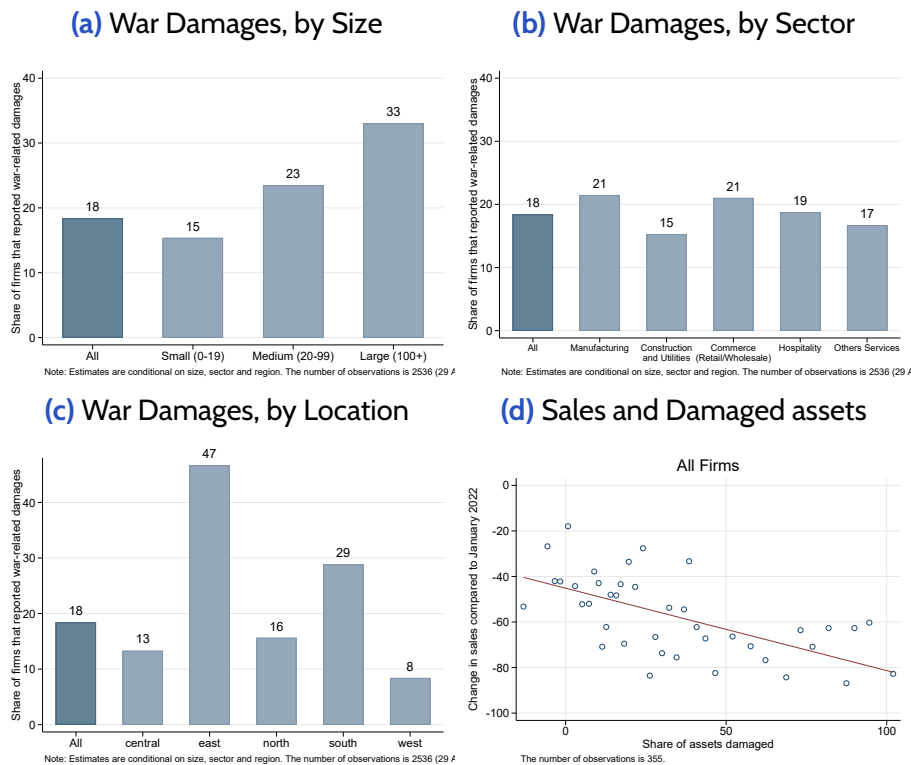
Supply Shocks

Approximately 20 percent of firms reported invasion-related damages, with those in commerce, manufacturing, and the Eastern and Southern regions being the most affected. About a third of large firms reported having damaged or stolen assets, compared to 15 percent among small firms. Commerce and manufacturing were the sectors with the largest proportion of damaged firms with 21 percent each. About half and a third of the firms in the East and the South, respectively, reported invasion-related damages (see Figure 1.3). These results aligned with the RDNA's (2023) findings in which over two-thirds of the damages to firms occur in two provinces in these regions – Donetsk and Kharkiv. Firms with the larger share of their assets damaged due to the invasion experienced the largest drop in sales.

The total damage of the invasion to the private sector by March 2023 is estimated at US\$3.6 billion according to the BPS, primarily attributed to large and medium-sized firms, as well as businesses in the Southern and Eastern regions. This figure likely underestimates the true extent of the damages, as the BPS did not account for the losses of businesses that had closed, many of which could not be surveyed. In fact, the results of the second RDNA report found that damage to the commerce and industry sector reached US\$10.9 billion by February 2023 (RDNA, 2023). The results of the BPS indicate that invasion-damaged firms lost on average a third of their assets. According to RDNA (2023), large and medium firms account for about half of the total damage. Firms in the East and South suffered the most damages, with 49 percent and 37 percent of invasion-damaged assets, respectively. Firms in construction and hospitality reported the largest proportion of damaged assets of at least 40 percent.

Disruptions to the supply of imported inputs and to transport and logistics significantly impacted over 70 percent of firms. The invasion has disrupted global logistics, leading to increased freight costs, shortages of containers, reduced availability of warehousing space, and the closure of several ports due to shipment delays and congestion

Figure 1.3: Large firms, businesses in manufacturing and commerce, and companies in the East experienced most damaged or asset theft



Sources: World Bank's staff calculations based on BPS.

(UNCTAD 2022). Approximately 65 percent of surveyed firms were compelled to reduce or halt their importation of raw materials or intermediate inputs. These shortages resulted in sales cancellations for more than one-fourth of firms. Retail and hospitality sectors, large firms, and those located in the West and South reported the highest proportion of cancellations due to delayed or interrupted inputs. Transport and logistics disruptions hindered exports for around 80 percent of large firms and 70 percent of small firms. Businesses affected by trade and logistics disruptions also reported a more significant drop in sales, at 42 percent, compared to 36 percent in non-affected firms.

The impact of the invasion, including population displacement, military service, and war casualties, has led to substantial worker shortages, especially among firms in manufacturing and Southern businesses. As of September 2023, approximately 5.8 million Ukrainian refugees had sought temporary protection in Europe (UNCHR 2023), representing around 15 percent of the country's pre-invasion population in 2022. Additionally, the workforce has significantly shrunk due to increasing war casualties and conscription.² According to the BPS, approximately 15 percent of firms had to cancel sales due to factors like displacement, war casualties, and conscription. Among sectors, manufacturing experienced the most significant impact from labor shortages. In the South, about 20 percent of firms reported sales cancellations due to a lack of workers, while in other regions, this figure ranged from 13 to 15 percent.

Power outages disrupted production and supply chains for firms, especially those in the South and in the manufacturing and hospitality sectors. Frequent Russian rocket attacks have targeted Ukraine's power grid, resulting in daily electricity blackouts with significant economic impacts (Blinov and Djankov 2022). According to the BPS, 15 percent of firms experienced power outages. Among sectors, hospitality was the hardest hit, with a third of firms reporting electricity disruptions, followed by manufacturing at 20 percent. In the South, approximately 20 percent of firms faced power outages,

²As of 2023, Ukraine had 200,000 active soldiers (Statista 2023, Cooper et al. 2023).

nearly double the rate of firms in the Central Region at 11 percent.

About 80 percent of firms face significant constraints when it comes to accessing finance, especially affecting large firms, those firms in hospitality and Eastern businesses. According to the BPS, more than half of all firms are either currently in arrears or anticipate being in arrears. Financial constraints are more pronounced among larger firms, affecting approximately 70 percent of them. The hospitality sector is particularly vulnerable, with over 60 percent of its firms experiencing financial constraints. Regionally, the East stands out as the most financially fragile area, with around 58 percent of firms reporting current or anticipated arrears. Additionally, the BPS findings highlight that the probability of insolvency or bankruptcy is highest among firms in the hospitality sector and in the Western region.

The primary difficulties in accessing finance included high interest rates, VAT invoice blocking, and heightened repayment risks. In the BPS, firms were asked to identify up to three main challenges they faced in obtaining financing. Approximately 20 percent of firms reported experiencing these financial restrictions. Specifically, the major challenges reported were as follows: high interest rates (27 percent of firms), VAT invoice blocking (25 percent)³, and increased repayment risk due to heightened uncertainty (17 percent).

Unbundling the Relative Importance of Supply and Demand Shocks

The demand shocks caused by the invasion remain the primary factor hurting firm sales. An econometric analysis was conducted to uncover the role of supply and demand shocks in influencing firm performance (see Box 3 in the Appendix). The results indicate that sectoral demand shocks (proxied by the average change in sales of other firms within the same sector as a firm) have had a strong correlation with firms'

³According to the Tax Code of Ukraine, VAT payers may declare input tax in their VAT returns after the seller issues a VAT voucher for a supply. With the start of full-scale invasion, various disruptions in business processes made it difficult to comply with VAT refund system requirements (doubtful claims have been automatically blocked by the system and sent for inspection), the economywide the VAT refund rate fell to 69% in 2022.

sales, highlighting the greater impact of industry-specific demand shocks on firm performance. In addition, supply shocks such as power outages emerged, first, as one of the most significant supply shocks negatively affecting firm's sales. Other shocks that showed statistically significant correlations with declining sales included disruptions in sourcing imported inputs and financial constraints. When demand and supply shocks were analyzed jointly, the demand shock appears to be relatively more correlated with firm's performance in most cases.

A Resilient and Multifaceted Response of the Private Sector

The sizable demand and supply shocks resulting from the invasion in Ukraine prompted firms that remained open to adapt to the more challenging operational environment by implementing changes in their business strategies. In this section, we will outline the key findings from the report regarding these responses, which include investments in fixed assets, acquiring new clients, introducing new products and services, and embracing new technologies.

Despite the initial impact of the Russian invasion, many Ukrainian firms displayed resilience by adapting their business strategies, particularly in terms of finding new customers. According to the BPS survey, approximately one-third of surveyed firms reported either no change or even increases in sales. Among the firms that continued to operate, around 18 percent adjusted their marketing and customer relations strategies. Businesses in the retail and manufacturing sectors, as well as larger firms, were more likely to modify their strategies.

Around 36 percent of firms began targeting new clients, with this approach being more prevalent among larger firms (41 percent), those in retail/wholesale (44 percent), and firms located in the Western and Central regions of the country (38 percent and 37 percent, respectively). Around 18 percent of firms also introduced new products or enhanced the quality of their existing products, particularly among larger

firms and those in the manufacturing and hospitality sectors.

Firms also reacted to the impact of the invasion by ramping up their utilization of digital tools and embracing supply optimization techniques. Approximately half of the hospitality firms either initiated or increased their usage of internet services, online social media, specialized apps, digital platforms, or remote work. This trend was most pronounced in the East, where 45 percent of firms adopted these measures, and least prevalent in the South, with 36 percent doing so. Moreover, around 12 percent of firms incorporated new technology and processes into their supply chain management techniques and operations, especially those located in the Central region, where 15 percent of firms did so, and in the commerce and manufacturing sectors, with 17 percent and 15 percent, respectively.

A Preliminary Assessment of Government Support to the Private Sector

Only 8 percent of firms received government support, with an even lower rate of 6 percent among small firms. In contrast, about 15 percent of large firms reported receiving support from the government, according to the BPS. Public assistance was notably scarce for firms in the construction and hospitality sectors, which were the hardest hit by the invasion in terms of sales, employment, and asset losses. When asked why they did not apply for government funds in the BPS, over one-third of firms stated that they did not require such assistance. Of these, 43 percent were in the West and 19 percent in the East. Other reasons for not seeking public support included perceived ineligibility (16 percent) and expectations of not receiving assistance (13 percent).

There is a significant lack of awareness regarding access, eligibility, and the need for public support, with one in four firms reportedly unaware of government support programs. Large firms (18 percent) and those in the hospitality sector (15 percent) exhibited the lowest levels of awareness regarding these programs. Additionally, 38 percent of firms in the partially occupied regions of the East, where active war zones exist,

reported not being aware of government support programs.

Firms that received government support experienced more moderate declines in sales and employment compared to non-assisted firms. The BPS results revealed that non-assisted firms saw sales decrease by half and employment drop by 26 percent. In contrast, publicly supported firms reported significantly lower declines in sales and employment than firms without government support. Firms that reported no decline in sales were 12 percent more likely to receive government assistance, compared to only 3 percent in firms with falling sales, indicating either that support had a positive impact or the need to improve targeting of public support programs.

Approximately one in eight firms did not expect to receive public support due to a lack of "connections". The hospitality sector was most affected, with 24 percent of firms discouraged from applying for government assistance for this reason. These firms were also twice as unlikely to apply and not receive public funds compared to firms in other sectors, with an average of 6 percent. The lack of the right connections to access government support affected the most firms in the South at 15 percent, compared to only 9 percent in Central Ukraine.

Firms identified three primary areas where they needed more public support: financial assistance, easing of regulations, and access to markets. Approximately 39 percent of firms requested tax and non-tax exemptions, while 35 percent preferred the unblocking of VAT invoice issues. Large firms had a higher demand for credit, with about half of them requiring it, compared to an average of 30 percent among other firms. Grants to rebuild destroyed assets were also more sought after by large firms, at 17 percent, compared to only 9 percent among small firms. Grants were a priority for firms in the East (27 percent) and the South (12 percent).

Multinational corporations (MNCs) require support to mitigate uncertainty in their investment decisions. According to the MNCs survey, the primary factors influencing MNCs' future investments include peace, the business environment, and macroeconomic and political conditions. The critical policies that MNCs suggest would be boost-

ing their future investments in Ukraine include war risk insurance, financial incentives, and investment guarantees.

A Tentative Framework for Enhancing Prioritization and Targeting of Public Assistance Programs

The findings of this report highlight cross-cutting priority areas where government assistance for firms affected by the Russian invasion can be improved. To enhance the effectiveness of public support, it should be directed toward the most severely impacted firms, sectors, and regions. Adequate prioritization and targeting are vital due to resource constraints, varying war-related impacts on different firms, and differences in their contributions to the economy and employment. Support programs should also address not only the extent of losses but also the structural changes in the economy resulting from shifting trade patterns. The results of the BPS also emphasize the need to increase awareness of existing government programs, especially among small firms and those in the Eastern regions. Ukraine also needs a targeted regional assistance strategy: around 10 per cent of firms have moved to Western Ukraine, and MNCs are channeling their future investments there.

Effective government support for the private sector affected by the Russian invasion of Ukraine requires a comprehensive action plan that considers the various impacts of the conflict within country. The Government of Ukraine has already been working on the Economic Recovery Plan and Facility, and this report emphasizes the need to include two dimensions: (a) reorganizing and revamping the portfolio of firm support programs to tailor it on the various needs of enterprises by size, typology, industry, location, systemic relevance, and extent of damages, and (b) addressing the widening disparities in the regions most affected by the invasion. There is also a clear indication by firms for expanding government support in four key areas across different firm sizes, sectors, and regions: (a) improving access to credit, (b) providing both tax and non-tax exemptions; (c) facilitating access to new customers and markets; and (d) simplifying regulatory processes. The evidence also suggests that to increase MNC investment in

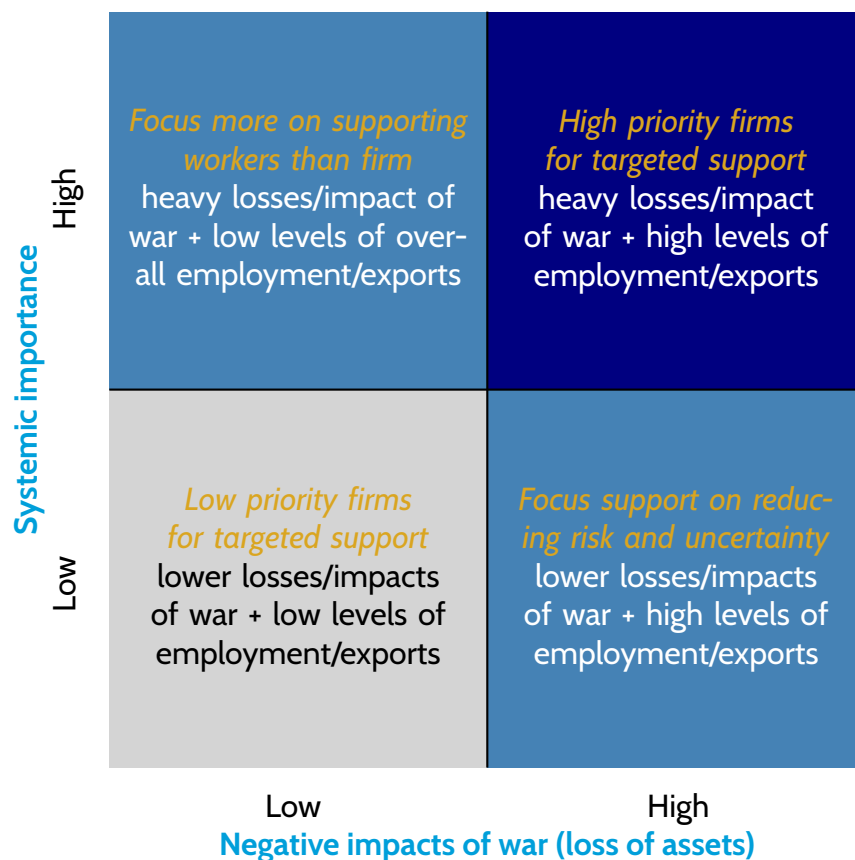
Ukraine, specific policies such as war risk insurance, financial incentives, and investment guarantees are necessary.

In addition to these key cross-cutting priorities, the World Bank proposes a framework to enhance the prioritization and targeting of government policy assistance to Ukraine's private sector (refer to Diagram 1). This framework is structured around two axes. The horizontal axis quantifies the extent of damage or asset theft suffered by Ukrainian firms due to the invasion. The vertical axis measures the firm's relative significance in the country's exports and employment, often referred to as its "systemic importance". These two axes allow us to define a matrix with four quadrants for prioritizing and targeting public support to the private sector:

- **High Priority for Targeted Support:** The upper right quadrant focuses on large firms that have experienced substantial losses and play a fundamental role in Ukraine's overall employment and exports. Targeted assistance should concentrate on these large firms facing liquidity constraints, which may include providing new working capital credit, grants for rebuilding damaged assets, and other necessary measures. The establishment of a registry, like the one used for housing property, to verify damage could facilitate the targeting of support for the most severely affected systemic firms.
- **Non-systemically Important Firms with Significant Losses:** Firms falling into the bottom right quadrant have incurred significant losses but have limited economic significance for the country. Public assistance in these cases should prioritize support for displaced employees through retraining, reskilling, and aid for creating new enterprises to address employment declines, internal displacement, and post-war demobilization.
- **Systemically Important Firms with Minor Losses:** Firms in this upper left quadrant have suffered minor losses but hold systemic importance. Public assistance for these firms should concentrate on measures geared towards reducing uncertainty, such as through the implementation of insurance schemes.

- *Non-systemically Important Firms with Minor Losses*: This lower-left quadrant encompasses firms that have experienced minor losses and have little impact on total exports and/or employment. These firms should receive assistance through crosscutting measures with a focus on distressed workers rather than businesses. By employing this framework, Ukraine's government can better prioritize and target its support to the private sector.

Figure 1.4: Policy Targeting and Prioritization Framework



Source. World Bank's staff own elaboration.

CHAPTER 2

Main Report: Introduction

The Russian invasion of Ukraine in February 2022 has hurt Ukraine's productive capacity, impacting firms severely. Prior to the invasion, the private sector contributed about 84 percent of GDP, but still had unrealized potential. Reforms that were underway to improve the business and investment climate and to allow greater dynamism from firms were interrupted. At this stage, it is crucial to understand in detail which businesses have been more severely affected and how to better define policy reforms and interventions to relaunch business activities and support recovery. The objective of this policy note is to assess the impact of the Russian invasion of Ukraine on businesses and their needs. It provides a comprehensive overview and actionable data on the impact of the 2022 Russian invasion of Ukraine on the private sector and on the public policy response to date.

During wartime, data on firm activity is limited, failing to capture the full spectrum of challenges faced by businesses, and limiting the capacity of the Government to effectively support private sector resilience and growth. Although various surveys and studies have been undertaken in Ukraine to understand the scope and scale of the impact on private firms operating in-country, a comprehensive picture has not emerged that could accurately inform policy decisions. These studies show that the private sector has experienced major losses due to the invasion, yet the differences of impacts across locations, sec-

tors, and business size is not well documented. For example, the latest Rapid Damage and Needs Assessment (RDNA), conducted in February 2023, assessed the overall cost of reconstruction and recovery in Ukraine at US\$411 billion and estimated the damage to the commerce and industry sector to be US\$10.9 billion, the fourth largest amount of damage of all sectors. However, these aggregate estimates, while useful to identify the overall needs, do not capture the nuances of how different businesses have been affected but also how some firms might have adjusted and demonstrated resilience. This policy note is part of the World Bank's (WB) efforts to remedy these gaps and generate the required evidence for Ukraine's policy makers by implementing a multi-source assessment of the impact of the invasion on firms.

The WB has undertaken an ambitious and comprehensive monitoring program through multiple innovative data sources on the private sector to find out its needs. This paper is based on three data sources generated by the WB and partners to describe the impact of the invasion on Ukrainian firms: a representative sample of all private (non-agricultural) sector firms, including small, medium, and large businesses, across all sectors and regions (the Business Pulse Survey, or BPS); satellite imagery that measures economic activity by changes in trends and patterns on the earth's surface; and a survey of multinational corporations (see Appendix 1 for a description of data sources). These three datasets provide different windows into the effect of the invasion on private sector

economic activity.¹

The results show that the negative impact on firms has been enormous. First, firms suffered from a large negative impact on sales, employment, and assets, but this impact varies across firms, locations, and sectors. Sales more than halved on average, but firms experienced different drops, with for instance small firms being more severely impacted than large firms. Second, firms have experienced significant disruptions to their operations because of inputs and labor shortages, the need to relocate, power and internet disruptions, and crime. Third, firms are in financial distress as most firms face financial problems. More than half of firms are (or expect to be) in arrears, with larger firms reporting the highest risk, and this is associated with higher levels of uncertainty. Fourth, uncertainty levels are very high and are associated with reduced sales, damages, and reduced employment.

At the same time, many firms have proven resilient as they have continued operating and even innovating. Despite severe disruptions, most interviewed firms have proven resilient and continued operating at low capacity (44 percent average capacity utilization). Many Ukrainian firms proactively responded through digitalization, innovation and finding new markets and clients. Moreover, most MNCs did not reduce invest-

¹First, the WB, in collaboration with the Kyiv School of Economics, implemented a Business Pulse Survey from March to July 2023. This is the largest and most representative firm survey in Ukraine since Russia's full-scale invasion, which reached 2,727 businesses of various sizes: small (0-19 employees), medium (20-99 employees), and large firms (100+ employees) and in all sectors. The survey seeks to provide a comprehensive view on: (i) the invasion's impact of economic conditions on businesses; (ii) firms' responsive strategies; and (iii) the perceived effectiveness of policies targeting them. The survey covers information on characteristics of the firm, self-reported impacts of the invasion, information on potential channels affecting firm's operations, expectations about the future and uncertainty (including scenarios), adjustment mechanisms chosen, investments decisions made, and information on trade and global value chains. Second, the WB completed a Multinational Corporations (MNCs) Survey in May 2023. This novel survey is the result of partnerships with large foreign business associations, including the European Business Association in Ukraine. Over 80 major MNCs participated in the survey, providing information on their current investments, divestments, and future planning trajectories in Ukraine. Lastly, the WB has utilized high frequency satellite data in an innovative manner. In collaboration with SpaceKnow, the WB has monitored economic activity through 49 indicators, with industry coverage up to approximately 40 percent of Ukraine's GDP. This high-frequency, oblast-level data represents the first time the WB is monitoring economic activity in real-time using such satellite-based metrics

ments and nearly half invested in new assets or repairs.

Government support and its targeting can be improved, particularly awareness of programs.

Firms report low access to government support and that it is uneven across firms, sectors, and locations. In particular, government support is less likely to reach smaller firms. Given the dynamics in the private sector, public policies can focus on targeting. Policies could focus on reducing uncertainty and financial fragility to de-risk private investments. Finally, reforms could help firms access new clients and export markets, helping firms to innovate and adjust.

This policy note summarizes the major findings in more detail, disaggregating the evidence by sectors, regions, and firm size as well as unbundling the channels through which the war has affected businesses. Chapter 3 provides an overview of the impacts of the invasion on the private sector, focusing on how those impacts have varied. Chapter 4 explores how the shock waves of the war have negatively impacted the private sector through demand and supply channels to cause operational disruptions to firms. This section discusses the impact of the war on firm financing and heightened uncertainty on firm outcomes. In Chapter 5, an analysis of the transmission channels of operational disruptions contributes to a more nuanced understanding of how firms have responded to the shocks of the war and showed resilience. Chapter 6 presents a preliminary assessment of how government policies have supported businesses throughout the war. Finally, Chapter 7 presents possible areas for policy re-design to better support recovery.

CHAPTER 3

The Shock: Impacts of the 2022 Russian Invasion of Ukraine on the Private Sector

I. Sales

Sales have halved since the invasion. In the BPS, firms were asked about their sales for the last 30 days (before the interview) compared to the same period in 2021. Sales dropped by an average of 53 percent with the highest drop in small businesses, at 55 percent, compared to 49 percent and 46 percent for medium and large firms respectively (Figure 3.1).

Firms located in different regions of Ukraine prior to the invasion reported varying changes in sales compared to the same period in 2021. Firms located in the East and South experienced the largest drop in sales (70 percent and 63 percent) while the West only saw a 39 percent drop (Figure 3.2).

Figure 3.1: Drop in Sales, by Size

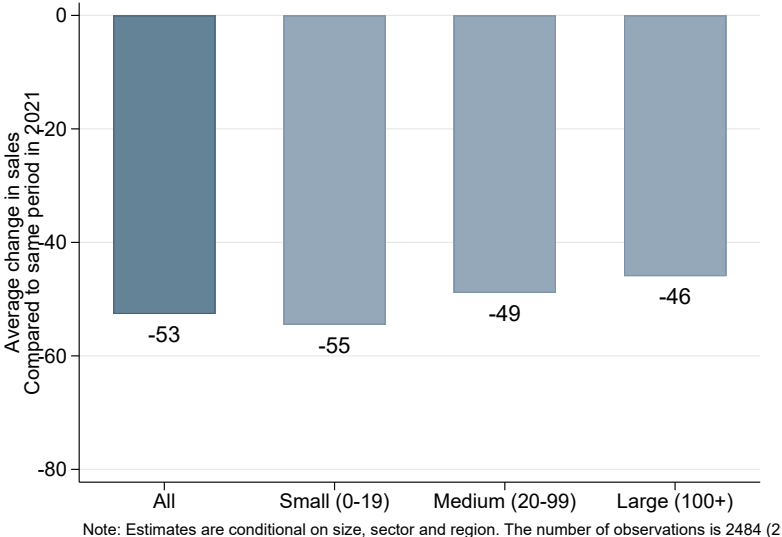
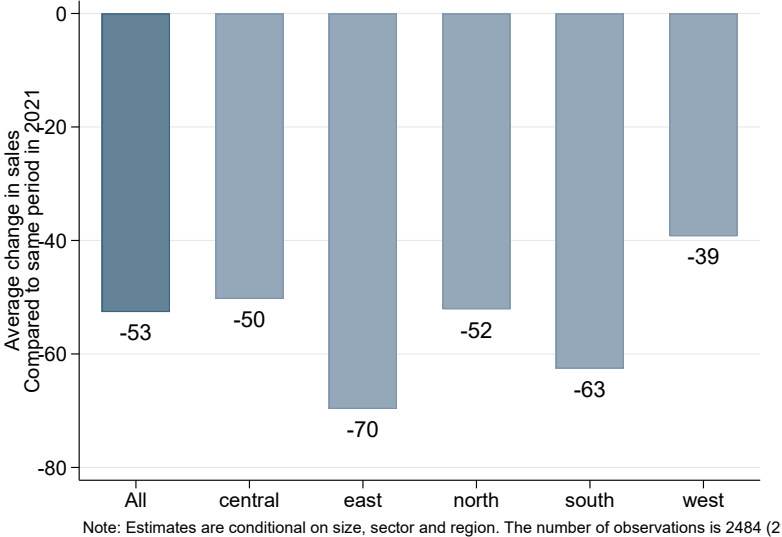
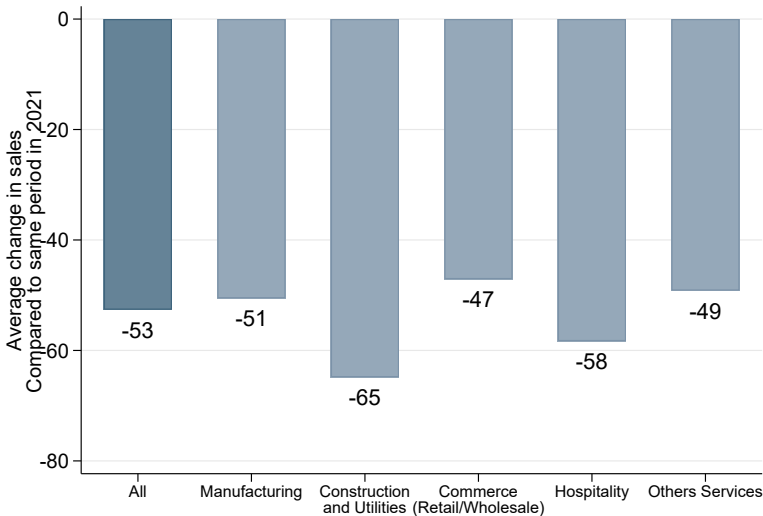


Figure 3.2: Drop in Sales, by Location



Key industries experienced significant sales declines due to the war. Firms in the construction and utilities industry reported the greatest decline in sales at 65 percent, while commerce reported the lowest drop of 47 percent (Figure 3.3).

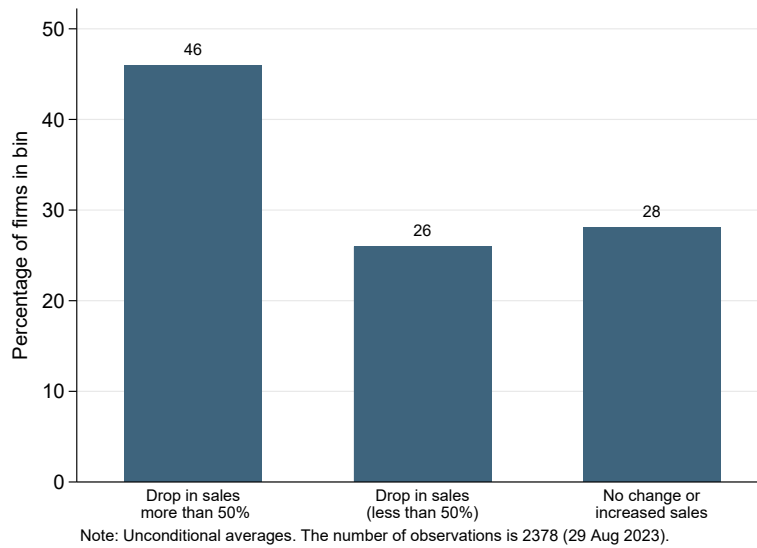
Figure 3.3: Drop in Sales, by Sector



Note: Estimates are conditional on size, sector and region. The number of observations is 2484 (2

Approximately 1 in 2 firms reported over 50 percent drop in sales. Around 72 percent of firms reported a decline in their sales, with almost half of firms (46 percent) reporting that their sales dropped by more than 50 percent (Figure 3.4).

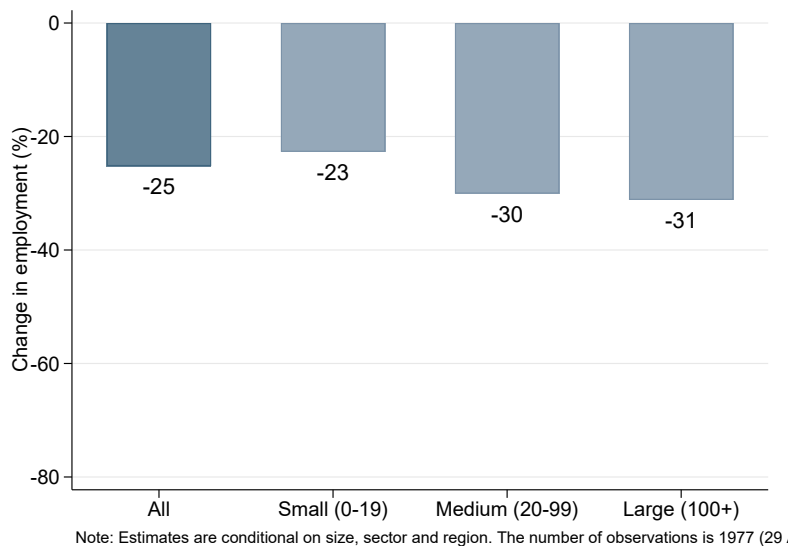
Figure 3.4: Percentage of Firms with Different Levels of Changes in Sales



II. Employment

Firms suffered from a large drop in employment, losing on average one-fourth of their workforce. Between January 2022 and the time of the survey, firms reported an average 25 percent drop in the number of full-time and part-time workers.¹ With a drop of 31 percent, large firms experienced a steeper decline in the number of full-time and part-time workers than small firms (Figure 3.5). Similar to the drop in sales, the drop in employment was largest in the construction and utilities sector (Figure 3.6) as well as in the East and South of the country (Figure 3.7). Firms in construction and utilities experienced the largest drop in employment of 36 percent, while firms in the East experienced a drop of 37 percent

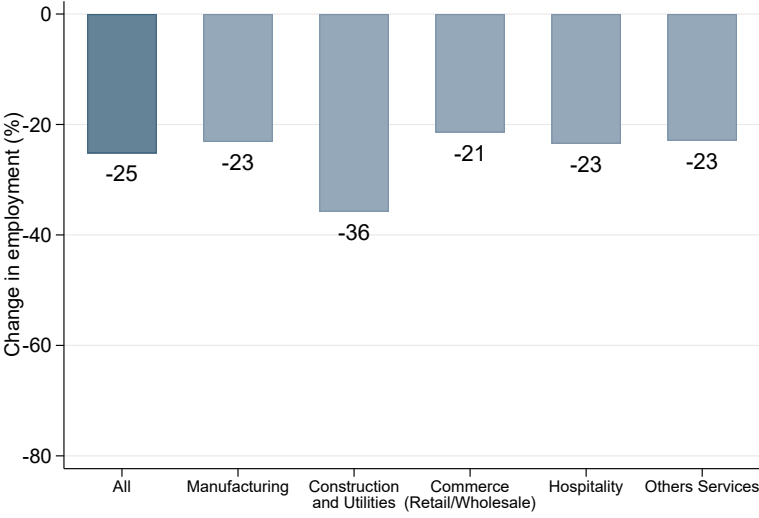
Figure 3.5: Decline in Employment, by Size



One-fourth of businesses lost more than half of their workers. Approximately 60 percent of businesses reduced their number of workers due to the war. One-quarter of firms reduced

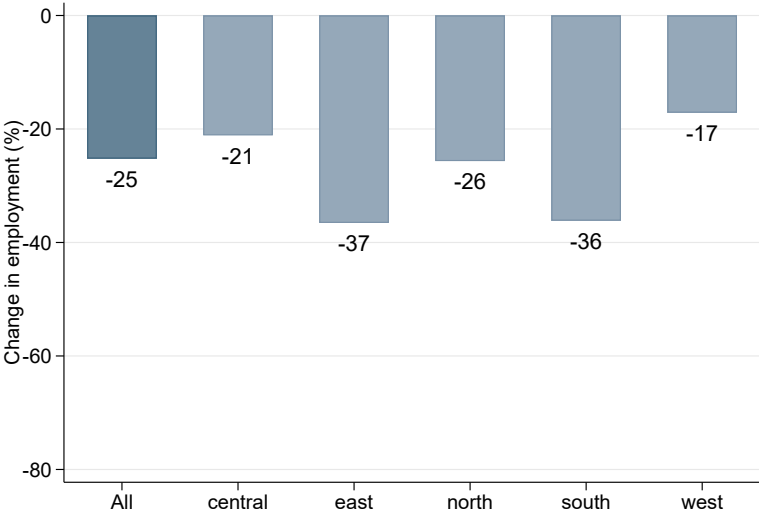
¹Firms were asked: How many paid workers (full-time and part-time) did this establishment have in January 2022? and, separately: How many paid workers (full-time and part-time) does this establishment currently have?

Figure 3.6: Conditional Drop in Employment, by Sector



Note: Estimates are conditional on size, sector and region. The number of observations is 1977 (29).

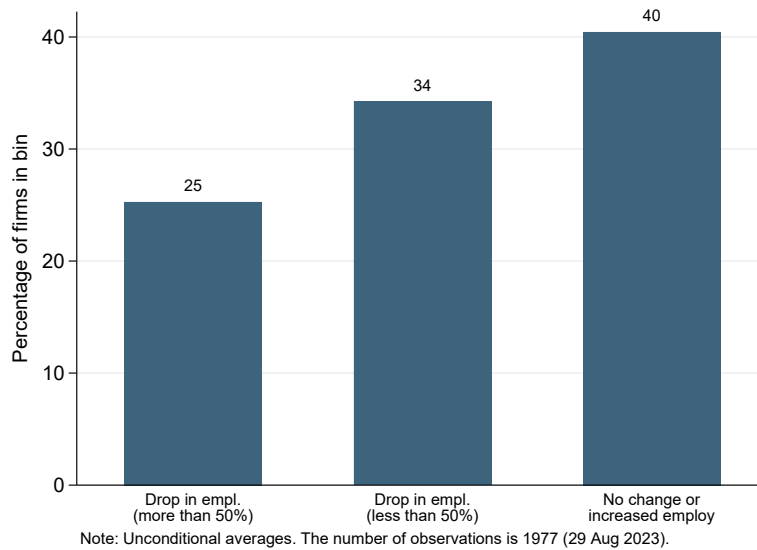
Figure 3.7: Conditional Drop in Employment, by Location



Note: Estimates are conditional on size, sector and region. The number of observations is 1977 (29).

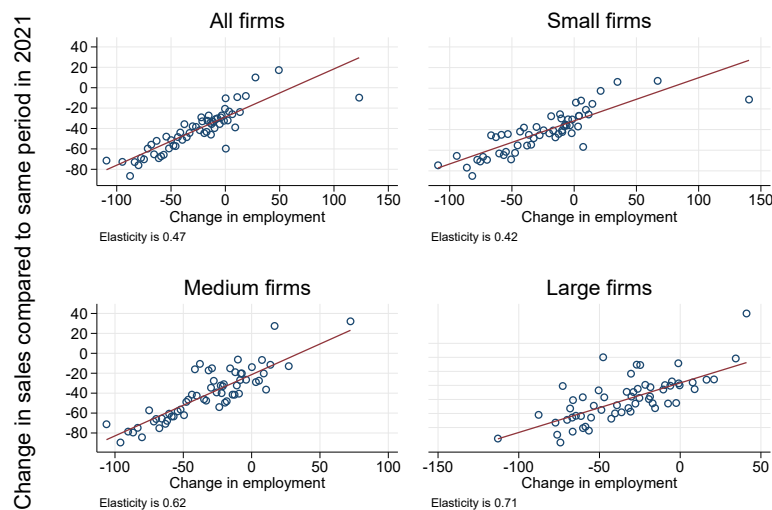
their number of employees by more than half during the period of the survey compared to January 2022, while 34 percent reduced employment by less than 50 percent (Figure 3.8).

Figure 3.8: Percentage of Firms with Different Employment Levels



Employment changes display a strong positive relationship with sales changes. Figure 3.9 shows the correlation between the above-described changes in employment and sales. For all size categories, this correlation is strongly positive with an elasticity of 0.4. Moreover, employment adjustment is more sensitive to sales for businesses that suffered demand shocks.

Figure 3.9: Correlations of Drop in Sales and Drop in Employment, by Size



Estimates are conditional on size, sector, and region

Comparing the average impacts on sales and employment within each heterogeneous dimension (size, sector, region), the results suggest that region is more relevant in explaining the impacts on sales and employment. From the conditional estimates reported in the figures above (3.1, 3.2, 3.3, 3.5, 3.6, and 3.7), we observe a larger dispersion of the impact within the region dimension compared to other dimensions. For example, the Eastern region reported the highest average decline in sales of 70 percent compared to 39 percent in the West, which suffered the least drop in sales- a difference of 31 percentage points. For the size dimension, small businesses reported the largest average drop in sales of 55 percent compared to 46 percent among large

businesses which suffered the least drop in sales - a difference of 11 percentage points. For the sector dimension, the difference between the sector that reported the highest average decline in sales (construction and utilities sector) and the sector with the least average decline in sales (commerce) is 18 percentage points.

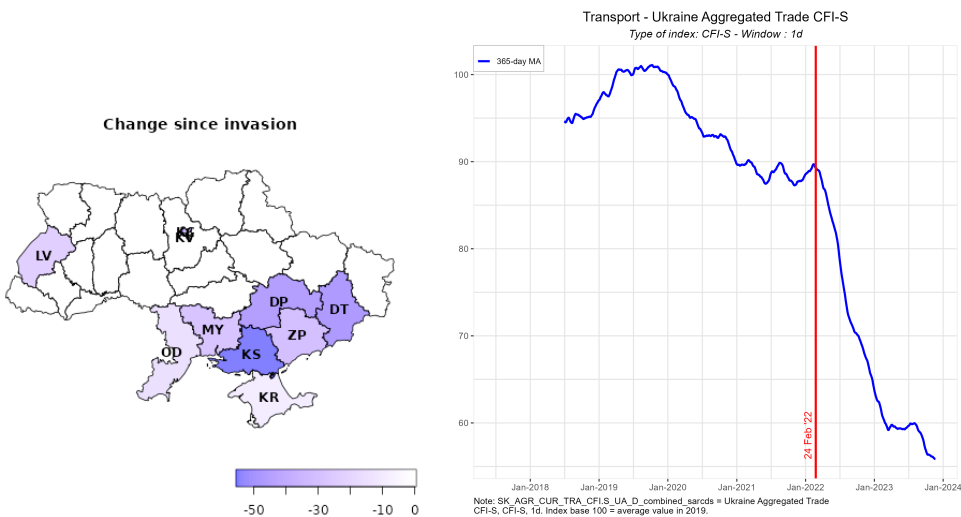
III. Further Evidence on Economic Changes

The satellite imagery data narrows the scope of analysis to specific sectors with observable activity. Overall, the set of industry-level data from 49 indicators representing up to roughly 40 percent of Ukraine's GDP has been analyzed on both national and regional levels. The performance of sectors oriented towards domestic demand (retail, food processing) was mixed across different regions with large drops in the East (occupied regions and areas adjacent to the active war zone) and less pronounced downturns in the Central and Western parts of the country².

Ukraine's role as a transit route connecting Russia, Belarus, and the European Union came to an abrupt halt with the full-scale invasion in February 2022. Ukraine's transportation infrastructure has suffered the second largest war damage after the housing sector (IFC 2023b). Disruption of the usual logistic routes was further influenced by the blockade of seaports and destruction of road infrastructure and logistic centers, leading to notable changes in the transportation landscape and a substantial downturn in transportation turnover (Figure 3.10). In the regional context, the South and East of the country witnessed the largest drops in transportation activity due to war and a shift of logistic routes away from the Black Sea ports.

²The latter is likely to reflect internal migration flows as millions have been forced to flee their homes. Facing reduced domestic demand and logistical challenges some industries shifted towards new destinations for their products primarily seeking to enter the EU market to substitute some of the sanctioned Russian and Belorussian exports (Dzerkalo Tyzhnia 2023). The topic of potential channels of change is discussed in more detail in the next chapter.

Figure 3.10: Trade Infrastructure - Satellite Data



Notes. SpaceKnow Aggregated Trade index for the Ukraine is made from 216 locations across the country. It embeds the whole transportation industry which consists of distribution centers, airports, and ports. Each category contains the following locations: 1) Distribution Centers: inland, train, and port containers, logistic centers that serve goods distribution, truck stops known as service stations, cars distribution, coal, and minerals distribution areas; 2) Airports: passenger and cargo areas, together with parking areas that are dedicated to passengers and employees; 3) Industrial and grain port areas.

III.A. Agriculture

The agricultural sector suffered significant losses because of the full-scale invasion since February 2022, resulting in an estimated 35 percent contraction of grain production volume in 2022 relative to the previous marketing year³ (IFC 2023a). Apart from grain storage infrastructure damages and military operations in the regions with a high concentration of agricultural production, the downturn in grain harvest in 2022 was due to a reduction of the planting area for winter wheat by 25 percent, logistical challenges due to the blockade of seaports,⁴ input supply disruptions (fertilizers, seeds, fuel), and low farmgate grain prices as the cost of overland transportation soared (IFC 2023b). Nonetheless, the sector remained one of the largest contributors to GDP and employment,⁵ as well as the top exporter by revenue, despite the 15.5 percent fall in agrifood export revenue in USD terms in 2022 (NBU 2023b). There were significant regional disparities in agricultural sector performance. The most war-affected regions in the East and South⁶ were responsible for more than a third of total agricultural output in the year preceding the invasion (IFC 2023a). By contrast, agricultural producers in the central parts of Ukraine were able to continue their usual operational activity, albeit still facing logistical challenges.

III.B. Industry

Industry is a large contributor to the country's economic output and employed 15 percent of the labor force in 2021. More than half of industrial production facilities have been concentrated in the Eastern and Southern regions, which were affected by the

³The marketing year refers to July 1-June 30 (close to wheat harvesting season)

⁴The satellite data clearly show that grain stocks started to pile up quickly after the invasion, reflecting the inability to export it (A.5 in appendix)

⁵Prior to invasion, the agricultural sector value added comprised 10 percent of GDP and employed 17 percent of labor force (in 15-70 age group) based on the State Statistics Service of Ukraine data on Employment by type of economic activity 2012-2021, https://www.ukrstat.gov.ua/operativ/operativ2014/rp/zn_ed/zn_ed_u/zn_ed_2020_ue.xls (accessed on September 11, 2023).

⁶In particular, Kharkiv, Luhansk, Donetsk, Zaporizhzhia, Kherson and Mykolaiv regions.

full-scale invasion the most.⁷ Apart from security issues due to missile attacks and proximity to active military zone, many industries faced a few other challenges including logistical, energy, and labor shortages that varied greatly by region. While in the Western regions the majority of industrial enterprises have been working at pre-war capacity levels, less than a third of industrial enterprises were able to keep high levels of capacity utilization in the regions adjacent to the frontlines (IER 2023).

Metallurgy, the major industrial segment with strong export orientation, suffered the largest damages and losses due to the full-scale invasion. With the two metallurgical plants in Mariupol ruined in March 2022, Ukraine lost an estimated 40 percent of its steel-making capacity (GMK 2023). As a result, metals and metal products output contracted 63 percent in 2022, with the deepest downfall experienced in spring 2022.

Similarly, other energy-intensive industries, such as cement, briefly resumed production in the third quarter of 2022 following the initial aftermath of the invasion. However, this tentative recovery was hindered by electricity shortages in the last quarter of 2022. Automotive production, particularly wire harnesses, which is concentrated in the West, also resumed after an initial shock.

Food processing was a major contributor to industrial output before the war, accounting for around 20 percent of output in 2022 and satisfying 90 percent of domestic demand. Vegetable oil processing, with 85 percent of output exported, suffered significant damage with 20 percent of processing plants damaged or in occupied territories. Disrupted logistics and electricity shortages led to lower capacity utilization, with firms resorting to lower value-added exports and switching to exporting raw seeds rather than oil. At the same time, state-of-the-art large facilities reduced production, despite pre-war upgrading investments.

⁷Based on the State Statistics Service of Ukraine data on industrial sales in Donetsk, Luhansk, Dnipropetrovsk, Kharkiv, Kherson, Mykolaiv and Odesa regions (State Statistics Service of Ukraine 2022. https://www.ukrstat.gov.ua/operativ/operativ2021/pr/orp_reg/orp_reg_2021_ue.xls, accessed on September 11, 2023).

III.C. Retail

The retail sector faced significant disruption due to the Russian invasion, resulting in substantial damage and a decline in demand. Retail trade infrastructure lost about a third of total retail stores, with turnover down by 21.4 percent in 2022 due to a contraction and shift of demand towards essential goods. However, consumer spending rebounded in 2023, and both foreign-owned retail chains and domestic small shops continued operations in the face of energy shortages and disrupted supply chains. While supply chains were reorganized and stabilized in 2023, retail chains shifted competition primarily to reducing prices and costs, halting investments in new retail locations points, and internalizing previously outsourced logistics services, all in an attempt to preserve thinning margins.

CHAPTER 4

Shockwaves of the 2022 Invasion: Transmission Channels of Firm-Level Operational Disruptions

Unbundling the mechanisms through which firms have been affected by the war is important to understand why certain firms have faced more severe effects than others and provides actionable insights to inform the type of support needed for businesses recovery. As will be shown in this chapter, Ukraine's economic activity varied greatly by sector, firm size, and location. It has depended on the spatial concentration of enterprises in the areas affected by military operations as well as other challenges related to labor resources, logistics, and finance.

I. Supply-Side Channels

War-related challenges, including labor shortages, disrupted utilities, supply chain bottlenecks, and financial constraints, have significantly depressed business activity. War-related damages to infrastructure and destruction of production facilities, disruption of usual logistical routes, and the humanitarian crisis brought about a 29.1 percent contraction of the Ukrainian economy in 2022, although the official projections for 2023 have im-

proved from 2.0 to 2.9 percent growth (NBU 2023). Surveyed firms provided information on the supply-side transmission factors which caused them to cancel sales orders, including lack of inputs and lack of workers, and other factors which were correlated with business disruptions, including power and internet outages.¹ The Business Pulse survey asked directly for the causes of operational disruptions. Approximately 27 percent of businesses reported a lack of inputs, 15 percent reported labor shortages, 15 percent power outages, 11 percent reported internet disruptions, while 6 percent reported crime. In what follows, the supply-side factors are analyzed in more detail.

I.A. Destruction and Disruption

Every fifth firm reported war damages. Approximately one-fifth of the firms surveyed (18 percent) reported their business had been damaged since the start of the invasion.² Larger firms are more likely to report that they were damaged since the start of the invasion than smaller firms. 33 percent of large firms reported damage, compared to 15 percent of small firms after controlling for their location and sector (Figure 4.1). These shares are slightly higher for businesses surveyed in hospitality, commerce, and manufacturing sectors (with 21 percent each) and lower in construction and utilities (15 percent, Figure 4.2). Not surprisingly, firms in the East and South suffered the most damage, with 47 percent and 29 percent of the firms that reported damage located in each region respectively (Figure 4.3). Again, this is consistent with the RDNA results which found that over two-thirds of the damage was in two provinces in these regions – Donetsk and Kharkiv.

Damages to firms' assets are correlated with a greater drop in sales. Enterprises with a larger

¹Main supply-side transmission channels depressing business activity are: labor shortages, due to war mobilization and outmigration; disrupted and pricey supply of electricity and other critical utilities; physical destruction of productive capital; limited or absent availability of inputs and intermediates, due to either complete loss of access to import markets or severe supply chain bottlenecks and logistics disruptions; dwindling and costly access to finance; deferred or halting investment in productive capacity at the firm level; and overall uncertainty of economic returns due to war-related risks and volatility.

²The original question text reads: "Has the establishment been damaged due to the war that started in February 2022? Yes; No; Refuses to answer; Don't know"

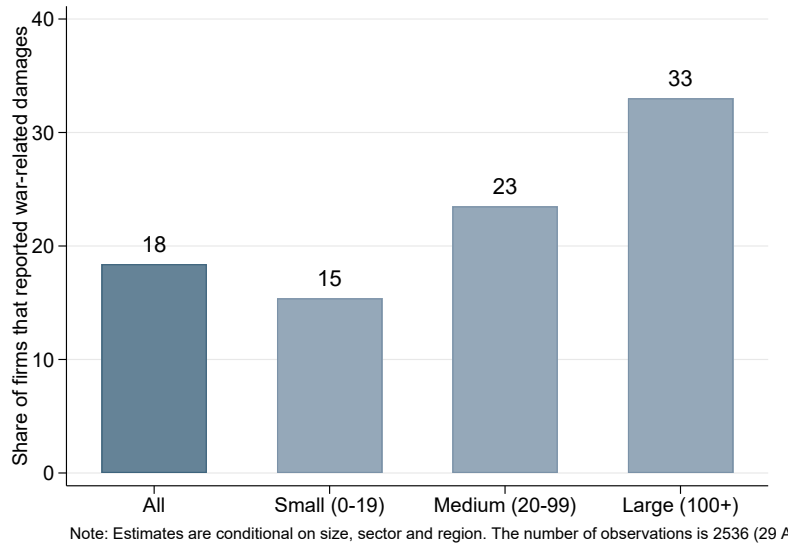
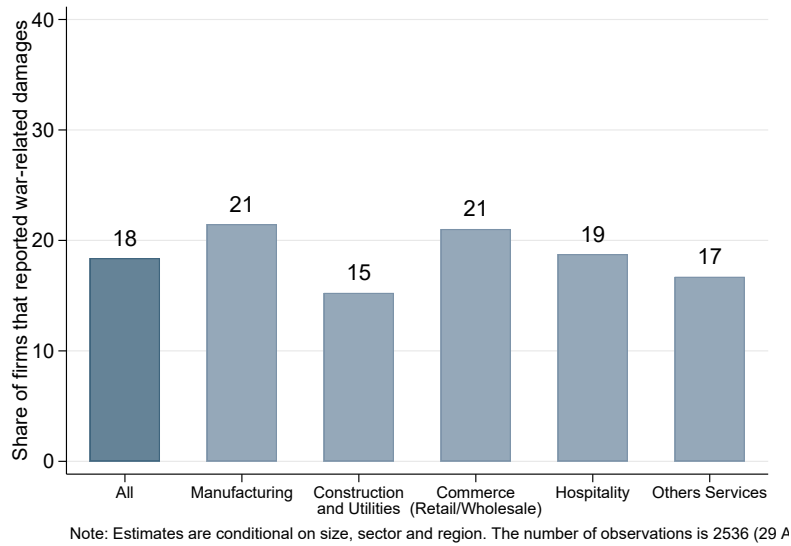
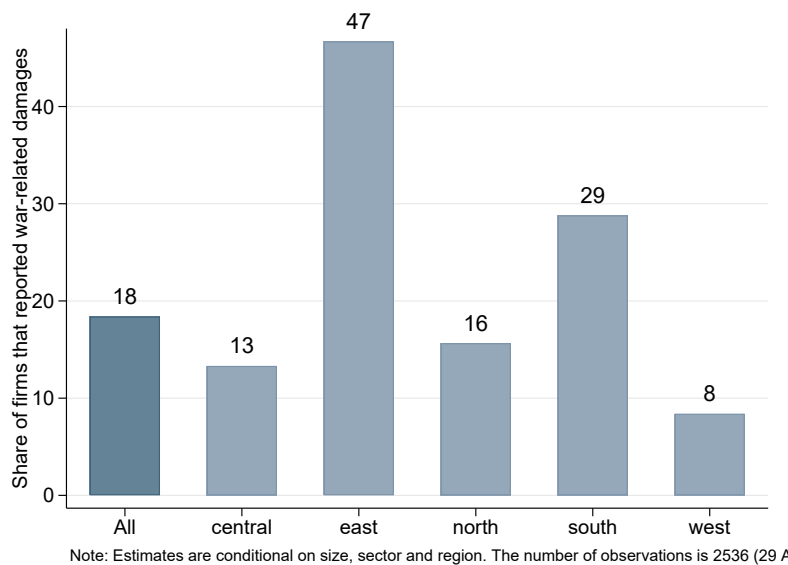
Figure 4.1: War Damages, by Size**Figure 4.2: War Damages, by Sector**

Figure 4.3: War Damages, by Location

share of their assets damaged due to the war experienced a greater drop in sales. Figure 4.4 presents a correlation between the change in sales of a firm and the share of their assets that was damaged due to the war. Clearly, among businesses that experienced asset damage, firms that suffered more damage to their assets also experienced a higher drop in their sales.

Losses by firms that reported damage or stolen assets were large. Firms reporting damages have on average lost over one-third of their assets, and a quarter of them lost over 60 percent of their assets. The total value of the damage to the private sector is estimated at US\$3.6 billion. This figure likely underestimates the value of the damage to all firms in Ukraine, since the survey primarily covers a sample of firms that were operating when it was conducted; only a few firms that are no longer operational (e.g., due to severe damages) were included. Small firms lost a greater share of the value of their assets and property reportedly due to damage from the war than large firms, however on average, large firms lost a much greater value (in nominal terms) of their assets to damages from the war. RDNA data also showed that about half of the damage (50.2 percent) occurred to

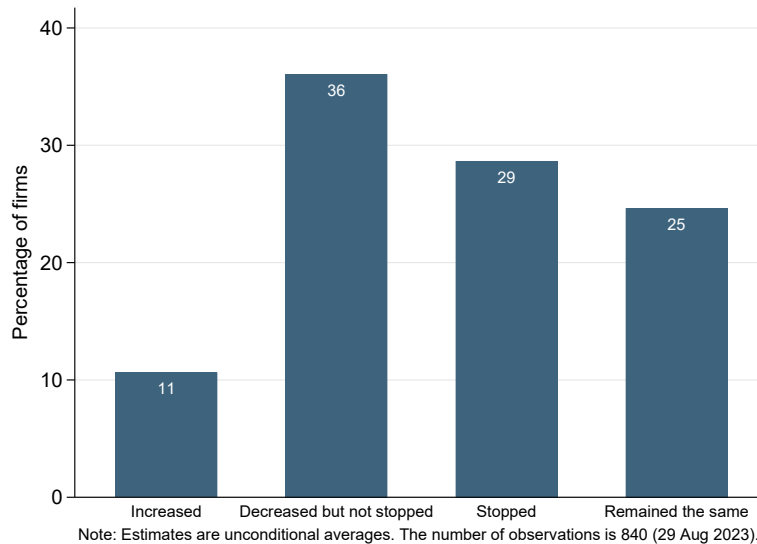
Figure 4.4: Correlation, Sales Changes and Assets Damages

large and medium-size enterprises, both public and private. Asset destruction did not vary much by firm size, but did by location and sector. Firms in the East and South – where the attacks were most intense – suffered the most damage or stolen assets, with the average share of damaged assets in total assets being 49 percent and 37 percent in each region, respectively. Over 40 percent of the average share of damaged assets were reported in construction and hospitality.³

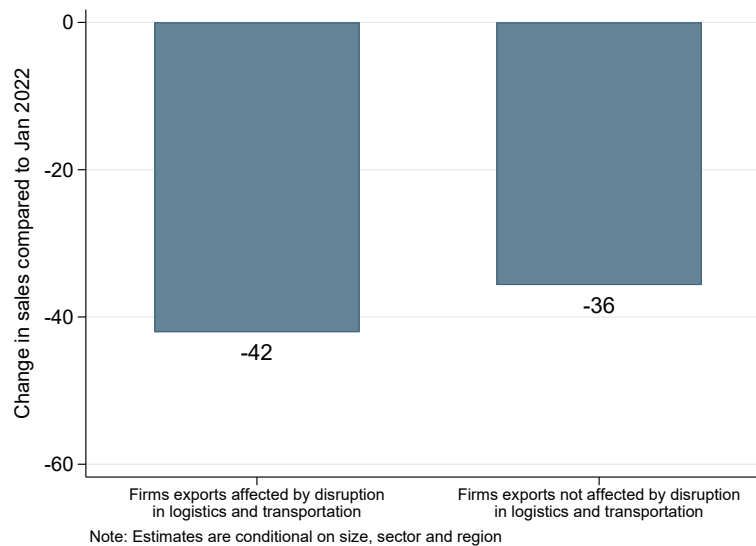
Disruptions to imported inputs and raw materials affected 2 in 3 firms. About 65 percent of firms had to reduce or stop imports of raw materials or intermediate inputs (Figure 4.5). Among large firms, 68 percent had to reduce or stop imports of raw materials or intermediate inputs. The construction and utilities sector was especially affected by this disruption to imports.

Many firms, especially the larger ones, reportedly experienced a drop in exports because

³This is consistent with the RDNA results which found that over two-thirds of the damage was in two provinces in these regions - Donetsk and Kharkiv.

Figure 4.5: Disruptions: Imported Inputs and Raw Materials

of disruptions to logistics and transport. Exports of 79 percent of large businesses were affected by disruption in logistics and transport due to the war compared to 71 percent for small firms. Disruptions in logistics and transportation may have led to a decline in sales through its effects on exports – businesses that reported that disruptions in logistics and transportation affected their exports faced a greater drop in their sales compared to pre-war levels (Figure 4.6).

Figure 4.6: Conditional Change in Sales, Interview vs. Jan 2022

I.B. Input Shortages

Disruptions or delays in receiving production inputs and high prices for electricity and other critical utilities made a significant proportion of firms cancel sales orders. The war has disrupted global logistics, leading to increased freight costs, container shortages, reduced warehousing availability, and the closure of several ports due to shipment delays and congestion (UNCTAD 2022). Firms experienced loss of access to import markets or severe supply chain bottlenecks and logistics disruptions. Figure 4.7 shows that 27 percent of firms reportedly cancelled sales orders in the 30 days before the interview because the inputs for production were delayed or interrupted. Large firms were more likely to cancel sales due to input shortages. The reported share was 8 percentage points higher among large firms (35 percent).⁴ Firms in the retail/wholesale (39 percent) and hospitality sectors (37 percent) had the highest proportions of sales cancellations reportedly due to delayed or interrupted inputs (Figure 4.8). Firms throughout the country can-

⁴The original question is: "In the last 30 days (before this interview), did this establishment have to cancel any sale orders because there were no inputs for production (they were delayed or interrupted)?"

celled sales orders due to lack of inputs, however the interruptions were more likely to be reported by firms located in the West (34 percent) and South (29 percent, Figure 4.9).

Figure 4.7: Cancelled Sales Orders, by Size

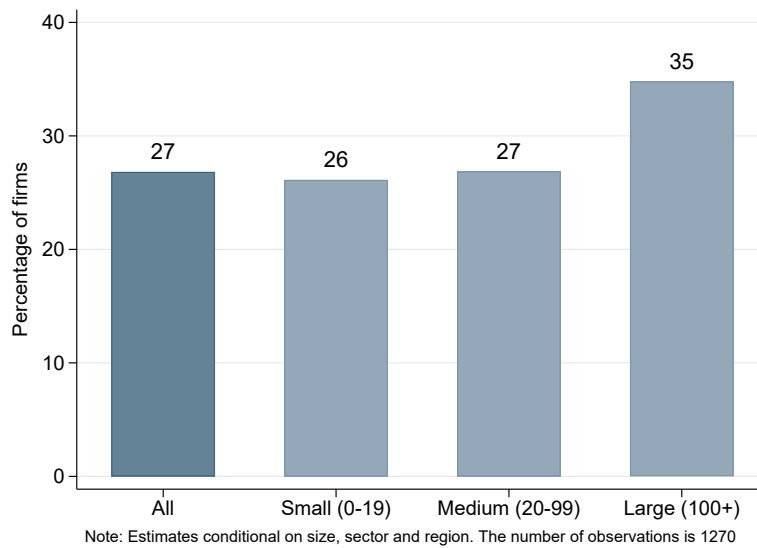
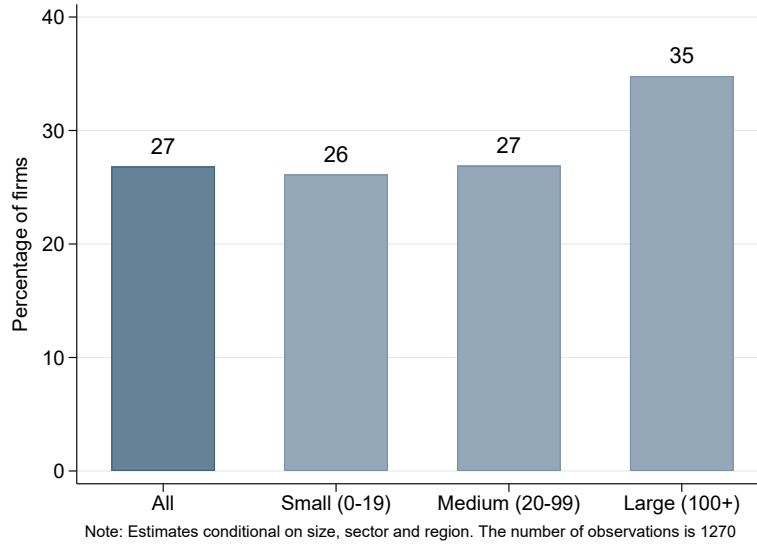
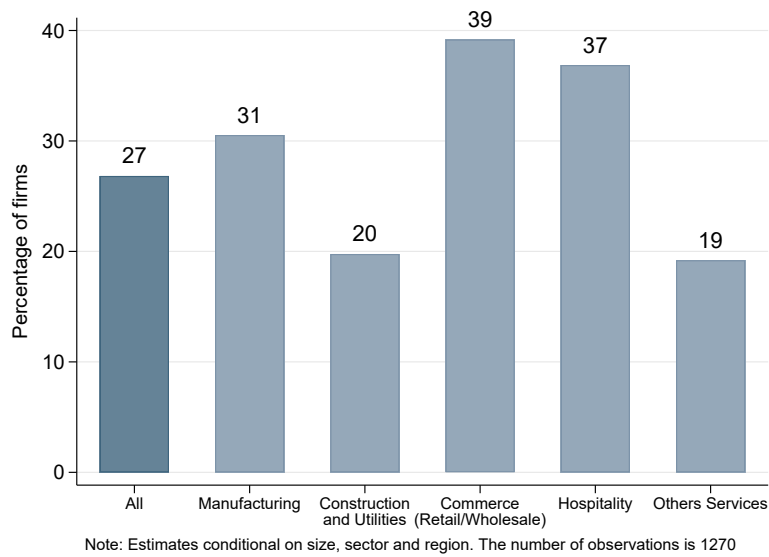


Figure 4.8: Cancelled Sales Orders, by Sector**Figure 4.9: Cancelled Sales Orders, by Location**

War-related displacement, military service and loss of life caused large worker shortages, which affected firms' sales. By September 2023 about 5.8 million of Ukrainian refugees sought temporary protection in Europe⁵, with a significant portion being highly educated women compared to other refugee demographics and the broader Ukrainian population (OECD 2023). Moreover, Ukraine's legal regime of martial law states that, with few exceptions, male citizens aged 18 to 60 can be called up for military service, forming a half-a-million people army and 200,000 active soldiers (Statista 2023, Cooper et al. 2023). Together with rising casualties during war, conscription significantly reduces the available labor supply. According to the Business Pulse Survey, 15 percent of firms reported that they had to cancel sales orders because workers had been displaced or conscripted. Larger firms were more likely to cancel sales due to a lack of workers than other firms (Figure 4.10). Manufacturing firms were more likely to cancel sales orders due to a worker shortage due to displacement or conscription compared to firms in other sectors (Figure 4.11). A greater percentage of firms in the South (21 percent) reported cancelling sales orders for this reason, with only 13 to 15 percent of firms in other regions reporting the same.

⁵UNHCR, <https://data.unhcr.org/en/situations/ukraine>, accessed on September 11, 2023

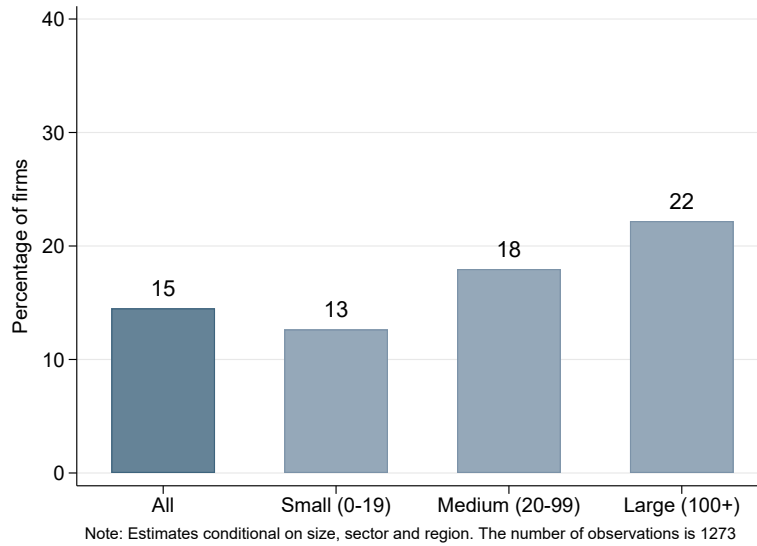
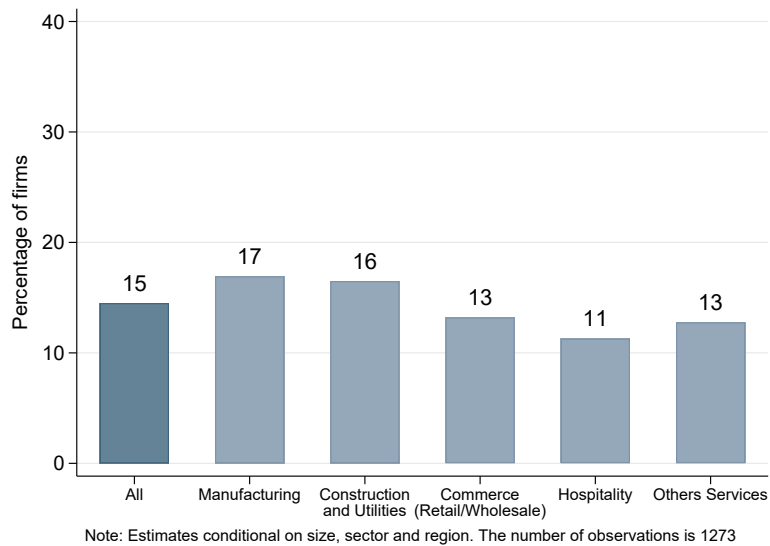
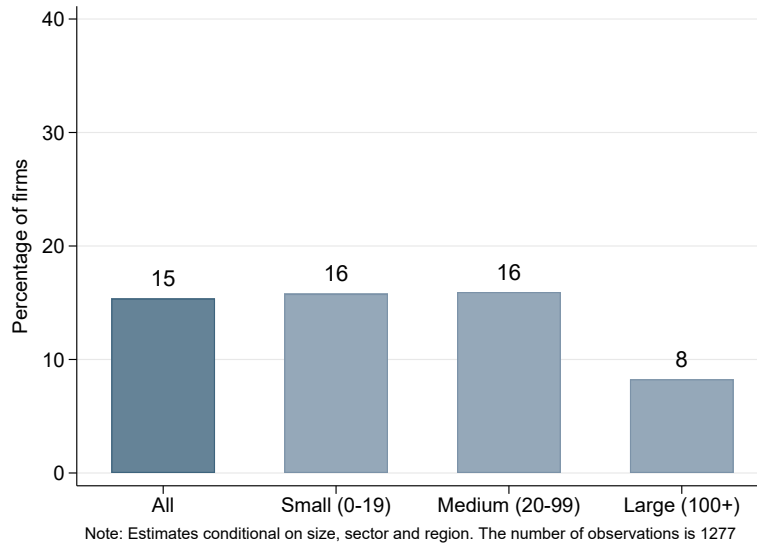
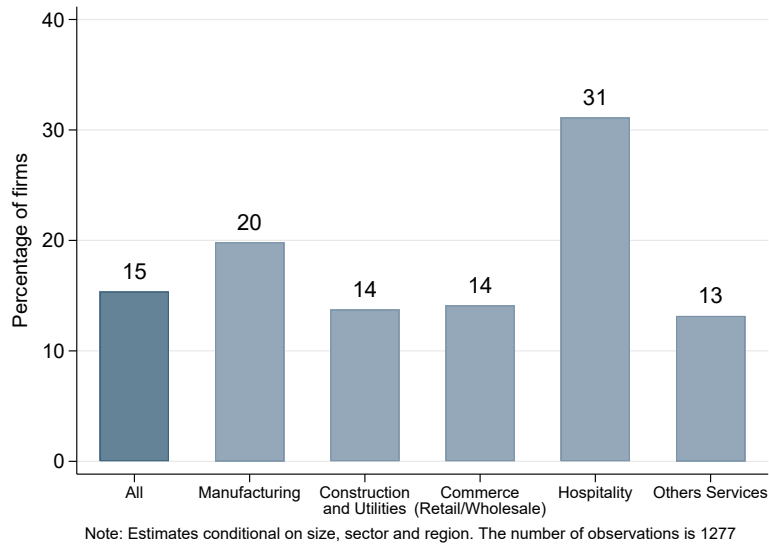
Figure 4.10: Sales Cancellations due to Shortage of Workers, by Size**Figure 4.11:** Sales Cancellations due to Shortage of Workers, by Sector

Figure 4.12: Power Outages, by Size**Figure 4.13: Power Outages, by Sector**

I.C. Power Outages

Unprecedented power outages have disrupted firms' production and supply chains, undermining their operational continuity. Russian rocket attacks have frequently targeted Ukraine's power grid, leading to daily electricity blackouts. Initial attacks in 2022 saw quick recovery in power supply, but by November, Ukraine lost 55 percent of its power in one day, significantly impacting the economy. Unprecedented attacks on the country's power grid caused significant economic fallout (Blinov and Djankov 2022). Relying on responses from the Business Pulse Survey between January 2023 to July 2023, the WB estimates that firms were heavily affected by power outages, with 15 percent of all firms experiencing power outages in the 30 days before the survey, though a lower proportion of large firms reported power outages in the same period which is likely due to backup systems (Figure 4.12). A greater proportion of firms in the hospitality sector (31 percent) experienced electricity outages, with manufacturing firms reporting the second greatest proportion (20 percent) of firms affected by power outages (Figure 4.13).

Finally, though firms surveyed in all regions reported power outages, a higher share of firms in the South (19 percent) and North (17 percent) experienced those outages, with the lowest proportion (11 percent) in the Central region. Energy-dependent industries like metallurgy and cement production had to reduce their production during periods of electricity shortages after a short-lived revival in the summer of 2022. Manufactured steel products experienced a revival in the summer of 2022, as many enterprises resumed their work even in the locations close to the frontline. In the fall of 2022, however, metal producers had to cut production due to electricity shortages caused by deliberate Russian attacks on energy infrastructure as well as due to logistical bottlenecks at the Western borders (with blocked seaports, metal exports were transported by rail to reach European ports for further shipment). This self-reported evidence is supported by an analysis of satellite data. Production Satellite imagery data confirmed a revival trend in metal production in the summer of 2022, with volatility during energy blackouts (Figure 4.14). Similarly, cement production dropped 51 percent in 2022 due to energy shortages and severe war-inflicted damage to two enterprises out of ten operational plants prior to

the invasion. Following the initial downturn in the first quarter of 2022, cement production resumed in the summer of 2022 at 30-50 percent capacity, but had to cut its production back due to electricity shortages in the fourth quarter of 2022 and the first quarter of 2023. Nonetheless, the electricity deficit varied across regions; thus some cement production facilities – e.g., in Khmelnytskyi Oblast – had less disruptions than similar enterprises located in Dnipropetrovsk and Mykolaiv regions (Figure 4.14).

Manufactured steel production, after the initial shock, revived in summer 2022, but then was affected by energy blackouts. Cement production dropped throughout the country, with regional variations. It resumed in the summer of 2022 at 30-50 percent capacity, but then was affected by electricity shortages

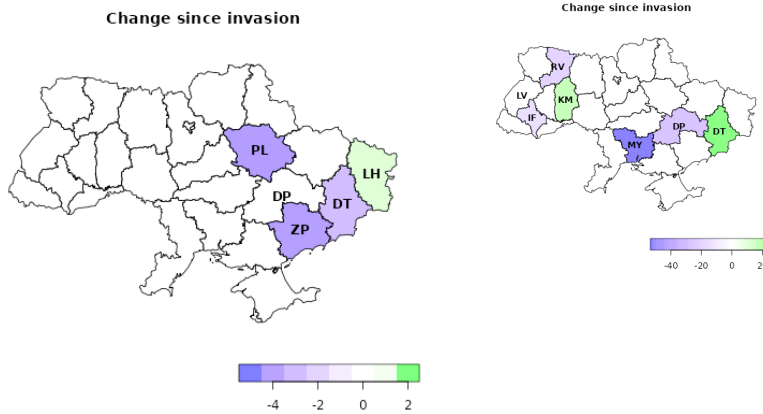
Power outages and destruction negatively affected internet connectivity, hindering businesses from maintaining seamless operations and communications. Insufficient internet connectivity for business purposes in the 30 days prior to the survey was reported by more than 1 in 10 firms (11 percent), mostly with no difference by firm size. A greater proportion of firms in the retail and wholesale sector (16 percent) reported problems in internet connectivity.

The water supply was reportedly not a key problem for production. Only 2 percent of firms reporting it as an obstacle to production in the last 30 days before they were surveyed.

Figure 4.14: Energy Blackouts in Manufactured Steel and Cement Production - Satellite Data, by Sectors

(a) Manufactured Steel Production

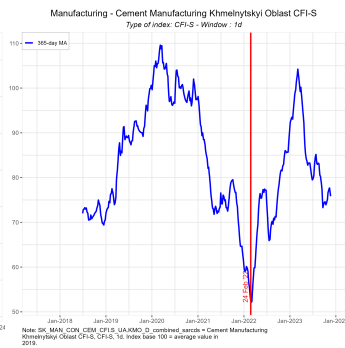
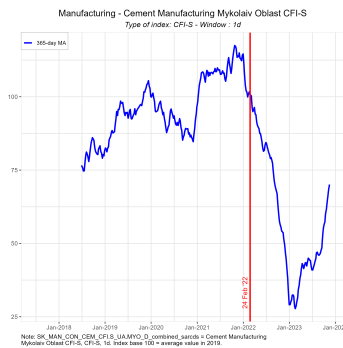
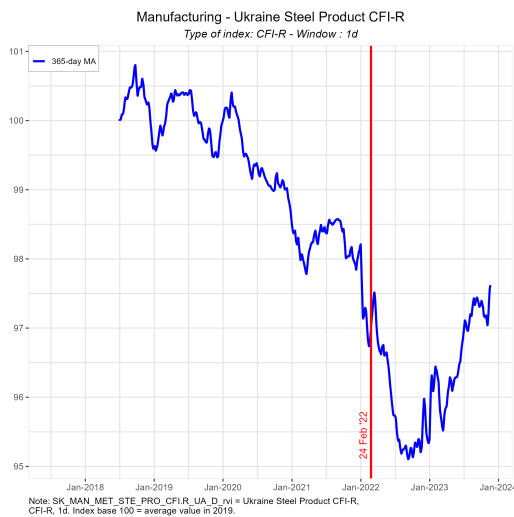
(b) Cement Production



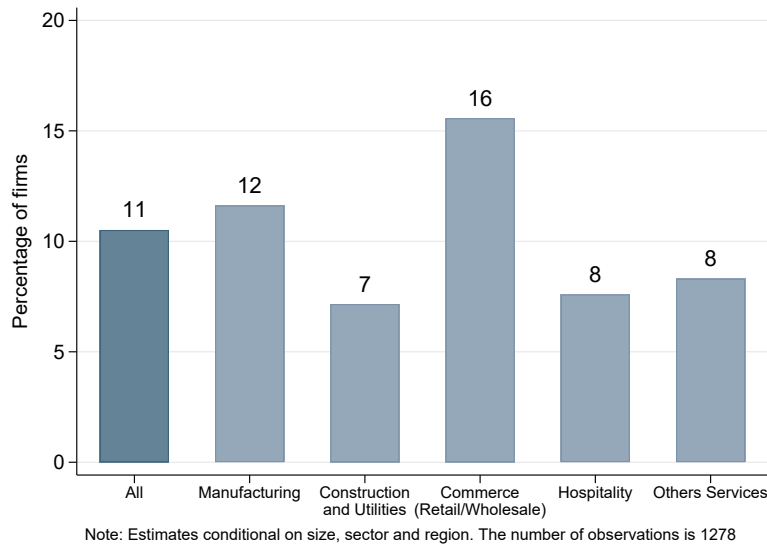
(c) Manufactured Steel (National Trend)

(d) Cement (Mykolaiv)

(e) Cement (Khmelnitskyi)



Notes. Manufactured steel production: After initial shock, revived in summer 2022, but then were affected by energy blackouts. Cement production dropped throughout the country, with regional variations. It resumed in the summer of 2022 at 30-50 percent capacity, but then affected by electricity shortages. (a) Manufactured steel production, after the initial shock, revived in summer 2022, but then was affected by energy blackouts; (b) Cement production dropped throughout the country, with regional variations. It resumed in the summer of 2022 at 30-50 percent capacity, but then was affected by electricity shortages.

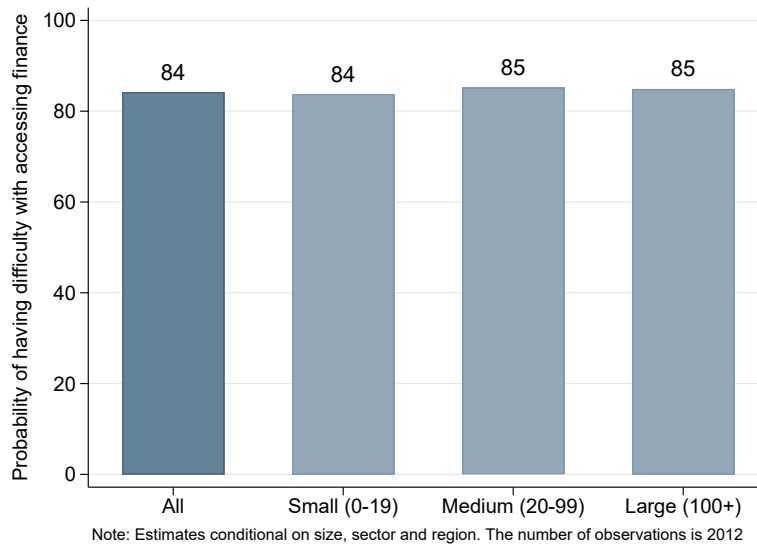
Figure 4.15: Insufficient Internet Connectivity, by Sector

I.D. Firm Financing

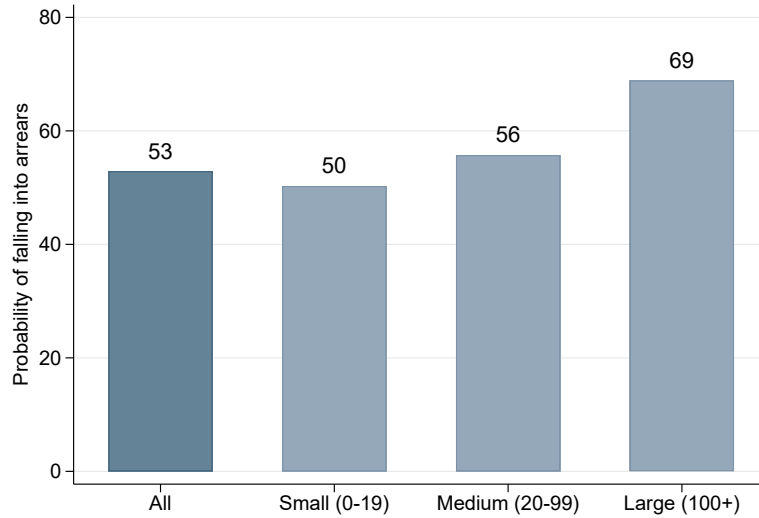
With little variation across firm size and firm sector, around 84 percent of firms report having difficulties in accessing finance. Financial certainty is crucial for firms as it enables predictable planning, investment decisions, and sustainable operations. War has introduced an exceptionally high level of financial uncertainty for firms, disrupting planning and hindering investment decisions. Throughout the country firms report high levels of difficulties in accessing finance (ranging from 76 percent in the East to 87 percent in the South).

Financial troubles are commonplace, with more than half of firms being or expecting to be in arrears. Large firms are more exposed to financial troubles than firms of other size categories. The share of large firms in arrears or that expect to fall in arrears is 69 percent, higher than the average for small and medium-sized firms (Figure 4.17).⁶ Financial fragility is prevalent across all sectors, but worse in the hospitality sector (63 percent)

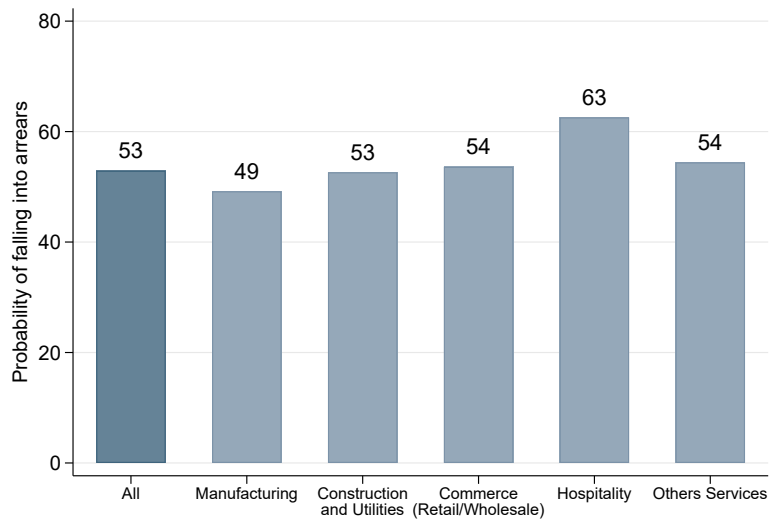
⁶The original question was: "Is it expected that this establishment will fall in arrears in any of its outstanding liabilities in the next 6 months?"

Figure 4.16: Access to Finance, by Size

compared to other sectors (Figure 4.18). Similarly, financial troubles are commonplace across all regions, where the least troubled regions are the West and Central regions of Ukraine with 49 percent each of the surveyed firms already in arrears or expecting to fall in arrears. The most financially fragile region is the East, with 58 percent of businesses reporting to be in arrears or expecting to fall into arrears.

Figure 4.17: Financial Troubles, by Size

Note: Estimates conditional on size, sector and region. The number of obs. is 1931 (29 Aug 2023).

Figure 4.18: Financial Troubles, by Sector

Note: Estimates conditional on size, sector and region. The number of obs. is 1931 (29 Aug 2023).

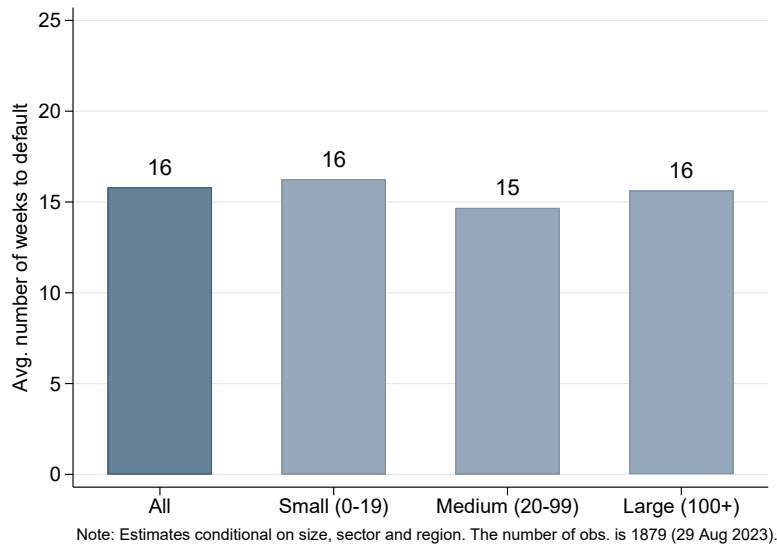
Firms reported on average they had about four months (16 weeks) until default. Quick and reliable access to finance is key for firms. In the BPS, firms were asked, as of today, for how many weeks they could continue paying all operating costs and payments (such as payroll, suppliers, taxes, or loan repayment) only with immediately available cash reserves (cash on hand and money in bank accounts). They were also asked for how many additional weeks they could continue paying all operating costs and payments (such as payroll, suppliers, taxes, or loan repayment) relying on external sources of finance that they would be certain or close to certain to have access to. External sources of finance were defined as loans from relatives or suppliers, lines of credit from banks, credit cards, factoring, merchant cash advance, etc. Adding both types of sources of finance, businesses in the construction and utility industry are reportedly likely to default earlier compared to other industries (13 weeks on average). With 17 weeks on average until default, businesses in the West are likely to default much later compared to other regions. The overall reported probability of insolvency or bankruptcy is 3 percent on average – the share is double in hospitality.

Access to finance is dwindling and costly. In the BPS, firms were asked to provide up to three main difficulties their establishment currently faces in accessing finance. 17 percent of firms indicated no difficulties and 22 percent indicated no need for a loan (with the firms reporting sufficient capital). For the rest, the key reported challenges were:

- too high interest rates (27 percent, 39 percent for large firms, little variation across sectors),
- issues with blocking VAT invoices (25 percent, 27 percent of medium-sized firms, 31 percent in construction)⁷, and

⁷VAT refunds impact a business's cash flow and manufacturing operations. In 2017, a new VAT refund system was launched to increase transparency and curb corruption, and it helped to bring the VAT refund rates close to over 90% of claimed amounts in 2019-2021. With the start of full-scale invasion, various disruptions in business processes made it difficult to comply with VAT refund system re-

Figure 4.19: Weeks until Default, by Size



- high repayment risk due to uncertainty (17 percent, with no variation by firm size, with highest rates in construction and commerce—19 and 18 percent, respectively).

quirements (doubtful claims have been automatically blocked by the system and sent for inspection), the economywide the VAT refund rate fell to 69% in 2022 (<https://opendatabot.ua/analytics/vat-refund>). The government introduced regulatory changes allowing taxpayers to extend the registration period of VAT declarations and to supplement them with supporting documentation, also the inspection period for doubtful claims was cut from 60 to 30 days. According to State Tax Service of Ukraine, VAT refund rate has reached 82% as of November 2023 (<https://tax.gov.ua/diyalnist-vidshkoduvannya-pdchv/informatsiya-pro-obsyagi-vidshkoduvannya/>).

II. Demand-Side Channels

*Domestic and external demand for the output produced by firms is challenged by migration outflows, lost trade linkages, halted FDI, and heightened security concerns.*⁸ Some factors, such as migration, external demand, and lost trade linkages were discussed above as they affect both the demand and supply side.

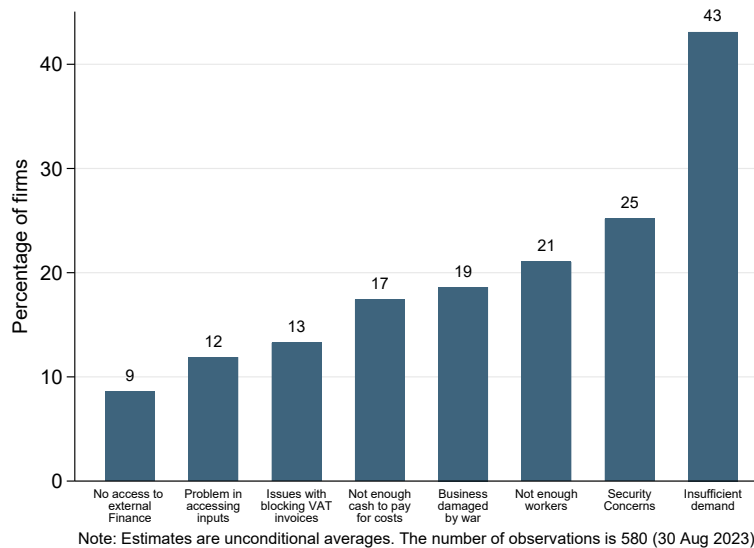
For instance, food and beverages production is the largest sector, contributing one fifth of the total industrial production. After the initial shock of full-scale invasion, food manufacturers resumed production in late spring-summer 2022, and close to 60 percent of enterprises reported they operated at close to full capacity (more than 75 percent) even in the periods of power outages (IER 2023). Production of sunflower oil is the largest export-oriented segment, contributing 35 percent of industrial sales and 70 percent of food exports proceeds (IFC 2023b). While being less sensitive to energy shortages, food manufacturers nevertheless suffered from logistical bottlenecks, consumer demand contraction, and limited export opportunities.

II.A. Consumer Spending

Insufficient demand caused most business closures. For businesses that were either temporarily or permanently closed, insufficient demand was the most cited reason for the closure (Figure 4.20). Indeed, the low level of demand relative to earlier years is indicated by the fact that the median firm utilizes about 40 percent of its production capacity. Further noteworthy reasons for business closures include security concerns, shortages in labor supply and damages due to the war.

Consumer spending patterns are negatively associated with depressed domestic demand

⁸Among the key demand-side transmission channels affecting businesses are: depressed domestic demand and war-induced changes in consumer spending patterns; shrinking consumer base due to migration outflows; loss of export markets, external demand, and trade linkages with Russia and selected CIS countries; halting FDI inflows and business-to-business demand for inputs and intermediate products by foreign subsidiaries; and increased uncertainty of the business environment, often associated with heightened crime and lack of security in parts of the country.

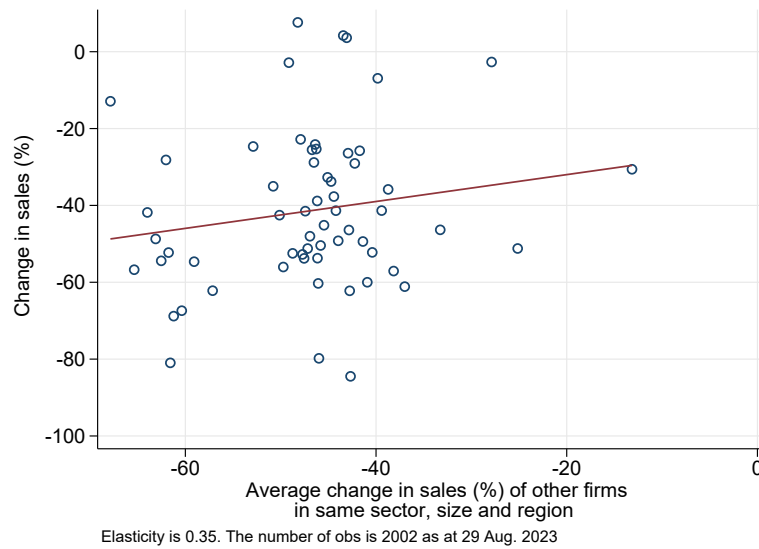
Figure 4.20: Reasons for Business Closures

and war-induced changes. The change in consumer spending on firms' output due to the war is not observed in the data. As such, it is proxied by the average sales of other firms within a firm's sector, region, and size category. The key assumption here is that similar firms⁹ faced similar demand shocks. Figure 4.21 presents a scatter plot (with a fitted regression line) of the percentage change in firm-level sales and consumer spending on products in their sector and region. Clearly, lower consumer spending is associated with depressed demand for a firm's output. The elasticity of this relationship is 0.35, which implies that a 10 percent decline in average consumer spending is associated with a 3.5 percent decline in sales.

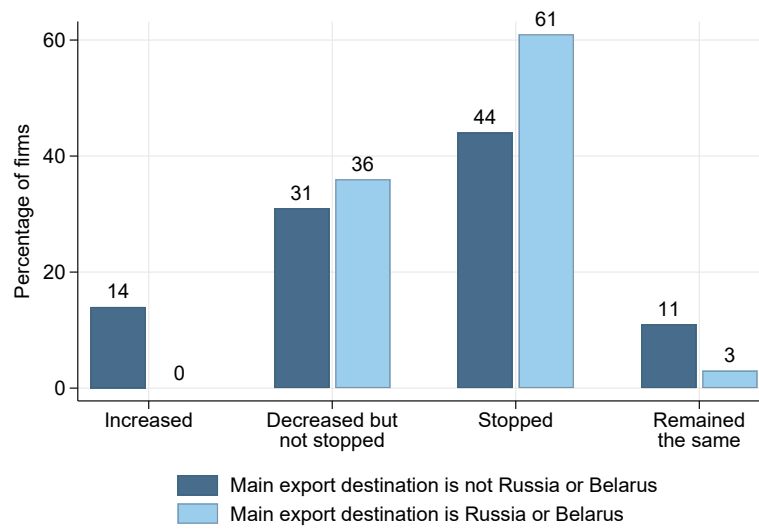
II.B. Exports

Exports to Russia and Belarus stopped. Pre-war trade exposure to Russia is likely one of the main causes of the decline in exports. About 97 percent of businesses that exported mainly to Russia or Belarus pre-war stopped exporting or experienced a drop

⁹Similar firms are defined as firms that are in the same sector and region and have similar firm size (i.e., number of employees).

Figure 4.21: Consumers Spending on Demand of Firm's Output

in their total exports. This number stands at 75 percent for businesses that did not export mainly to Russia or Belarus before the war, while 14 percent of firms were able to increase their exports (Figure 4.22 with estimates conditional on pre-invasion location, size, and sector of the firm).

Figure 4.22: Export Disruptions

Note: Estimates are conditional on size, sector and region. The number of observations is 427

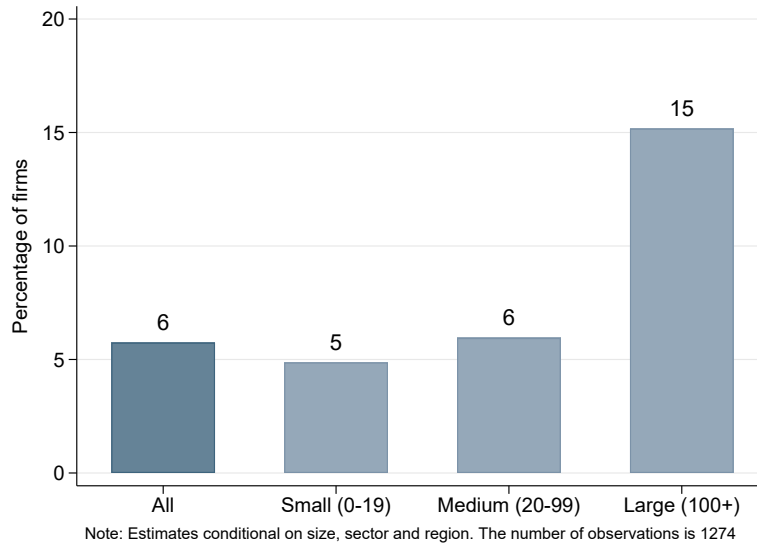
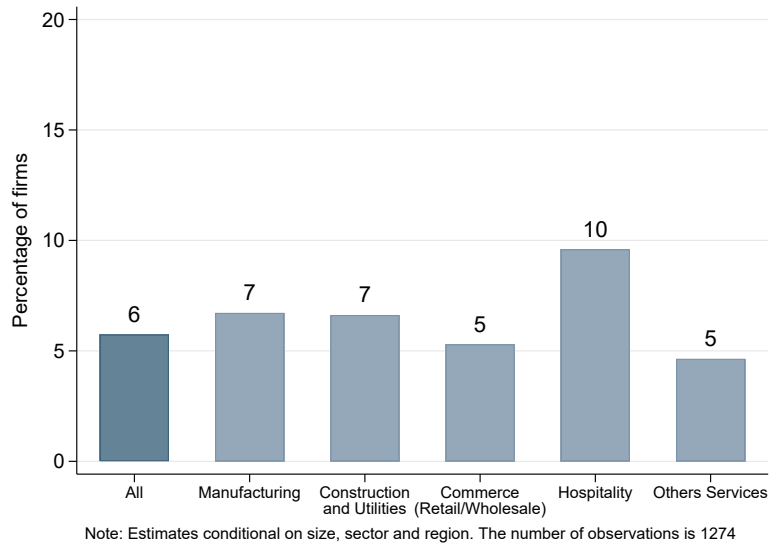
II.C. Theft, Robbery, and Vandalism

Crime disproportionately affected larger firms (1 in 8 firms) . Crime such as theft, robbery, vandalism, among others, can affect normal business operations.¹⁰ Under these circumstances, businesses may weigh the benefits of operating normally against its cost. In addition, customers may be less likely to patronize businesses in high crime neighborhoods due to safety concerns. The survey asked businesses whether they experienced any losses due to theft, robbery, vandalism, arson on the establishment's premises, or internet hacking or fraudulent internet transactions in the last 30 days before the interview. Although only 6 percent of firms experienced such crimes, the share of large firms is remarkably higher at around 15 percent compared to 5 and 6 percent for small and medium-sized enterprises respectively (Figure 4.23). The hospitality sector was disproportionately higher (10 percent) than other sectors (Figure 4.24). By contrast, crime is equally prevalent across all regions, although slightly higher in the East and South.

II.D. Uncertainty and Expectations

Sales expectations matter. Businesses with positive future sales outlook are more likely to hire more, borrow more, and increase investments in productive capacity and inventory in anticipation of positive future sales. Sales expectation was computed as a weighted average of the firm's expected sales under three potential future scenarios:

¹⁰The original question reads as: "In the last 30 days (before this interview), did this establishment experience any losses due to theft, robbery, vandalism, arson on the establishment's premises or from internet hacking or fraudulent internet transactions?"

Figure 4.23: Crime Exposure, by Size**Figure 4.24: Crime Exposure, by Sector**

regular (or continuation of same circumstances), optimistic, and pessimistic.¹¹

The role of uncertainty and a novel firm-level measure. Uncertainty is also very important for business decisions. During periods of economic shock such as the war in Ukraine, economic uncertainty can reduce investments, prevent hiring, and reduce consumption. Firm-level uncertainty is measured using the novel methodology proposed by Altig et al (2020) and applied by the Atlanta Federal Reserve Bank in measuring uncertainty¹² at the firm-level during the COVID-19 pandemic. Simply put, uncertainty is measured as the standard deviation of sales changes that managers expect to see during the next 12 months.¹³ Three scenarios are distinguished - normal, optimistic, and pessimistic views of the Ukrainian economy and its sales expectation - such that higher values of this metric denote higher levels of uncertainty.

Sales expectations were high but accompanied by increased levels of sales uncertainty associated with Russian attacks and heightened crime rates. At the time of the survey, the average sales expectation was for a 30 percent increase, with high levels of sales expectation among small firms and firms in the construction and utilities industry. Firms in the hospitality sector and in the East reported the lowest levels of sales expectations

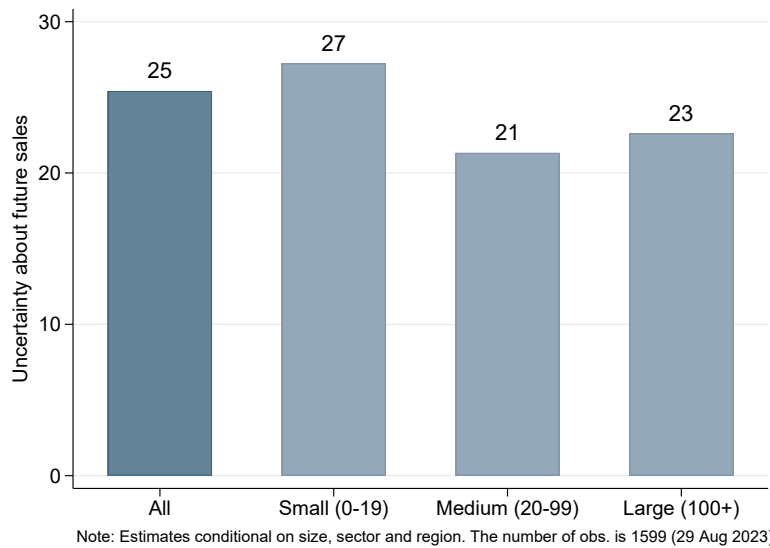
¹¹Sales expectations were captured with the following question: "Consider this establishment sales during the month of January this year. Looking ahead to the same month of January next year, do you expect this establishment sales to increase, decrease, or remain the same relative to January of this year? 1 Increase, 2 Decrease, 3 Remain the same, -88 Refuses to answer, -99 Don't know (spontaneous)." Specifically, enterprises were asked about their expected sales in the next 12 months under 3 future scenarios: a "regular" scenario representing their most probable scenario, a more "optimistic" scenario, and a more "pessimistic" scenario. Enterprises were also asked about the likelihood of each of the 3 scenarios occurring such that the summation of the likelihood of all 3 scenarios sums up to 100. sales expectation was computed as the weighted average of their expected sales under the 3 scenarios with weights equal to the likelihood for each scenario.

¹²"Survey of Business Uncertainty- Federal Reserve Bank of Atlanta." n.d. [www.atlantafed.org](https://www.atlantafed.org/research/surveys/business-uncertainty). <https://www.atlantafed.org/research/surveys/business-uncertainty>.

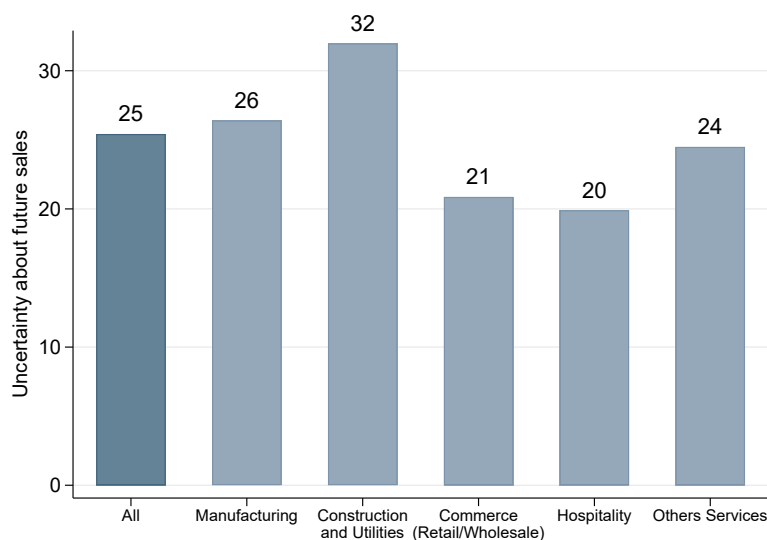
¹³For example, uncertainty about future sales changes of 20 percent implies that the manager expects the size of the typical forecast error about future sales changes to be about 20 p.p. Comparing 20 to 30 percent indicates that the typical forecast error will be about 1.5 times larger in the latter case. Expectation is also important. If the manager forecasts a 10 percent sales change in the next 6 months, a 20 percent uncertainty means they would not be shocked if the actual change turns out to be either -10 percent or +40 percent. 30 percent uncertainty means they would not be shocked by -20 percent or +50 percent.

at 18 percent and 25 percent, respectively. High sales expectation was accompanied by high levels of sales uncertainty at 25 percent, with a higher level of uncertainty among small firms compared to other firms (Figure 4.25), and businesses in the construction and utilities industry (Figure 4.26). Uncertainty levels were also very high across regions but there were no large differences in the level of uncertainty across regions.

Figure 4.25: Sales Uncertainty, by Size



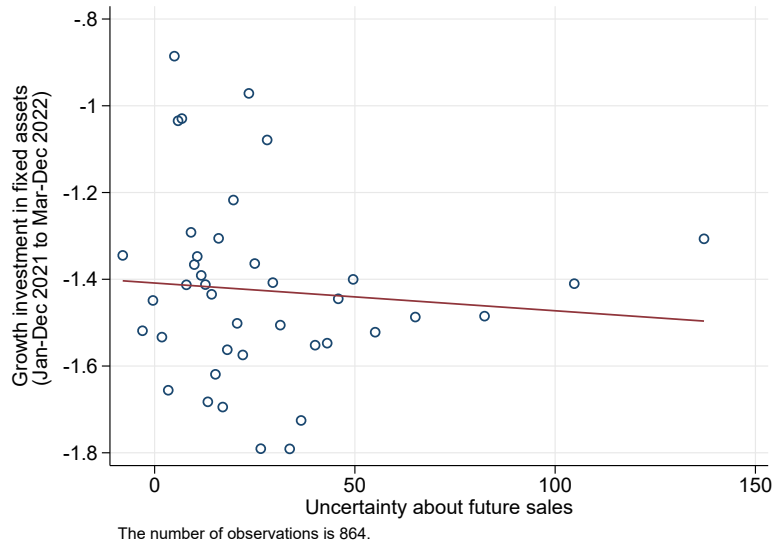
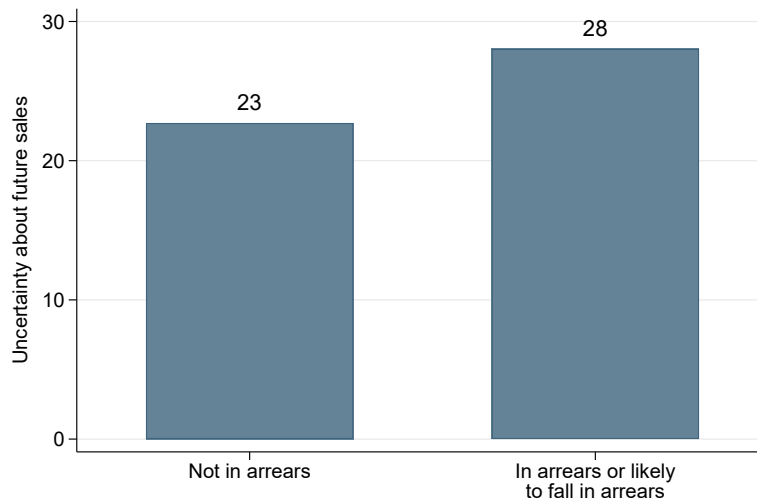
Higher levels of uncertainty are associated with lower investments in fixed assets. Investments in fixed assets (new or used machinery; equipment, software, vehicles, etc.) declined between 2021 and 2022. In 2021, the average investments in fixed assets by the surveyed firms was around 4 million Ukrainian Hryvnias (UAH). However, between March to December 2022, this amount was approximately 400,000 UAH. The survey evidence suggests a negative relationship between uncertainty and investment growth between 2021 and 2022 (Figure 4.27). This finding suggests that uncertainty may deter firm-level investments in productive capacity. Uncertainty is associated with financial troubles. Enterprises that are in financial troubles (i.e., in arrears or high likelihood of falling in arrears) are more uncertain about their future sales compared with those that

Figure 4.26: Sales Uncertainty, by Sector

Note: Estimates conditional on size, sector and region. The number of obs. is 1599 (29 Aug 2023).

are not in financial troubles (Figure 4.28). This does not mean that financial difficulties cause sales uncertainty, since firms that experience more uncertainty about demand could have more difficult financial situations. Eventually, public support to businesses may reduce uncertainty. This is the association we present in Figure 4.29. It shows that firms that received public support reported lower levels of uncertainty than those that did not.

Uncertainty about future sales is due to various issues. Uncertainty about future sales may be driven by several factors, including demand shocks, input supply shocks, damage to the firm's assets, among others. While the survey design does not speak to the causal impact of these factors on uncertainty, it provides some suggestive evidence that could serve as a yardstick for further analysis. The evidence shows a negative correlation between changes in employment and uncertainty (Figure 4.30). Unsurprisingly, businesses that suffered a higher decline in their sales were also more uncertain about their future sales (Figure 4.31). Lastly, uncertainty is higher for businesses that experienced greater damage to their assets.

Figure 4.27: Correlation, Investment Growth and Uncertainty**Figure 4.28:** Uncertainty, by Financial Troubles

Estimates are conditional on sector and region
The number of observations is 1599 (29 Aug 2023).

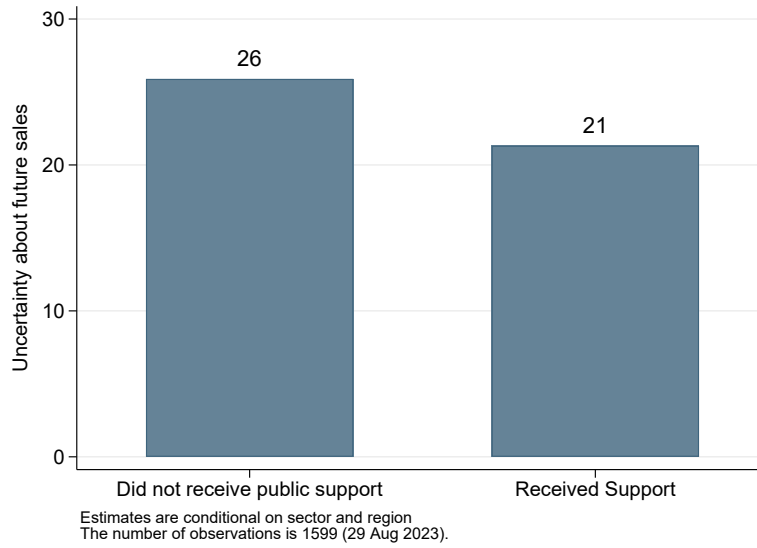
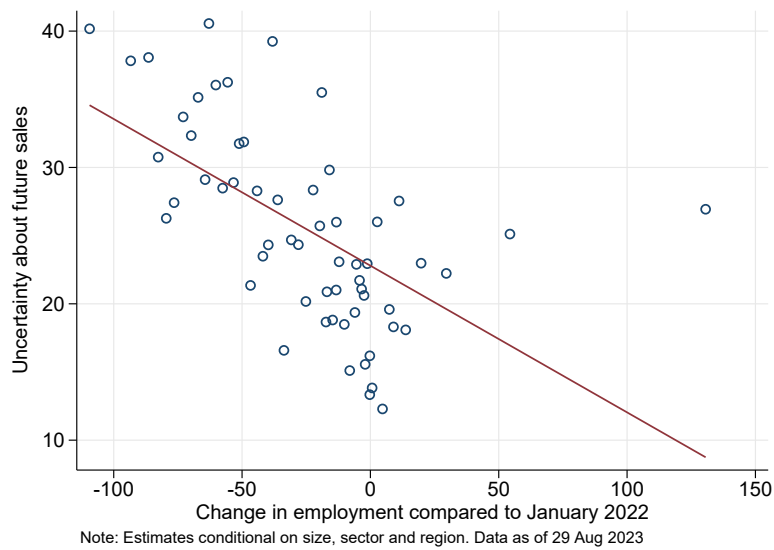
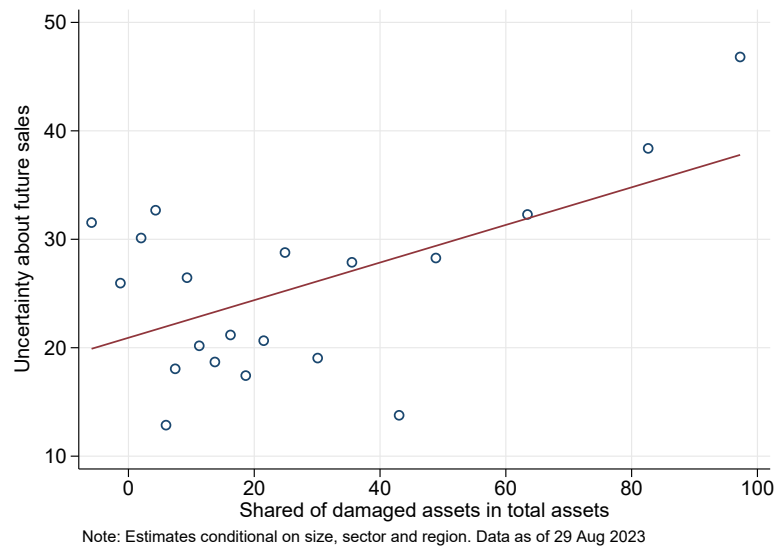
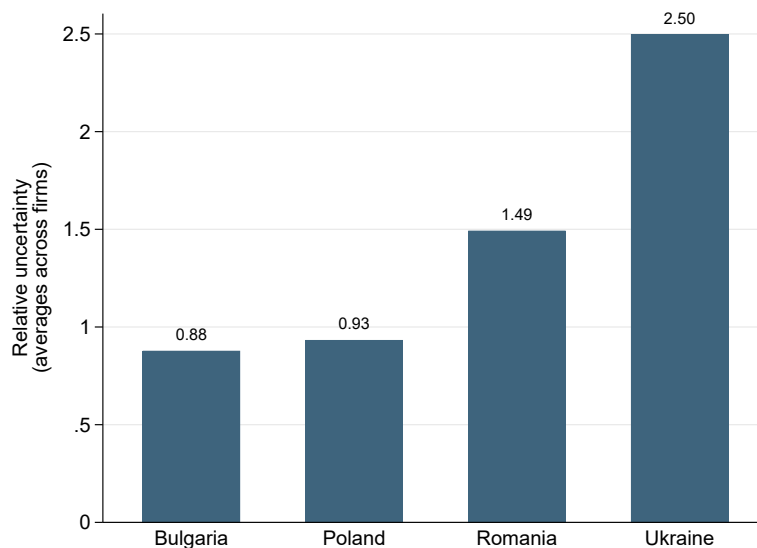
Figure 4.29: Uncertainty, by Access to Government Support**Figure 4.30:** Correlation, Uncertainty and Change in Employment

Figure 4.31: Correlation, Uncertainty and Change in Sales

Businesses in Ukraine are more uncertain about their future sales than their peers in some central and eastern European countries. Relative uncertainty is defined as the ratio of a firm's uncertainty to its sales expectation. As sales uncertainty might be correlated with sales expectations, this measure considers the level of the average expected sales, thus providing a more reliable measure of sales uncertainty for comparisons across countries, industries, or firms than the measure of firm's uncertainty.¹⁴ The BPS was implemented in Bulgaria, Romania, and Poland between late 2021 and early 2022 where questions that measure sales expectations and uncertainty were asked. Figure 4.32 compares relative uncertainty in Ukraine in 2023 with that of similar firms in Bulgaria, Poland, and Romania in 2022 (the latest year this variable is available in the data). Clearly, relative uncertainty is higher in Ukraine compared to any of the countries by at least more than 60 percent.

¹⁴For example, if sales expectation at the firm is 20 percent, and the relative uncertainty is 0.5 (i.e., 50 percent). This implies that the firm expects that sales could grow by 20 percent on average but also could be 30 percent or 10 percent.

Figure 4.32: Relative Uncertainty: Cross-country Comparisons

At the same time, MNCs in Ukraine expect investment conditions to remain similar in the coming months and perceive less uncertainty about their own future than domestic firms and firms in peer countries. When asked in the MNC survey about the likelihood of observing similar, better, or worse investment conditions in the next six-month period, the average MNC in Ukraine reportedly expects the circumstances to remain the same with a probability of 48.3 percent, improve with 31.8 percent, and deteriorate with 19.8 percent. The average MNC in Ukraine reports that the regular scenario (i.e., that the circumstances remain the same) is more likely to happen than did MNCs in Eastern Europe and Central Asia (ECA) and non-ECA regions interviewed during the second half of 2021. However, the average MNC in Ukraine also reports that the optimistic scenario is less likely to happen than the average MNC in ECA and non-ECA regions. Furthermore, MNCs perceive less uncertainty than domestic firms in Ukraine. The average MNC in Ukraine reports a relative uncertainty of 40 percent vis-à-vis 250 percent in the do-

mestic firms.¹⁵ Additionally, relative uncertainty is lower for MNCs in Ukraine than domestic firms in Poland, Romania, and Bulgaria (with a “relative” standard deviation of 93 percent, 149 percent, and 87percent, respectively).

III. Supply vs. Demand-Side Channels

In a set of multivariate regressions, the supply and demand factors are jointly analyzed. In this section, the factors that were described above are now analyzed more systematically in a set of linear regressions, whereby two factors are being added to the analysis: First, the relationship between changes in sales and supply-side factors, and second, the relationship between changes in sales and demand-side factors, both presented in Appendix 2 Table A.8 and Table A.9 respectively. The reference period is pre-invasion (same period as covered by the interview, but in 2021).¹⁶ The reported relationships are assumed to be linear, which means that the change in sales is proportional to the change in the supply/ demand side factors. The reported results can be interpreted as associations only - with no claim of causality as many unobserved factors may influence the observed relationships. The factors influencing changes in sales for a firm are captured by reporting the problems experienced by other similar firms¹⁷, rather than relying solely on the firm’s own, self-reported problems/ experiences. This strategy is chosen to reduce endogeneity in the analysis.¹⁸ Analyzing, for instance, input problems on sales by considering problems reported by other firms helps mitigate endogeneity by reducing self-reporting bias, cross-validating the relationship, and implicitly controlling for unobserved factors. It allows for more generalized conclusions while acknowledging that a complete elimination of endogeneity concerns even with this approach

¹⁵“Relative” standard deviation is computed by multiplying the standard deviation by 100 and dividing this product by the average.

¹⁶The original two questions are: “Comparing this establishment sales for the last 30 days (before this interview) with the same period in 2021, did the sales...? Increased/Remained the same/ Decreased/ RA/ DK; By how much?”

¹⁷Similar firms are defined as firms in the same size category, sector and region.

¹⁸Endogeneity is a statistical term which refers to a situation where an unobserved variable in a regression model is jointly correlated with an explanatory variable and the dependent variable (here: change in sales) which can lead to biased and unreliable results.

is likely not possible. Second, all regressions control for firm-sector and location. In all regressions, the factors are added sequentially while keeping the number of firms across regressions fixed to facilitate a comparison across regressions. Finally, while a split in supply and demand factors is made here, it is acknowledged that some supply factors can be demand factors as well, and vice versa.

Power outages stands out as an important factor influencing changes in sales negatively.

Out of all supply factors analyzed (including input interruption, war damages, arrears, workers' interruption, and internet outages), power outages is the one that suggests a strong statistical association (statistically significant at the 5 percent level). For each percentage point increase in the share of firms who experienced a power outage, sales are expected to drop by 0.37 percentage points (if power outages is the only independent variable, besides fixed effects) to 0.45 percentage points (if the other supply side variables are controlled for)–(Table A.9 in Appendix 2). Again, no causal claims can be made even after controlling for the other described, certainly correlated, factors, as other unmeasured or confounding factors may influence this relationship.

Positive increases in sales by firms in the same sector, region and size categories are associated with positive and statistically significant changes of a firm's sales.

Sales of other firms is the most important predictor in the multivariate regression (Appendix Table A.8, column (5)), after controlling for reported crime, decline in exports, and sales uncertainty. For instance, for each percentage point increase in the sales of other firms, a firm's sales increase by 0.35 percentage points.

Both supply and demand war-related shocks influence changes in sales negatively – however the relationship turns statistically insignificant once sector, firm, and location fixed effects are added.

To understand whether the demand- or supply-side factors are more relevant for sales, both factors are considered jointly. Due to the large number of potential explanatory factors, the principal component analysis is applied separately for demand- and supply-side factors to reduce the dimensionality of the many individual factors. Then, first principal components for demand and supply are extracted which

capture the largest variance in the data. The two principal components for supply and demand are a linear combination of the original variables reported above. This concise representation of the data allows to retain most of its original information. The results of this exercise indicate a clear negative and statistically significant association of the two types of market factors in a war setting. However, once all control variables are added – size, location, and sector fixed effects – the results turn insignificant, indicating that these factors might have been capturing variation that is already accounted for by the fixed effects. In other words, context-specific factors are crucial for the interpretation of specific supply or demand factors¹⁹. The principal component scores that capture the supply and demand shocks can be interpreted as follows: For every one standard deviation increase in the supply shock, the changes in sales drop by 1.6 percentage points (Appendix Table A.10, column (1)); and for every one standard deviation increase in the demand shock, the changes in sales drop by 4.0 percentage points (Appendix Table A.10, column (2)).

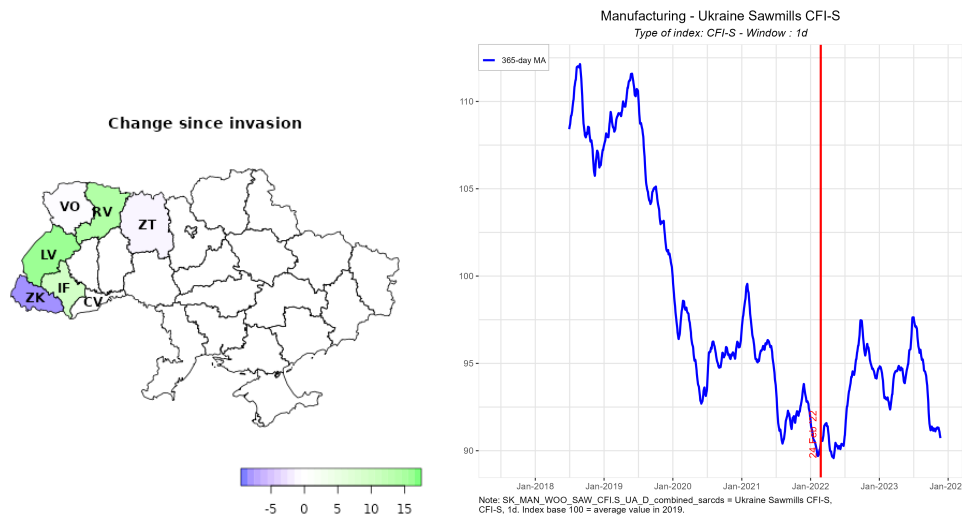
¹⁹It is difficult to unarguably state whether the demand or supply shock had the most impact. Although the demand shock seems to matter more than the supply shock in most specifications, the coefficient of both shocks becomes insignificant when size, sector and region fixed effects are controlled. The loss of significance is likely due to how the shocks were constructed. The variables used in extracting the first principal component for both the demand and shocks were constructed based on the shocks faced by other firms within a firm's sector, size and sector bin.

CHAPTER 5

A Resilient and Multifaceted Response of the Private Sector

Following the initial shock of the full-scale invasion that forced economic activity to a standstill in spring of 2022, there were visible signs of revival already in May 2022. Satellite imagery data and official statistics help identify the partial recovery in specific sectors, although this recovery was later interrupted by power outages during the cold weather.

For instance, wood, and furniture production fell by 32 percent in 2022 largely due to a plunge immediately after the invasion before gradual recovery in the late spring and summer 2022. Indeed, satellite data show that national production is back to levels comparable to three years ago (Figure 5.1). Being concentrated predominantly in the Western regions (see map in Figure 5.1), the wood industry was less affected by missile attacks than industries in other parts of the country and had the opportunity to continue exporting, thanks to proximity to the EU border. However, wood processing enterprises suffered from power outages during fall 2022 and winter 2023, with only one fifth of the enterprises working at almost full capacity in December 2022 through March 2023. Overall, wood and furniture products have potential to replace Russian and Belorussian products on the EU market, albeit it takes effort to meet the EU standards to enter the market.

Figure 5.1: Time Series for Wood and Furniture – Satellite Data, by Sector

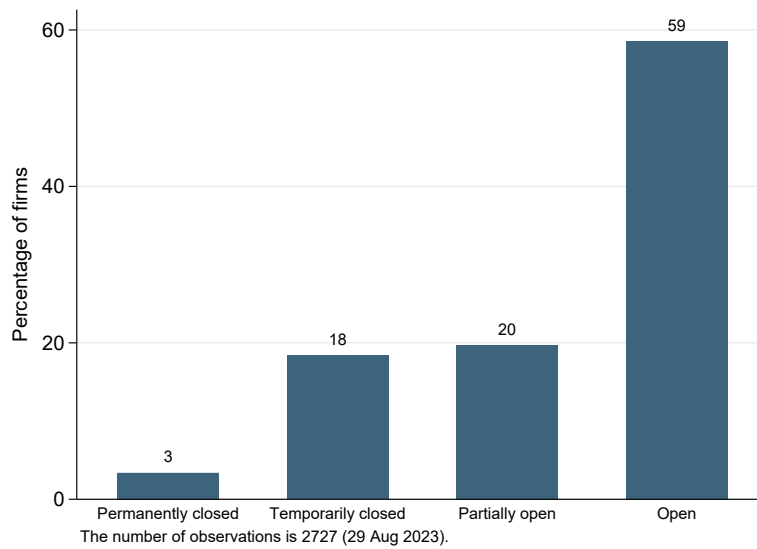
Notes. Wood and Furniture – National Trend: Food and Furniture remained stable in the West, due to increased export demand.

Almost 8 in 10 firms interviewed remained (partially) open. 59 percent remained fully open, and 20 percent partially open (Figure 5.2). Firms have proactively responded through digitalization, innovation, and finding new markets and clients.

I. Investments

The war reduced investment, yet still about 1 in 4 firms decided to invest in their business. In the BPS, firms were asked: “How much did this establishment invest in purchasing fixed assets for the firm (new or used machinery; equipment, software, vehicles)”. The firms were asked to report investments for 2021 and, separately, for the period between March and December 2022. On average, investments dropped by 76 percent (Figure 5.3). The average value of investment (in Ukrainian Hryvnias) fell sharply for all size firms (Figure 5.4). Across the sectors, construction and hospitality had the biggest drops in investments, 85 and 86 percent, respectively, while manufacturing firms had the

Figure 5.2: Firm Status



smallest (56 percent). Firms in the North reduced investments by 81 percent, in the East by 63 percent.

Figure 5.3: Investments, by Size

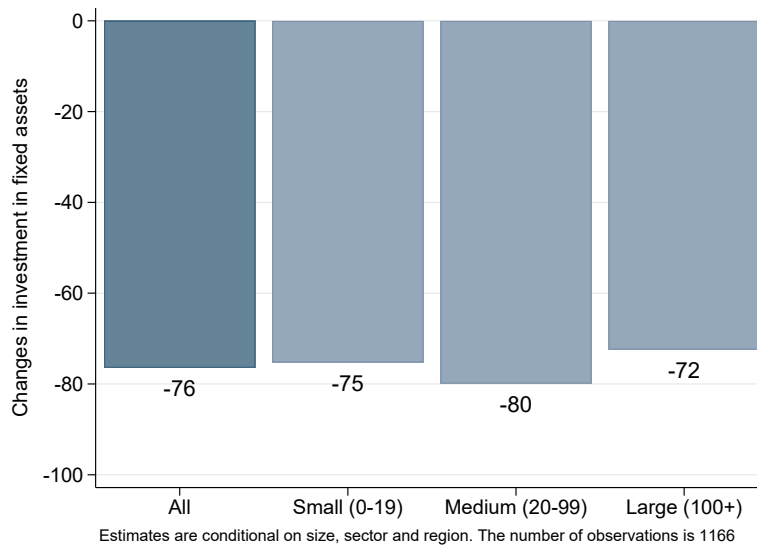
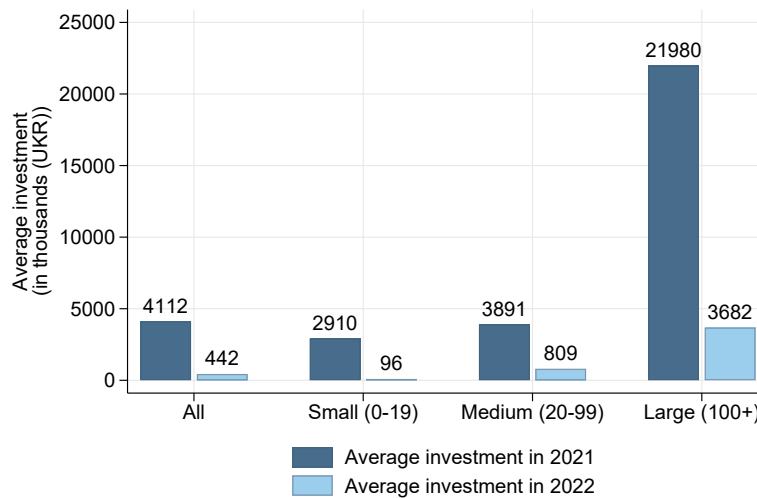


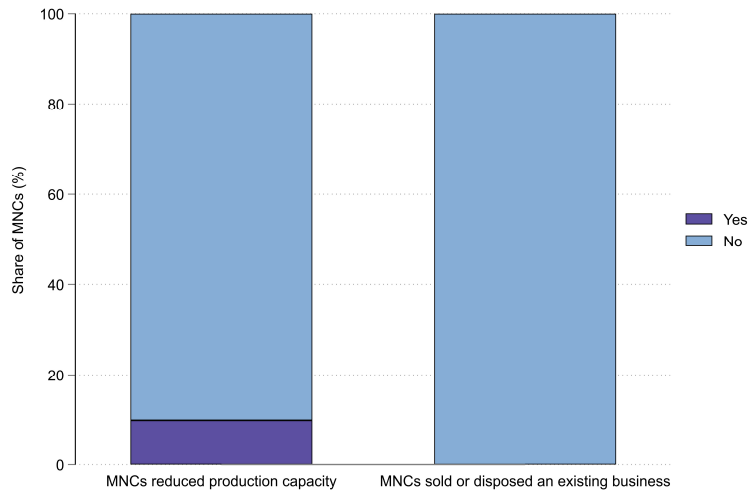
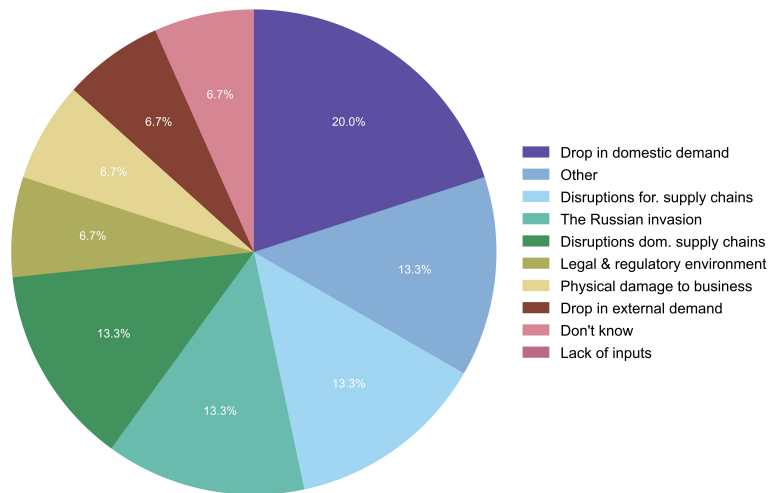
Figure 5.4: Average Investment in UAH, by Size

Estimates are conditional on size, sector and region. The number of observations is 2028. Investment in 2022 is between March and December 2022.

Most MNCs did not disinvest. In the six months prior to the surveys (completed in May 2023), less than 10 percent of the over 80 major multinational corporations that responded to the survey reduced their production capacity in Ukraine with the sale or disposal of fixed assets. None of the MNCs sold or disposed of a subsidiary or existing business within Ukraine during this period (Figure 5.5). Among the major reasons cited for disinvestment by the few MNCs that did are disruptions in the supply chain, drop in domestic demand, and the Russian invasion (Figure 5.6).

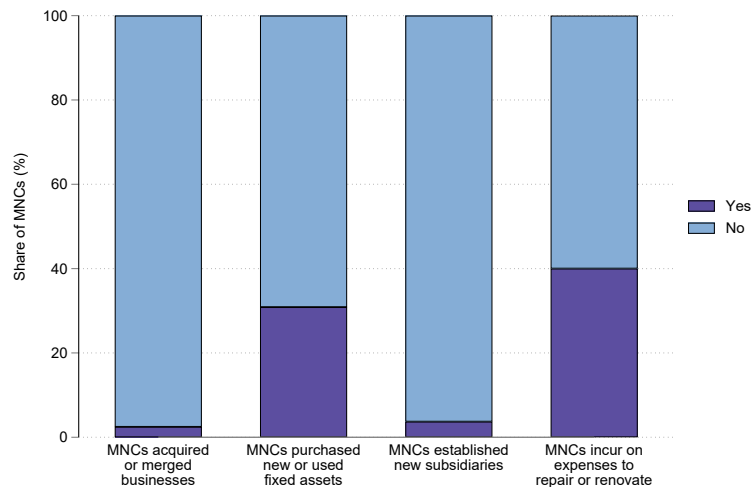
Many MNCs even expanded their investments. During the six-month period prior to the interviews, nearly half expanded their investments. Most of those purchased new or used fixed assets or repaired/renovated existing assets (Figure 5.7).¹ Of those firms,

¹The histograms display response to the following questions: In the past 6 months did this multinational company acquire or merge with an existing business in Ukraine?; In the past 6 months did this multinational company purchase new or used fixed assets to increase the production capacity of existing affiliates in Ukraine?; In the past 6 months did this multinational company establish new subsidiaries in Ukraine?; In the past 6 months did this multinational company incur on expenditures to repair or renovate current fixed assets in existing affiliates in Ukraine?

Figure 5.5: Most MNCs did not Reduce Investments**Figure 5.6:** Driving Factors for Disinvestment

the main reasons for increasing investment were for meeting growth in demand, both external and domestic, and disruptions in supply chains (Figure 5.8).

Figure 5.7: Investments Made by MNCs that Expanded Investments

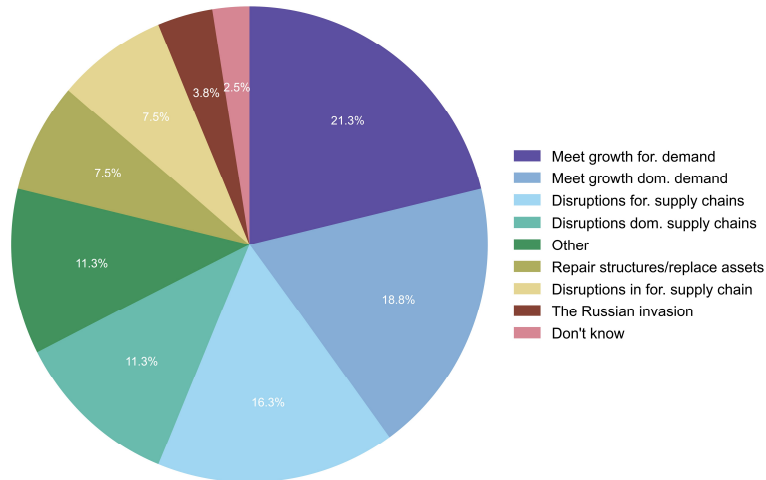


II. New Clients, Products and Services

Despite the challenges described in the previous sections, many firms have proven resilient. While almost half of firms experienced a sales loss of more than 50 percent, 28 percent experienced no change or even an increase in sales (see Figure 3.4). Many firms continue to operate at low capacity (44 percent average capacity utilization). Almost a fifth of firms (18 percent) changed marketing and customers relations as a response to the invasion; among the large firms, the percentage was even higher at 23 percent. Retail and wholesale, and manufacturing firms were more likely to make these changes than firms in other sectors.

Every third firm started selling to new clients and every fifth firm started innovating with their products. In the BPS, firm representatives were asked “In response to the war (since February of 2022) has this establishment implemented some of the following?” with

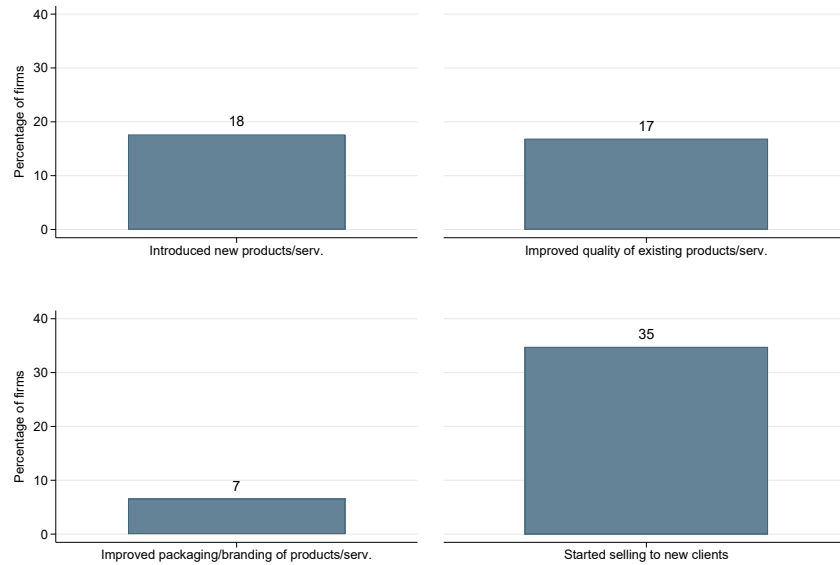
Figure 5.8: Driving Factors for Investment by MNCs



the following answer options (1) Introduced new products or services (significantly different from last year), (2) improved the quality of existing products or services, (3) improved the packaging or branding of products or services, and (4) started selling to new clients, among others. 35 percent of 2,015 firms that provided a response to this question indicate they started selling to new clients (Figure 5.9). With 41 percent, this share is highest for large firms and for firms in retail/wholesale (44 percent), mostly located in the West and the Center of the country (38 and 37 percent, respectively). The next most frequent adjustment strategies were the introduction of new products and improved quality of products/ services (18 and 17 percent, respectively). New products were most frequently introduced by medium and large firms (24 percent each). In response to the war (since February of 2022), especially large firms and firms in manufacturing improved the packaging or branding of products or services (13 and 10 percent, respectively). The quality of services was most frequently improved in manufacturing and hospitality, by about 1 in 5 firms each.

Every tenth firm introduced new products or services. In the BPS, firms were asked about

Figure 5.9: Innovation



Note: Estimates are conditional on size, sector and region. The number of observations is 2015 (29 Aug 2023)

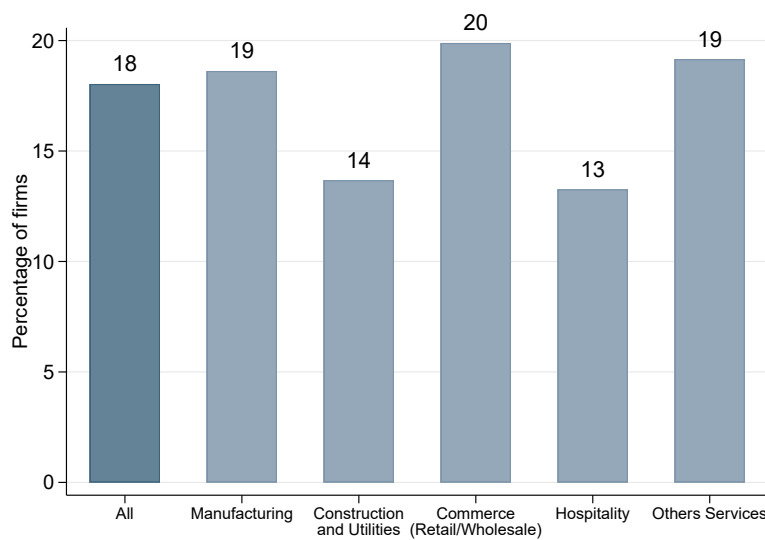
their changes in products or sales in the past six months. 1,354 firms provided responses. A higher proportion of large firms changed products or services in response to war (14 percent). This was predominantly in the hospitality sector, where every fifth firm changed its behavior accordingly (while only every tenth firm did it in the full sample, conditional on size, sector, and region). The shares were also higher in the North of the country (every eighth firm).

III. New Technologies and Strategies

Around 41 percent of surveyed businesses use digital platforms. More than half of firms (51 percent) in hospitality started using or increased the use of internet, online social media, specialized apps, digital platforms, or remote work in response to the war. The share is highest in the East (45 percent) and lowest in the South (36 percent). Asked whether in response to the 2022 invasion, the establishment modified any business

functions through new technology and processes, 18 percent of firms indicated “Marketing”, followed by 15 percent, “Business Administration” (with 2,015 firms responding) — especially among large firms (23 percent). Also, production or service planning was most likely to be adopted by large firms (17 percent vs. 11 percent in the total sample). These adjustments were most prominent in the North and West of the country (17 and 16 percent, respectively). 11 percent of manufacturing firms adopted new production technologies.

Figure 5.10: Change in Marketing and Customer Relations, by Sector



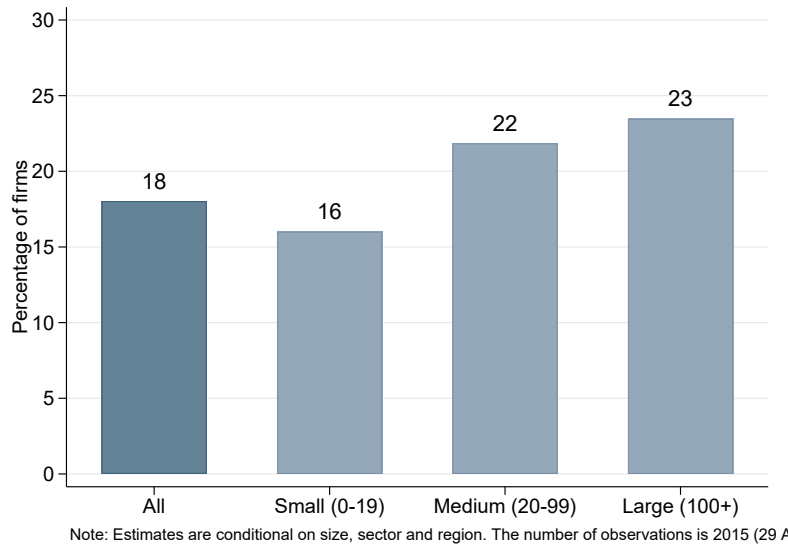
Note: Estimates are conditional on size, sector and region. The number of observations is 2015 (29 A)

Supply chain management was adopted by about 1 in 8 firms (12 percent of the firms). Supply chain management adoption was strongest in the Center of the country and least strong in the East (15 vs. 4 percent). It was adopted by commerce and manufacturing (17 and 15 percent, respectively) and mostly in the Center of the country (15 percent).

Almost 1 in 4 large firms (23 percent) changed marketing and customers relations. Figure 5.11 displays the breakdown of the strategy by firm size. This strategy was adopted by 1 in 5 firms in commerce, manufacturing, and other services, and most frequently in the West of the country (21 percent). 14 percent of firms started using online sales and

payment methods, again with large firms leading with an average of 17 percent and high shares of firms in hospitality (20 percent) and commerce (18 percent).

Figure 5.11: Change in Marketing and Customer Relations, by Size



IV. Responses to High Uncertainty of Agricultural Logistics Routes

High uncertainty about the marine transportation route (the Grain Deal was subject to renewal every 60 days and terminated in July 2023) and low farmgate prices prompted farmers to expand their grain storage capacities and/or to switch to more profitable technical crops and to invest into facilities to process grain locally². Since the invasion, 16.5 percent of pre-war elevator capacity (or 9.4 million tons out of 56.6 million tons as of end 2021) have been destroyed or damaged, and about 10 percent left in occupied territories in East and South Ukraine. However, 32 new elevators were put into opera-

²According to APK-Inform 2022. Ukrainian farmers switching to oilseeds crops - officials. September 13, 2022. <https://www.apk-inform.com/uk/news/1529222> (Accessed 11 September 2023)

tion in Central and Western Ukraine, along with an expansion of existing capacities and temporary grain storage built in 2022.³ As a result, the total elevator capacity shrunk by about 12.9 percent as of September 2023.⁴

³Based on data published by Elevatorist.com 2023a. Results of 2022: destruction and construction of elevators. January 4, 2023, <https://elevatorist.com/spetsproekt/185-pidsumki-2022-ruynuvannya-i-budivnitstvo-elevatoriv> (Accessed 12 September 2023).

⁴According to data from Elevatorist.com 2023b. Ukraine's elevators losses due to war as of June 2023. June 30, 2023, <https://elevatorist.com/blog/read/853-elevatorni-vtrati-cherez-viynu-na-cherven-2023-roku> (Accessed 12 September 2023).

CHAPTER 6

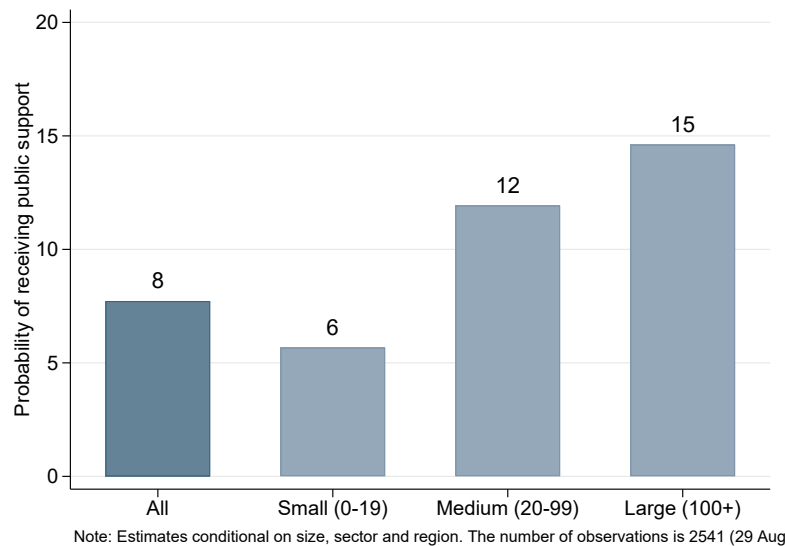
Government Support of the Private Sector

Better targeting and increased awareness of government programs are seen by firms as the two priority areas to improve the public sector's response to the war in support of the private sector.

Only 8 percent of firms reportedly received public support. Only 6 percent of small firms report receiving public support as opposed to 15 percent of large firms (Figure 6.1). Government support was provided to only 4 percent of firms in the East of the country, which is likely related to the inability to access these firms in occupied areas. Government support is uneven across sectors: lower levels of support were reported in the construction and hospitality sectors, both of which were among the most severely affected industries in terms of sales, employment, uncertainty, and asset loss and damage.¹

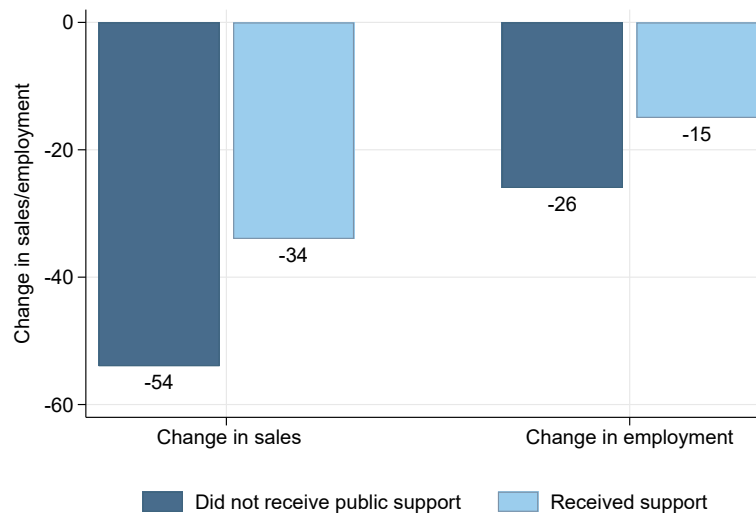
One potential reason for not receiving governmental support is a lack of need, reported by 1 in 3 of 2,305 firms interviewed. This share does not vary much by firm size or sector. This

¹Only 5 percent of firms in construction and 3 percent of firms in the hospitality sector report receiving government support. However, the number of observations to make robust conclusions is very small in the hospitality sector, covering only 2 percent of the total sample.

Figure 6.1: Public Support, by Size

statement is more likely to be made in the West of the country (43 percent) than in the East (19 percent). Access to public support is associated with a lower drop in sales and employment. The firms that experienced the lowest drops in sales have the highest probability of receiving government support. Among firms that did not receive public support, sales dropped by 54 percent and employment by 26 percent. Supported firms, however, have a 20 percentage points smaller drop in sales and an 11 percentage points smaller drop in employment (Figure 6.2). If a firm did not experience a drop in sales or even sales increased, the probability of reporting access to public funds is 12 percent, while among the firms with the highest drop it is only 3 percent. These associations need to be carefully interpreted since the direction of the relationship is not clear. Thus, whether this is related to imperfect targeting or successful impact of support will need to be further explored in future waves of the survey.

Awareness about access, eligibility and need for public support is low. While the process for applying for support is reportedly not cumbersome, one in four firms is reportedly

Figure 6.2: Public Support: Correlations with Sales and Employment

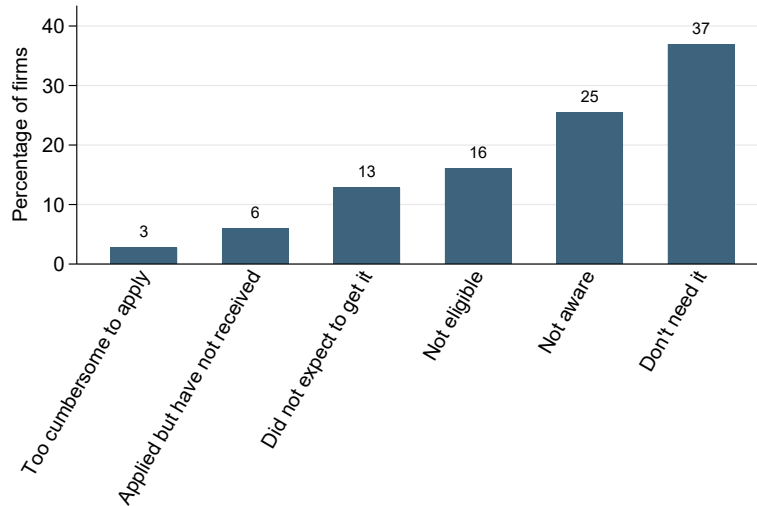
Note: Estimates conditional on size, sector and region. Data as of 25 Nov 2023

unaware of government support programs (Figure 6.3).² This share is smallest among large firms (18 percent) and among firms in the hospitality sector (15 percent). Firms must be aware of and able to access the support to reap the benefits. In particular, awareness about access to public funds should be raised among small and medium-sized firms. At the same time, many firms report that they do not need public funds (37 percent), and others were discouraged from applying in the belief that they would not be eligible (16 percent) or would not get it (13 percent). The East of the country stands out: not only is the actual governmental support in the East of the country the lowest, but also the awareness of the support opportunities is lacking (38 percent of firms are not aware of funding opportunities). This is not surprising given that the East of the country has been partially occupied since 2014 and is an active battle zone. Accordingly, it is here that businesses reported the greatest drop in sales and the greatest share of war-related damages. Awareness raising and actual support in the regions after

²The original question is: "Which of the following options best describe the reason why this establishment did not receive any national or local government measures issued in response to the crisis since the beginning of the war in February 2022?"

the end of the war will likely result in big impacts given the low baseline levels.

Figure 6.3: Reasons not to Apply for Public Funds



Note: Estimates are unconditional averages. The number of observations is 1719

1 in 8 firms do not expect to receive public support due to a lack of “right connections”. Lack of transparency and corruption are being alluded to when responding “I don’t expect to get it because I don’t have the right connections”. The share is almost double among firms in hospitality, where 24 percent are discouraged from applying for public funds for this reason. Firms in this sector are also twice as likely to report that they have applied for but not received funds (12 percent) than firms in other sectors (average across all sectors: 6 percent). The share is highest in the South (15 percent) and lowest in Center Ukraine (9 percent).

In general, firms note that support is needed in three areas: (1) financial support (capital/credit, taxes), (2) better regulations, and (3) markets access. 2,517 firms provided responses to the question “What type of Government support would be more important for your business today?” (multiple responses were permitted). Firms report the need for tax and non-tax exemptions (37 percent) and, related, solving issues with the blockage of VAT

invoices (35 percent).³ On average, 31 percent would like to receive access to new credit for investments or working capital - more so the large firms (46 percent) than the small ones (37 percent). Grants to rebuild destroyed assets are requested by large firms (17 percent) as opposed to only 9 percent of small firms. Assistance to access new markets is, on the other hand, more relevant to small and medium-sized firms than the large firms (31 and 33 percent vs. 26 percent, Table 6.1). Tax exemptions are a priority for 67 percent of firms in hospitality, while access to new credits is a priority among businesses active in commerce (42 percent). Grants to rebuild destroyed assets are top priority among firms in the East (27 percent) and less relevant in other regions (followed by 12 percent in the South).

MNCs report need of support to reduce uncertainty and provide guarantees. The main factors driving MNCs' future investments are peace, business environment, and macro-economic/ political conditions (Figure 6.4). The three main policies that MNCs report that would encourage future investments in Ukraine are war risk insurance, financial incentives, and investment guarantees.

³VAT refunds impact a business's cash flow and manufacturing operations. In 2017, a new VAT refund system was launched to increase transparency and curb corruption, and it helped to bring the VAT refund rates close to over 90% of claimed amounts in 2019-2021. With the start of full-scale invasion, various disruptions in business processes made it difficult to comply with VAT refund system requirements (doubtful claims have been automatically blocked by the system and sent for inspection), the economywide the VAT refund rate fell to 69% in 2022 (<https://opendatabot.ua/analytics/vat-refund>). The government introduced regulatory changes allowing taxpayers to extend the registration period of VAT declarations and to supplement them with supporting documentation, also the inspection period for doubtful claims was cut from 60 to 30 days. According to State Tax Service of Ukraine, VAT refund rate has reached 82% as of November 2023 (<https://tax.gov.ua/diyalnist-vidshkoduvannya-pdchv/informatsiya-pro-obsyagi-vidshkoduvannya/>).

Table 6.1: Public Support Needed, by Size

	Small	Medium	Large	All
Access to new credit for investments or working capital	37.0	36.0	45.7	37.2
Tax and non-tax exemptions, reductions, or deferrals (please specify)	36.4	44.4	46.0	39.0
Wage subsidies	8.1	10.7	11.2	8.9
Relocation support	1.8	3.3	3.2	2.2
Grant to rebuild destroyed assets	8.6	13.4	16.8	10.2
Assistance to access to new clients and markets	30.9	33.3	26.4	31.2
Simplification of regulations	22.8	25.2	28.3	23.7
Issues with blocking VAT invoices	34.4	36.7	34.9	35.0
Mobilization exemption	2.9	3.8	1.5	3.0
Observations	2517			

Figure 6.4: Main Factors Driving Investment

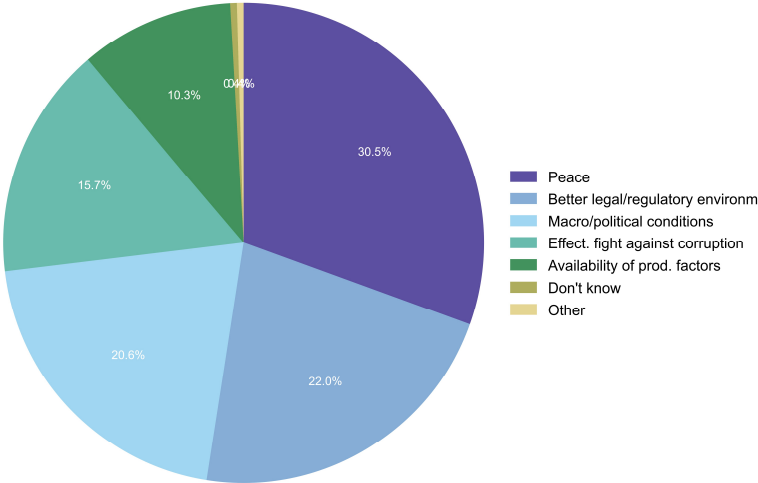
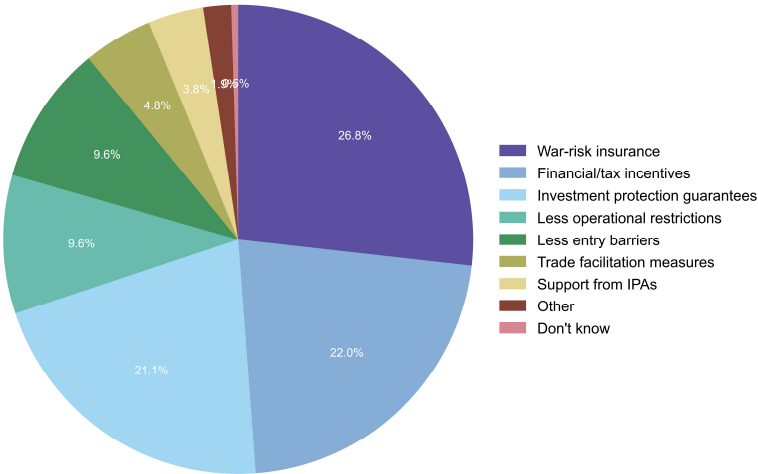


Figure 6.5: Main Policies to Encourage Investment



CHAPTER 7

A Tentative Framework for Enhancing Prioritization and Targeting of Public Assistance Programs

The findings of this report highlight cross-cutting priority areas where government assistance for firms affected by the Russian invasion can be improved. To enhance the effectiveness of public support, it should also be directed toward the most severely impacted firms, sectors, and regions. Adequate prioritization and targeting are vital due to resource constraints, varying war-related impacts on different firms, and differences in their contributions to the economy and employment. Support programs should also address not only the extent of losses but also the structural changes in the economy resulting from shifting trade patterns. The results of BPS also emphasize the need to increase awareness of existing government programs, especially among small firms and those in the Eastern regions. Ukraine also needs a targeted regional assistance strategy: around 10 percent of firms have moved to Western Ukraine, and MNCs are channeling their future investments there.

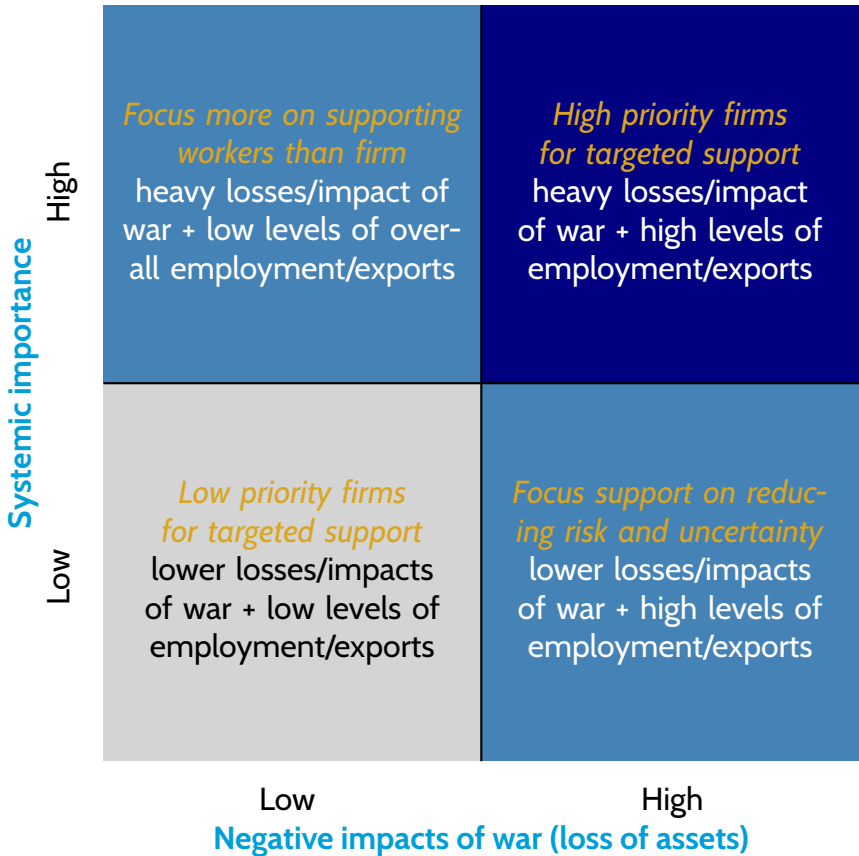
Effective government support for the private sector affected by the Russian invasion requires a comprehensive action plan that considers the various impacts of the conflict within the

country. The Government of Ukraine has already been working on the Economic Recovery Plan and Facility, and this report emphasizes the need to include two dimensions: (a) reorganizing and revamping the portfolio of firm support programs to tailor it on the various needs of enterprises by size, typology, industry, location, systemic relevance, and extent of damages improving the economic infrastructure in Western Ukraine to handle increased investment, and (b) addressing the widening disparities in the regions most affected by the invasion. According to surveyed firms, there is also a clear indication for expanding government support in four key areas across different firm sizes, sectors, and regions: (a) improving access to credit, (b) providing both tax and non-tax exemptions; (c) facilitating access to new customers and markets; (d) and simplifying regulatory processes. The evidence also suggests that to increase MNC investment in Ukraine, specific policies such as war risk insurance, financial incentives, and investment guarantees are necessary.

In addition to these key cross-cutting priorities, the World Bank proposes a framework to enhance the prioritization and targeting of government policy assistance to Ukraine's private sector (refer to Figure 7.1). This framework is structured around two axes. The horizontal axis quantifies the extent of damage or asset theft suffered by Ukrainian firms due to the invasion. The vertical axis measures the firm's relative significance in the country's exports and employment, often referred to as its "systemic importance". These two axes allow us to define a matrix with four quadrants for prioritizing and targeting public support to the private sector:

- *High Priority for Targeted Support:* The upper right quadrant focuses on large firms that have experienced substantial losses and play a fundamental role in Ukraine's overall employment and exports. Targeted assistance should concentrate on these large firms facing liquidity constraints, which may include providing new working capital credit, grants for rebuilding damaged assets, and other necessary measures. The establishment of a registry, like the one used for housing property, to verify damage could facilitate the targeting of support for the most severely affected systemic firms.

Figure 7.1: Public Support and Targeting - A Framework



Source. World Bank's staff own elaboration.

- *Non-systemically Important Firms with Significant Losses*: Firms falling into the bottom right quadrant have incurred significant losses but have limited economic significance for the country. Public assistance in these cases should prioritize support for displaced employees through retraining, reskilling, and aid for creating new enterprises to address employment declines, internal displacement, and post-war demobilization.
- *Systemically Important Firms with Minor Losses*: Firms in this upper left quadrant have suffered minor losses but hold systemic importance. Public assistance for these firms should concentrate on measures geared towards reducing uncertainty, such as through the implementation of insurance schemes.
- *Non-systemically Important Firms with Minor Losses*: This lower-left quadrant encompasses firms that have experienced minor losses and have little impact on total exports and/or employment. These firms should receive assistance through crosscutting measures with a focus on distressed workers rather than those businesses.

By employing this framework, Ukraine's government can better prioritize and target its support to the private sector.

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Appendices

Box 1. Sources of Evidence of the Impacts of the Invasion on Ukraine's Private Sector

During wartime, data on firm activity is limited and often fails to capture the full spectrum of challenges faced by businesses, thus limiting the capacity of the Government to effectively support private sector resilience and growth. The World Bank has undertaken an ambitious and comprehensive monitoring program through three innovative data sources on the private sector to find out its needs.

In collaboration with the Kyiv School of Economics, the World Bank carried out the first Business Pulse Survey (BPS) from March to July 2023. The BPS is the largest and most representative firm survey ever conducted in Ukraine since Russia's full-scale invasion, interviewing over 2,700 private small, medium, and large firms, across all sectors and regions. It provides information on the characteristics of the firm, self-reported impacts of the invasion, potential channels affecting firms' operations, expectations and uncertainty, policy interventions, adjustment mechanisms, investments, and participation in trade and global value chains.

In partnership with the largest foreign business associations, including the European Business Association of Ukraine, the World Bank also carried out the Multinational Corporations (MNCs) survey. The survey collected information from about 80 major MNCs during the spring of 2023, on their current and expected investments and divestments, and future planning trajectories.

Finally, the World Bank, in collaboration with SpaceKnow, utilized high-frequency satellite imagery data to monitor the effects of the invasion on economic activity through 49 indicators, with industry coverage up to approximately 40 percent of Ukraine's GDP. This is the first time the World Bank is monitoring economic activity in Ukraine in real time using satellite imagery-based information.

Box 2. Are Multinational Corporations Different? As part of the comprehensive assessment of the impact of the invasion on Ukraine's private sector, the World Bank conducted a survey in May 2022 with about 80 of the largest corporations (MNCs) operating in the country. This survey provides detailed insight into how the invasion affected these firms and how they responded to the challenges posed by the invasion.

According to the survey findings, most MNCs did not reduce their investments in

fixed capital. Only about 10 percent of the MNCs reported a reduction in production by selling or disposing of fixed assets. None of the surveyed MNCs sold or disposed of their subsidiaries or existing businesses. In fact, many MNCs increased their investments: in the six months leading up to the survey, nearly half of them expanded their investments in fixed assets. Among these firms, the primary reasons for investing included meeting increased demand and addressing disruptions in their value chains.

More than half of MNCs plan to boost investments in the Western region over the next six months, whereas only 3 percent have such intentions for the invasion-affected Eastern region. Among sectors, manufacturing is the most optimistic about investment (37.5 percent), followed by agriculture, fishing, and mining (18.8 percent). The primary driving factor for increased future investments is the attainment of peace, followed by improvements in the legal and regulatory environment.

Box 3. On Correlations of Supply and Demand Shocks on Firms' Operations Understanding the relative importance of demand and supply shocks to influencing the operation of firms is crucial for determining the right policy responses. While establishing causality is challenging, this report presents the results of a simple econometric analysis of the effects of these shocks on sales. The goal is to provide some guidance for designing the most appropriate public support for firms. The reported results must be interpreted as correlations because multiple unobserved factors can influence sales, our measure of firm performance.

In this analysis, we focus on reporting the shocks experienced by similar firms rather than relying solely on self-reported information from the firms themselves. This approach aims to minimize potential bias stemming from self-reporting and implicitly control for other unobserved factors related to the firm, sector, and region. Throughout the regressions, factors are added sequentially while keeping the number of firms constant, making it easier to compare results across regressions. While we differentiate between supply and demand factors in the analysis, we acknowledge that some supply factors can also affect demand and vice versa.

To assess whether demand or supply-side shocks are more strongly correlated with changes in sales, we consider both types of shocks simultaneously. Given the numer-

ous potential explanatory factors involved, we employ a principal component analysis to reduce the dimensionality of these factors separately. Subsequently, we extract the first principal components for both demand and supply, which capture the most significant variations in the data. These two principal components for supply and demand are linear combinations of the original variables mentioned earlier. This streamlined representation of the data retains most of its original information while simplifying the analysis.

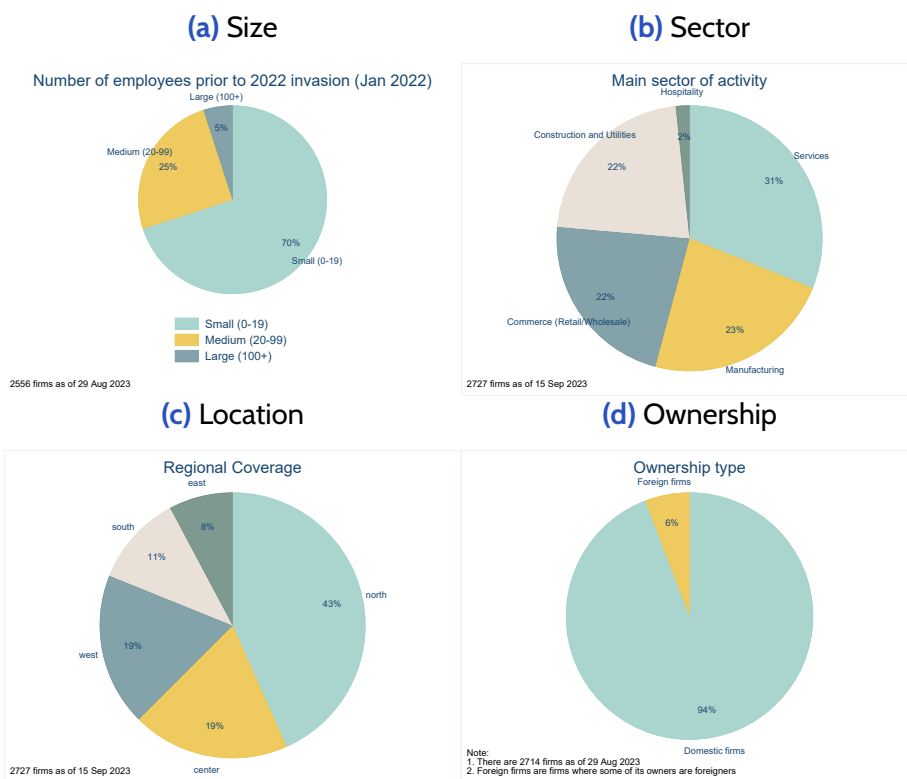
A.1 Background on the Sources of Evidence

A.1A. First Ukraine Business Pulse Survey

The first-of-its-kind Business Pulse Survey in Ukraine provides a representative sample of all private (non-agricultural) sector firms, including small, medium, and large businesses, across all sectors and regions. The Business Pulse Survey was designed such that the data is a representative sample of all firms in the private sector in Ukraine. The data includes firms of all sizes. Approximately 70 percent of the firms are small, 25 percent medium-sized, and 5 percent large. The data also covers all sectors, including the services sector (31 percent); manufacturing (23 percent); commerce (retail and wholesale) (22 percent); construction and utilities (22 percent), and hospitality (2 percent). The data also covers businesses in all the regions in Ukraine. Around 43 percent of the businesses are in the north, 19 percent in Central Ukraine, 19 percent in the West, 11 percent in the South, and 8 percent in the East (Figure A.1). Approximately 94 percent of firms are domestic firms while about 6 percent of firms are partially or fully owned by foreigners. The locations are recorded prior to Covid-19, as noted in the sampling frame (see Table A.2 in the Appendix, for more information). Firm-size, sector, and ownership type, unless otherwise specified, refers to the information reported by the firms during the interview for January 2022. The representativeness of the sample was achieved by stratifying the population of the firms by size, sector, and region, and a random sample was selected from each stratum and surveyed (see Table A.4 in the Appendix).

Approximately 80 percent of firms surveyed are either open or partially open. 1

Figure A.1: Distribution of survey in each dimension of size, sector, location and ownership type



in 8 firms (12 percent) had to relocate due to the war. But this share is almost double for larger firms (1 in 5 firms) than for small firms (1 in 10 firms), and higher for firms that were in the East and South regions (16 percent each) prior to the war than the rest of the country. All results use survey weights and indicate whenever control variables, such as sector, region, or size, were added. As of today, this is the largest and representative firm survey in Ukraine since Russia's full-scale invasion.

Sampling Frame of the BPS The sampling frame was shared by Vkursi Agro LTD. The population consists of companies with official financial statements with information from the State Register of Legal Entities (October 2022) or found in the State Register of Property Rights (available every year); other registers and lists containing data on encumbrances of movable property, transport, licenses and permits; data on export and import of company products; financial report data submitted to the State Fiscal Service, in particular Form No. 1 regarding current and non-current assets, as well as Form No. 1 regarding financial results (income and profit information) (2020, however with no data for 2021); or data from the State Statistics Service on the number of employees (2020, however with no data for 2021). A random sample was drawn from the three sectors: agriculture (excluding farmers but, e.g., including food processing), manufacturing and services.¹

Moreover, strata were created by size of companies as well as for five regions (West: Volyn, Zakarpattya, Ivano-Frankivsk, Lviv, Ternopil, Rivne, Chernivtzi; Center: Chmelnytskyi, Vinnytsya, Cherkasy, Kirovohradska (Kropyvnytskyi), Poltavska, Dnipropetrovska (Dnipro); North: Zhytomyr, Kyiv, Chernigiv, Sumy; East: Kharkiv, Luhansk, Donetsk; and South: Odesa, Kherson, Zaporizhzhya, Mykolaiv. The sampling frame did not contain firms below five employees.

All 77,279 phone numbers from the sampling frame were called. Up to 5 repeated calls were attempted with phone numbers that worked. Eventually, 2,727 (3.52 per-

¹In more detail, the sampled sectors included: Traditional manufacturing (Food Processing, beverages and tobacco); Light Manufacturing (textile, garments, leather and related, and wood products); Heavy manufacturing (petroleum, chemicals and pharma); Metallic and non-metallic manufactures (paper and paper products, rubber and plastics, other non-metallic mineral products, basic metals, metal products except machinery and equipment, furniture) .

cent) of the original sampling frame provided responses to the BPS survey. Of those whose answers were not captured, the reasons were as follows (results displayed for second batch of the survey with 52,083 phone numbers): 64.23 percent or 33,453 respondents indicated to be busy or not available and 26.12 percent (N=13,608) refused to be interviewed (see Table A.1).

Figure A.2: Data Collection (Completed Interviews) over Time

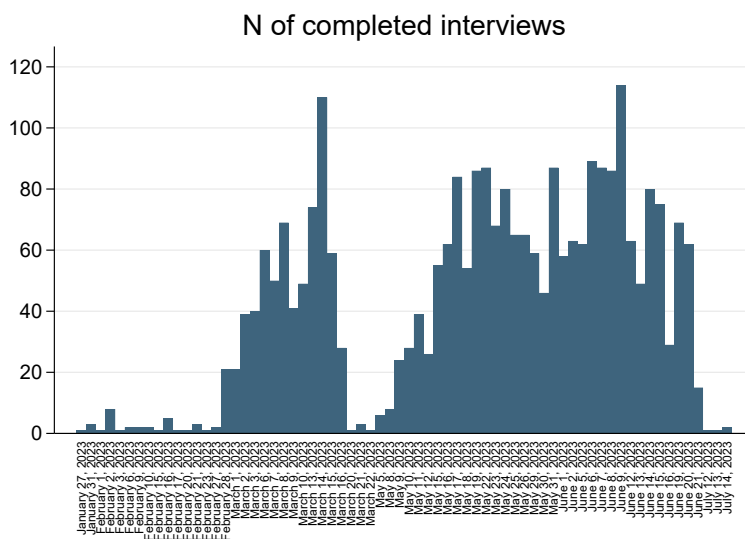


Figure A.3: Geographical Distribution of Completed Interviews

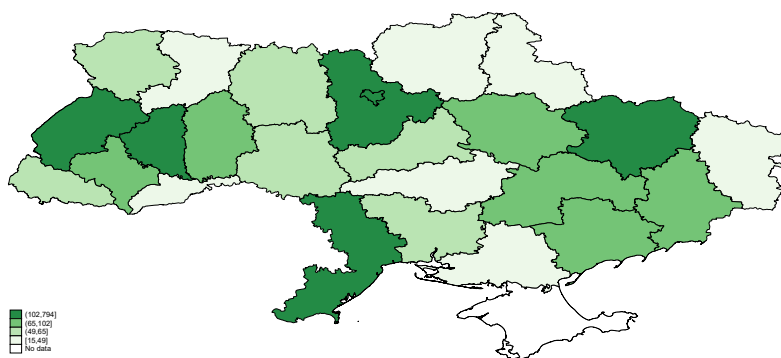


Table A.1: Reasons for not Participating in the BPS

Reason firm was not interviewed	Freq.	Percent	Cum.
Other, specify	628	1.21	1.21
Firm is not open	198	0.38	1.59
Respondent refused to participate	13608	26.13	27.72
Right person not found or available	887	1.70	29.42
Respondent was (repeatedly) busy or unavailable	33453	64.23	93.65
None of the available phone numbers works	327	0.63	94.28
At least one phone number works, but nobody picked up	12	0.02	94.30
The phone number belongs to another person	1614	3.10	97.40
The respondent does not work at this company	195	0.37	97.77
The company closed until 2021	39	0.07	97.84
The respondent asked to call at another time	1122	2.15	99.99
Total	52083	100.00	

Table A.2: Distribution of Sampling frame

Region	Size	Services	Manufacturing	Agriculture
north	micro	18193	2765	236
north	small	4541	884	73
north	medium	4531	1145	149
north	large	1011	413	110
east	micro	3305	667	65
east	small	804	278	25
east	medium	855	431	65
east	large	200	178	48
west	micro	5083	1066	151
west	small	1578	476	72
west	medium	1561	717	141
west	large	325	289	63
south	micro	4852	785	99
south	small	1175	289	51
south	medium	1288	416	93
south	large	227	155	45
central	micro	7386	1483	175
central	small	1928	557	78
central	medium	1897	857	138
central	large	340	350	117

Table A.4: Representativeness Analysis: Sampling Frame vs. Completed Interviews, by Location, Sector, Size

Dimension	Number firms	Share(%)	Target sample	No_firms complete	Share(%) complete	Diff.
agriculture	1994	2.58	70	45	1.65	-.9
manufacturing	14201	18.38	501	570	20.9	2.5
services	61080	79.04	2155	2112	77.45	-1.6
large	3871	5.01	137	89	3.26	-1.8
medium	14284	18.48	504	508	18.63	.1
small	59120	76.51	2086	2130	78.11	1.6
central	15306	19.81	540	533	19.55	-.3
east	6921	8.96	244	204	7.48	-1.5
north	34051	44.06	1202	1185	43.45	-.6
south	9475	12.26	334	310	11.37	-.9
west	11522	14.91	407	495	18.15	3.2

Table A.6: Distribution of Completed Surveys

Region	Size	Services	Manufacturing	Agriculture
north	micro	625	109	4
north	small	167	50	2
north	medium	142	48	4
north	large	23	11	0
east	micro	104	14	3
east	small	33	9	0
east	medium	24	9	3
east	large	3	2	0
west	micro	196	62	3
west	small	83	31	1
west	medium	64	32	5
west	large	8	10	0
south	micro	158	24	4
south	small	30	11	2
south	medium	43	23	4
south	large	6	5	0
central	micro	250	50	5
central	small	71	28	1
central	medium	71	34	2
central	large	11	8	2

A.1B. Satellite Data

Satellite data and AI identify industries and capture changing trends and patterns on Earth's surface. In what follows, the index creation is described in detail.

Source Geospatial analysis began in 1950. It focuses on identifying trends, patterns, and anomalies in satellite images of the Earth's surface.² The team worked with SpaceKnow, which collects satellite data and processes them using a mix of analysts and AI. The figures presented in this report were last updated on November 24, 2023.

Locations The index creation process begins with annotating locations from satellite imagery. It contains several steps: identify the main observable industries in a country; pinpoint locations where industrial activity can be remotely monitored (e.g., factories, transportation hubs, construction-related sites, mines, etc.); annotate and categorize locations based on industry types and subtypes; and save annotated locations to a proprietary database for querying and filtering in internal calculations.

Data The data utilized is derived from a Change Detection algorithm applied to SAR (synthetic aperture radar) imagery. SAR utilizes radar waves emitted from satellites that penetrate through clouds, providing regular images regardless of weather conditions. Imagery is gathered by Sentinel-1 of the ESA Copernicus program, with a revisit range of 6-12 days. A scalable cloud-based back-end infrastructure allows for the download, processing, and evaluation of massive amounts of satellite data. The Change Detection algorithm calculates the change between consecutive SAR images at each location. Observations occur approximately every 6-12 days, resulting in 2-6 observations per location per month. The algorithm measures the central tendency to construct monthly series.

Index Creation SAR change is employed as an indicator of economic activity. Physical changes observed at industrial locations act as proxies for economic value generation.

²Source: <https://spaceknow.com/technology/> (accessed September 13, 2023). Information described here relies on input from the SpaceKnow team.

Movement of vehicles, storage of input materials, and transportation of final goods are considered as indicators of economic activity.

Data Processing The data are downloaded from SpaceKnow's API (last download on 10 September 2023). They cover up to 49 industries/sub-sectors with oblast-level geographic disaggregation since 2017. The first six months of data (up to June 2017) are discarded, as advised by SpaceKnow. Indicators are normalized to indices with a base of 100 equal to the average value in 2019 (the last year since the Covid pandemic). The time series are smoothed using a 365-day moving average (MA) to estimate underlying trends and remove seasonality. Note, a right-aligned 365-day MA is used, i.e., the smoothed series is one year "shorter" than the original series, it "starts" one year later. In consequence, the graphs show somewhat "delayed" trends.

Data Presentation Time series graphs of satellite data present the estimated trend (i.e., the MA-smoothed series). The red vertical line marks the 24 February 2022. Moreover, the data are also processed as maps to show the geographic heterogeneity. Maps are built on the MA-smoothed index-transformed series, showing their average values in the following periods: 1. Year prior to Russian invasion, 2. Period since Russian invasion, 3. Change (in average) since Russian invasion.

Data Interpretation The SpaceKnow database includes two important types of indices. First, "Inventory"-type indicators (CFI-R) simply measure the ground area covered by metallic objects. Their interpretation can be problematic for storage locations, e.g., a high index value may reflect stocks of merchandise that cannot be moved, or that a location is used as storage space by the military. Such indicators are most relevant for "traffic"-type locations, such as distribution centers or passenger and retail parking. Second, "Traffic"-based indicators (CFI-S) measure the change in the area covered by metallic objects. They reflect changes in "activity" and, to some extent, are more reliable than inventory-type indicators. However, they can be harder to interpret because the index value has no direct interpretation (it reflects a change but does not give the reference point). It must be noted that some indicators may not reflect the "true"

level of industrial activity. While images always show what is actually happening on the ground, the difficulty is rather to understand what phenomenon is captured. Figure A.4 presents the number of locations observed for each industry/sub-industry (national level).

Figure A.4: Data Coverage, by Sector

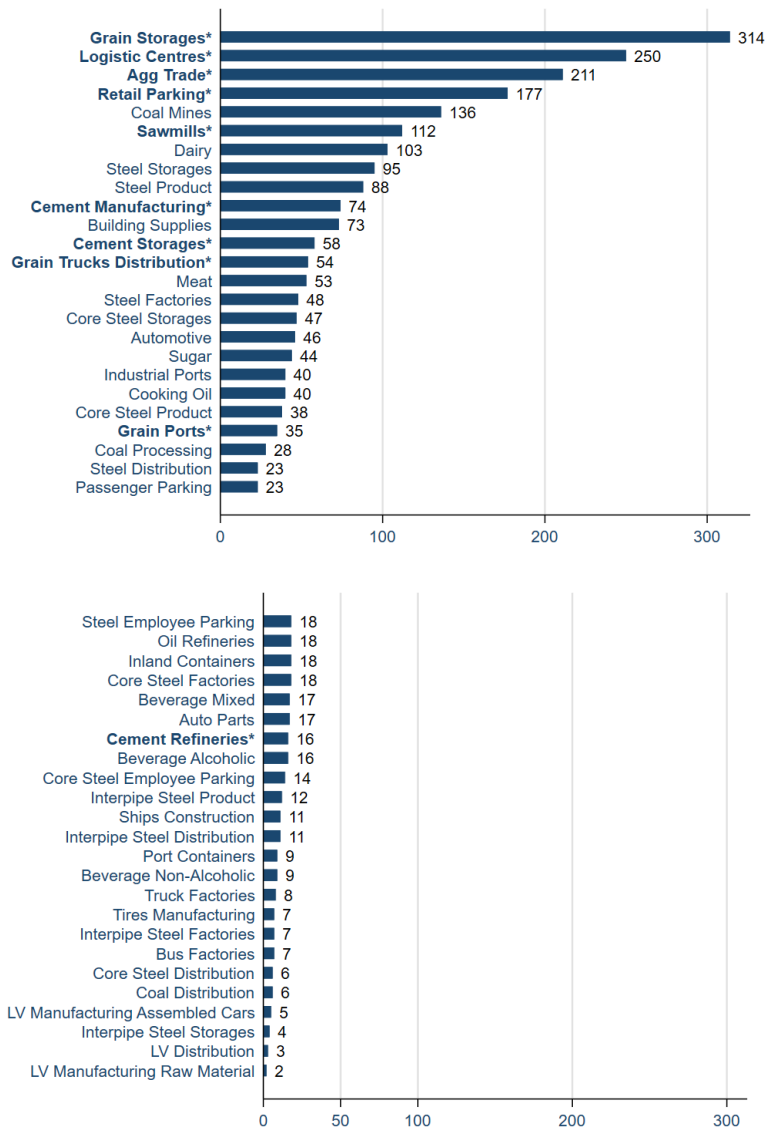
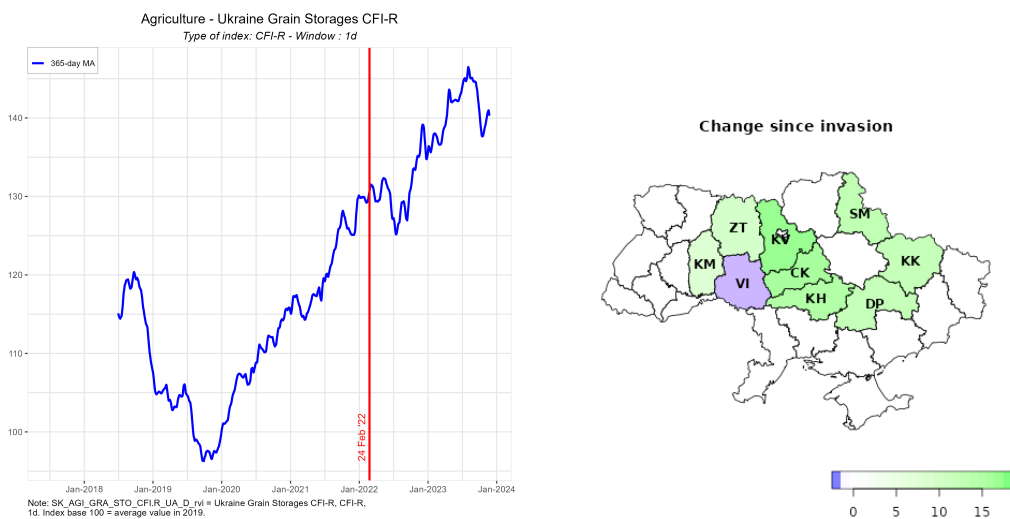


Figure A.5: Grain Storage Indicator – Satellite Data



Notes. Grain Storage. Stocks of grain have substantially increased throughout the country since the invasion.

A.1C. First Multinational Corporations Survey

The Multinational Corporation (MNC) survey provides valuable insights into the investment climate in Ukraine and the factors that drive investment decisions. The approach for this survey involved conducting a quantitative survey among senior executives of MNC Affiliates. The survey was conducted in cooperation with major business associations, particularly the European Business Association in Ukraine. The objective of the survey was to examine the reasons why MNCs choose to locate in Ukraine, investment and disinvestment flows, and their drivers, uncertainty, and expected future investment in Ukraine, as well as investment flows in benchmark countries for comparison. The data collection for the survey took place in spring 2023, and data was collected from 81 MNCs. The survey had a broad reach to capture the perspectives of a diverse range of MNCs operating in Ukraine to better understand the investment landscape in Ukraine and the opportunities and challenges that exist for MNCs operating in the country.

A.2 Further Results

Table A.8: Demand-side Factors (experienced by other firms) Associated with Changes in Sales

VARIABLES	(1) Change Sales	(2) Change Sales	(3) Change Sales	(4) Change Sales	(5) Change Sales
Crime (other firms)	-0.453* (0.246)				-0.378 (0.233)
Decline export (other firms)		0.141 (0.0881)			0.0832 (0.0594)
Sales uncertainty (other firms)			-0.236 (0.218)		0.0613 (0.211)
Sales (other firms)				0.350*** (0.0980)	0.322** (0.117)
Constant	-22.18*** (7.438)	-25.95*** (7.526)	-18.25** (9.199)	-8.972 (8.535)	-11.22 (9.715)
Size FE	no	no	no	no	no
Sector FE	yes	yes	yes	yes	yes
Region FE	yes	yes	yes	yes	yes
Observations	2,002	2,002	2,002	2,002	2,002
R-squared	0.024	0.024	0.023	0.029	0.030

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Change in sales is with respect to same period in 2021

Table A.9: Supply-Side Factors (experienced by other firms) Associated with Changes in Sales

VARIABLES	(1) Change in sales	(2) Change in sales	(3) Change in sales	(4) Change in sales	(5) Change in sales	(6) Change in sales	(7) Change in sales
Input interruption (other firms)	0.0875 (0.0913)						0.236* (0.120)
Damages (other firms)		0.0143 (0.0731)					-0.0511 (0.0621)
Arrears (other firms)			0.106 (0.154)				0.128 (0.149)
Worker's interruption (other firms)				-0.112 (0.150)			-0.136 (0.165)
Power outages (other firms)					-0.371** (0.138)		-0.452*** (0.151)
Internet outages (other firms)						-0.100 (0.189)	-0.0940 (0.177)
Constant	-38.32*** (3.170)	-36.24*** (2.110)	-40.90*** (8.194)	-33.99*** (3.102)	-31.54*** (2.814)	-35.29*** (3.179)	-38.62*** (6.770)
Size	no	no	no	no	no	no	no
Sector	yes	yes	yes	yes	yes	yes	yes
Region	yes	yes	yes	yes	yes	yes	yes
Observations	1,885	1,885	1,885	1,885	1,885	1,885	1,885
R-squared	0.028	0.028	0.029	0.028	0.030	0.028	0.032

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Change in sales is with reference to same period in 2021

Table A.10: Principal Component Analysis of Supply and Demand Factors on Changes in Sales

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Change Sales	Change Sales	Change Sales	Change Sales	Change Sales	Change Sales	Change Sales	Change Sales
Supply shocks	-1.567** (0.694)		-1.422** (0.682)	-1.340* (0.721)	-2.182*** (0.842)	-0.298 (0.907)	-0.776 (1.004)	-0.360 (0.923)
Demand shocks		-3.958*** (0.775)	-3.917*** (0.784)	-4.320*** (0.809)	-1.472 (1.283)	-3.215*** (0.928)	1.655 (1.479)	0.179 (1.118)
Constant	-40.43*** (1.033)	-40.47*** (1.023)	-40.41*** (1.022)	-39.44*** (1.337)	-37.28*** (2.675)	-37.97*** (2.708)	-36.31*** (3.393)	-35.67*** (3.133)
Observations	1,885	1,874	1,873	1,787	1,787	1,787	1,787	1,873
R-squared	0.002	0.013	0.015	0.016	0.023	0.021	0.034	0.032
Size FE	no	no	no	yes	yes	yes	yes	no
Sector FE	no	no	no	no	yes	no	yes	yes
Region FE	no	no	no	no	no	yes	yes	yes

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