KIER DISCUSSION PAPER SERIES

KYOTO INSTITUTE OF ECONOMIC RESEARCH

Discussion Paper No. 1115

"Firm Survival in Emerging European Markets: Impacts of COVID-19 Pandemic and Russo-Ukrainian War"

Evžen Kočenda and Ichiro Iwasaki

April 2025

KYOTO UNIVERSITY

KYOTO, JAPAN

Firm Survival in Emerging European Markets: Impacts of COVID-19 Pandemic and Russo-Ukrainian War

Evžen Kočenda[a] and Ichiro Iwasaki[b]

Abstract

We investigate the determinants of firm survival in 17 emerging European markets during the dual crises of the COVID-19 pandemic and the Russo-Ukrainian war. Using a large dataset of over 59,000 firms and employing a Cox proportional hazards model, the study evaluates how firm-specific characteristics, regional socio-economic conditions, and institutional quality shaped survival outcomes between 2020 and 2023. The analysis reveals that firm exit was more prevalent in EU member states, likely due to stricter crisis-related restrictions. Socio-economic variables such as population density, tourism dependence, and health expenditures played a critical role, while institutional quality, contrary to expectations, was associated with higher exit rates during crises. The banking sector played a role in influencing firm resilience through credit provision and financial support mechanisms. The Russo-Ukrainian war further amplified survival risks, especially for firms located in countries geographically or economically exposed to the conflict. The findings offer valuable insights for designing targeted policy interventions aimed at enhancing business resilience in vulnerable and institutionally diverse environments.

Keywords: firm survival; covid pandemic; Russo-Ukrainian war; Central and Eastern Europe; emerging markets; survival and exit determinants; banking sector

JEL Classification: C14, D02, D22, G33

[a] Institute of Economic Studies, Charles University, Opletalova 26, 110 00, Prague, Czech Republic; Mendel University, Brno, Czech Republic; CESifo, Munich; IOS, Regensburg; E-mail: evzen.kocenda@fsv.cuni.cz

[b] Department of Law, Economics, and Management, Okinawa University, Kokuba 555, Naha 902-8521, Okinawa, Japan; Institute of Economic Research, Hitotsubashi University, Naka 2-1, Kunitachi, Tokyo 186-8603, Japan. E-mail: i-iwasaki@okinawa-u.ac.jp

We are grateful for helpful comments from Eduard Baumöhl, Adam Geršl, Satoshi Mizobata, Meri Papavangjeli, Lorena Skufi, and Petr Teplý. The paper was written while Kočenda visited the Institute of Economic Research at Kyoto University, whose hospitality is much appreciated. Kočenda acknowledges research support from the Grant Agency of the Czech Republic (No. 25-18457S). Iwasaki acknowledges financial support from Okinawa University. The usual disclaimer applies.

1. Introduction

The COVID-19 pandemic triggered one of the most severe economic disruptions in modern history, affecting businesses of all sizes across the globe (Figueira‐de‐Lemos et al., 2024). The Russian invasion of Ukraine, immediately following the last wave of the pandemic, brought another economic hardship. Emerging European markets, characterized by economic volatility, institutional weaknesses, and structural rigidities, faced disproportionate challenges compared to more developed economies (De Vet et al., 2021; Desalegn et al., 2022). Unlike advanced economies with extensive financial safety nets, firms in these regions had limited access to liquidity and financial relief, making them particularly vulnerable to the crisis (Büntgen et al., 2021). In this context, the role of domestic banking sectors became particularly critical in bank-based financial systems, typical of emerging Europe, where the ability of firms to access timely credit and bank support mechanisms, such as loan restructuring or credit line extensions, play a critical role in firm survival, particularly for small and medium enterprises that rely heavily on bank-based financing (Beck and Demirgüç-Kunt, 2006). This study examines firm survival dynamics in these markets, analyzing how socio-economic conditions, institutional factors, and internal firm characteristics influenced businesses' ability to withstand and recover from the pandemic-induced and war-related economic shocks.

Emerging European markets encompass countries that have undergone significant economic transformations since the late 20th century. The major steps were their economic, social, and political transformation (Estrin et al., 2005), their integration into the European Union business structures (Hanousek et al., 2015), and the global financial crisis (Baumöhl et al., 2019). These nations have been integrating into the global economy, yet they often grapple with institutional weaknesses, limited access to capital, and infrastructural deficits. The advent of COVID-19 exacerbated these existing vulnerabilities, leading to severe operational challenges for firms. The Russo-Ukrainian war did not help their economies either. Our novel contribution rests in bringing new evidence on corporate survival in the distressed environment, combining the COVID-19 and war shocks.

The pandemic's impact on firm survival in these markets is multifaceted. Supply chain disruptions, demand fluctuations, and stringent public health measures have collectively strained business operations (Sarker, 2025). Small and medium-sized enterprises (SMEs), which constitute a significant portion of the business landscape in these regions, have been disproportionately affected due to their limited financial buffers and access to external financing (European Parliament, 2021). In this respect, the role of banks and public institutions has been pivotal in supporting firm survival, and crises such as the COVID-19 pandemic and the Russo-Ukrainian war have underscored the importance of liquidity and credit support provided by financial institutions. The pandemic disrupted the links

between the real economy and the financial sector, leading to unexpected shifts in credit supply and loan default patterns (Skufi and Geršl, 2023). These disruptions prompted banks to recalibrate risk management strategies to navigate extreme uncertainty and maintain firm stability.

Understanding firm survival during and after COVID-19 is critical for multiple reasons. First, the pandemic-induced recession was unique in its simultaneous supply-side and demand-side shocks, affecting firms across various sectors in ways that previous financial crises did not (Webster et al., 2022). Second, firm survival is a crucial factor of economic recovery, employment stabilization, and long-term competitiveness. If business closures become widespread, they can lead to persistent scaring effects, including long-term unemployment, reduced market competition, and lower overall productivity (Pham and Nguyen, 2022). Moreover, firm survival studies provide valuable insights into the effectiveness of government interventions. Various fiscal and monetary policies, including wage subsidies, loan guarantees, and targeted financial support, were implemented to cushion the economic impact (Audretsch et al., 2025). However, the effectiveness of these measures varied significantly based on firm characteristics, sectoral exposure, and country-specific institutional quality (Bruhn et al., 2023). As most of the supportive steps involve financial flows, the identification and impact assessment of firm failure determinants is extremely important for banks and financial institutions in general, because of their credit risk management (Geršl et al., 2015).[1] By analyzing firm survival in emerging European markets, this research contributes to understanding the interplay between government policy, institutional strength, and business resilience.

Firm survival is influenced by a complex set of factors that we broadly categorize into firm-level characteristics, socio-economic variables, and institutional quality indicators. Firm-specific factors play a crucial role in determining resilience during crises. Previous studies have emphasized the importance of legal forms of incorporation, ownership structure, board composition, financial performance, listing status, firm size, and firm age as key determinants of survival (Pandey et al., 2024).

Beyond firm-specific factors, the broader economic environment plays a significant role in firm survival. Socio-economic variables such as population density, economic growth, national income levels, service industry concentration, international tourism activity, and health expenditure shaped how firms responded to the crisis (Desalegn et al., 2022). For example, service-oriented economies with heavy reliance on tourism suffered more pronounced firm closures, while countries with stronger

[1] Jakubík and Teplý (2011) identified key credit risk determinants explaining business failure at a 1-year prediction horizon (case study on the Czech Republic). The indicators are measures of liquidity, solvency, profitability, and corporate activity. In our dataset, we use measures of solvency and profitability.

public health investments were better equipped to manage economic disruptions (Maneenop and Kotcharin, 2023).

Institutional quality significantly impacts firm resilience by influencing regulatory responses, financial aid distribution, and overall business confidence. Stronger institutions enhance the rule of law, government effectiveness, political stability, regulatory quality, voice and accountability, and control of corruption, which in turn create a more favorable environment for firm survival (Baumöhl et al., 2019). Countries with transparent and efficient financial support mechanisms saw lower firm exit rates compared to those with weaker governance frameworks (Bruhn et al., 2023). Understanding the role of institutional quality in firm survival is crucial for designing future crisis-response strategies and ensuring economic stability in emerging markets.

This study contributes to the growing literature on corporate resilience by providing a nuanced analysis of firm survival in emerging European markets during and after the COVID-19 pandemic, along with the impact of the ongoing Russo-Ukrainian war. Unlike studies that focus solely on advanced economies, this research highlights the unique challenges faced by businesses operating in less-developed institutional environments. By incorporating firm-specific, socio-economic, and institutional determinants, this study offers a comprehensive framework for understanding how firms navigate economic crises.

Furthermore, this research provides valuable policy recommendations. By identifying key determinants of firm survival, policymakers can design more targeted interventions to enhance business resilience. For instance, improving institutional quality, ensuring equitable access to financial relief, and promoting sector-specific policies can mitigate the long-term economic effects of future crises. Future crisis-response frameworks should also account for the role of banks in stabilizing firm finances. Encouraging counter-cyclical lending, strengthening banking sector governance, and expanding SME-oriented credit programs—particularly in regions with underdeveloped financial ecosystems—can enhance resilience and complement broader institutional reforms (Behr et al., 2015; OECD, 2022).

The remainder of this paper is organized as follows. Section 2 provides a literature review on firm survival determinants, highlighting previous empirical findings. Section 3 outlines the research methodology, including data sources and survival models. Section 4 presents the results, analyzing the impact of socio-economic factors and institutional quality on survival rates while controlling for firm characteristics; robustness checks are also presented. Finally, Section 5 concludes the study, summarizing key insights.

2. Relevant literature on firm survival during economic shocks

The survival of firms during economic crises has been widely examined in corporate finance, management, and institutional economics. The resource-based view (RBV) (Barney, 1991) posits that firms with superior financial, managerial, and technological resources have higher survival chances. Dynamic capabilities theory (Teece et al., 1997) extends this argument by emphasizing firms' ability to reconfigure resources in response to external shocks. From an institutional perspective, institutional theory (North, 1990) suggests that the external environment, including government policies and regulatory quality, significantly influences firm survival. This is especially relevant for emerging European markets, where institutional quality (IQ) factors—such as rule of law, political stability, and corruption control—vary across countries and shape the resilience of businesses (OECD, 2021). This is particularly true in banking-intensive economies where institutional quality governs bank soundness (Laeven and Levine, 2008) and their response mechanisms in times of crisis.

2.1 Crises: Covid-19 pandemic and Russo-Ukrainian war

In terms of serious shocks, studies analyzing past economic crises, including the 2008 financial crisis, provide further practical insights into firm survival mechanisms. Research by Cowling et al. (2015) found that firms with strong financial reserves, flexible labor structures, and export orientation were more resilient during downturns. More nuanced findings were echoed in research assessing the impact of the COVID-19 pandemic on firm survival, and in the following review, an accent is put on findings related to European emerging markets.

Economic fragility and firm closures are the phenomena where the COVID-19 pandemic has significantly impacted firm survival across European emerging markets, highlighting structural vulnerabilities and economic fragility. Many firms, particularly in Southern Europe, experienced severe financial distress, with a high likelihood of closures and substantial employment losses due to declines in sales and operational disruptions (Webster et al., 2022). This effect was particularly pronounced in the hospitality and retail sectors, where firms often lacked the financial reserves to withstand prolonged closures (Pham and Nguyen, 2022). Smaller firms were disproportionately affected compared to larger firms, leading to a potential reallocation of economic activity towards more productive entities (Bruhn et al., 2023).

Governments engaged in support of firms and government interventions played a crucial role in mitigating the economic consequences of the pandemic; however, the effectiveness of these measures varied. Studies indicate that financial support policies disproportionately benefited larger and less productive firms, potentially distorting competition and inhibiting long-term productivity growth (Bruhn et al., 2023). Additionally, many firms reported that the assistance received was insufficient to offset the risks of bankruptcy and operational disruption (Pham and Nguyen, 2022).

Consequently, targeted policy interventions, including those enhancing labor market flexibility and direct support for vulnerable sectors, were recommended to foster a more effective recovery (Webster et al., 2022).

Sector-specific vulnerabilities revealed that, in terms of support, quite a nuanced approach is needed, as certain industries exhibited greater susceptibility to the pandemic's economic effects. The transportation sector, particularly airlines, experienced severe stock price declines, with firms in emerging markets more adversely affected than those in developed economies (Maneenop and Kotcharin, 2023). In the hospitality sector, foreign-owned SMEs and business group-affiliated firms demonstrated greater resilience than independent entities, though they still faced substantial challenges (Ashraf and Sarhan, 2024). Similarly, the retail and service industries encountered considerable financial difficulties, underscoring the need for sector-specific interventions (Pham and Nguyen, 2022).

The financial implications of COVID-19 on firms represent an aggregate financial outcome, and the financial repercussions of the pandemic vary depending on firm characteristics. More productive firms fared better in competitive environments, while smaller businesses struggled to remain operational (Büntgen et al., 2021). In this respect, business group affiliation provided small businesses with access to strategic resources that were crucial during the COVID-19 crisis, enhancing their ability to navigate external shocks (Hamelin and Lefebre, 2025). Firms with foreign ownership and strong governance structures demonstrated enhanced resilience, suggesting that ownership and institutional quality played a significant role in firm survival (Pandey et al., 2024). The pandemic also triggered a reallocation of market activity towards more competitive firms, reflecting broader economic shifts (Bruhn et al., 2023).

With respect to the relevant literature, we speculate that due to the differences in their economic, social, and institutional developments, firms across various regions might be faced with different conditions and limits during the COVID pandemic. Attitudes and implementation of various Covid-related measures varied across countries, and it is quite legitimate to assume that the EU countries, guided by EU directives, often imposed stricter restrictions on domestic business activities during the COVID-19 pandemic compared to non-EU countries (Egger and Magni-Berton, 2024). For that, we formulate a general Null Hypothesis H1: There is no difference in firm survival probability across regions.

Further, the recent Russo–Ukrainian war triggered severe disruptions in energy and food markets, and this crisis so far induced about 6% losses for companies most exposed to the belligerents (Auer et al., 2025). Countries in Europe, and especially those that are in proximity to the conflict, are the most exposed. Already at the beginning of the war, roughly 80% of firms in Finland and Poland,

countries sharing a border with Russia or Ukraine were deeply concerned about the impacts of the war (Caldara et al., 2022), Further, Martins et al. (2023) observed a negative and statistically significant stock price reaction of European banks at and around the beginning of the Russo–Ukrainian war; the fact that the effect was even larger in foreign banks with a high exposure to Russia shows that harmful "Russian connection" is not limited only to a geographical concept.[2] Hence, firms located in countries directly bordering Russia and Ukraine might be subject to war-related worsening conditions most heavily. Accordingly, we formulate the additional Null Hypothesis, H2: The Russo-Ukrainian war does not affect firm survival probability.

Beyond firm-level characteristics, socio-economic and institutional quality variables influenced firm survival during the pandemic. Those types of factors are presented in more detail further on.

2.2 Socio-economic factors

In our analysis, we aim at a comprehensive assessment by employing various relevant socio-economic factors that have been linked to firm survival. Factors such as population density, economic growth, national income, and health expenditure shaped the severity of the crisis at the regional level (Desalegn et al., 2022). For example, higher population density has been associated with both positive and negative effects on firm survival. While denser regions benefit from stronger consumer demand and better infrastructure, they also experienced stricter lockdown measures during COVID-19, increasing operational challenges (Glaeser et al., 2021).

Regarding economic growth and national income, macroeconomic conditions are expected to influence firm survival. Countries with higher GDP growth and per capita income provided stronger economic buffers during the pandemic (IMF, 2021). Further, regional disparities in banking infrastructure and credit availability may also have shaped firm survival indirectly. For instance, areas with higher bank branch density or a more active SME-lending ecosystem are likely better equipped to support firms through liquidity constraints (Degryse and Ongena, 2002; Ergungor, 2010). Conversely, economies with pre-existing structural weaknesses experienced higher firm exit rates (European Commission, 2021). In this respect, Papavangjeli and Geršl (2024) highlight that during periods of high financial vulnerabilities, the effectiveness of monetary policy is weakened, limiting firms' access to credit and hindering their survival. When financial conditions improve, firms in less

[2] Additionally, Gong (2024) investigates the psychological impact of market turbulence on investors, especially in relation to global banking institutions. The study suggests that geopolitical shocks, such as the Russo-Ukrainian war, can significantly influence investor sentiment and, by extension, bank stock prices. These market reactions can cascade into broader credit and funding conditions, emphasizing the importance of both internal responses and external dynamics in sustaining firm viability and promoting their survival.

vulnerable economies benefit from increased borrowing and investment. However, in economies with high financial vulnerabilities, such improvements fail to stimulate growth, and excessive risk-taking may further restrict credit access, potentially threatening firm survival.[3]

Specific industry characteristics also carry specific obstacles. Service-oriented firms, particularly those in hospitality, travel, and retail, suffered disproportionately during the pandemic due to restrictions on mobility and consumer demand shifts (Guerrieri et al., 2020). Tourism-dependent economies faced prolonged recovery periods, leading to heightened firm exit rates (OECD, 2021). The survival of firms during economic crises is also influenced by the role of banks in mitigating the impacts of exogenous shocks. Operational reforms at the bank level and strategic interventions at the policy level are critical for ensuring firm survival. The literature on banks emphasizes that the interplay between internal bank resilience and external regulatory support creates a dynamic environment where empirical insights into bank performance and central bank policy are essential for understanding and enhancing firm survivability under turbulent conditions.

During the pandemic, governments allocated vast amounts of money towards health expenditures. Higher public health expenditure correlated with faster economic recovery and better firm survival rates. Countries with strong healthcare infrastructure mitigated the long-term economic effects of COVID-19 more effectively (World Bank, 2022). Similarly, the strength and supervision of the banking sector, closely tied to institutional quality in terms of financial development and banking sector reforms, affect credit risk management and banks' willingness to lend during downturns. Weak institutions may enable risk aversion or credit withdrawal, whereas transparent financial governance can encourage banks to act counter-cyclically, supporting firm survival (Beyer and Dautović, 2025).

Based on the relevant literature, we formulate the related Null Hypothesis, H3: Initial socio-economic conditions do not affect firm survival probability.

2.3 Institutional quality

In our analysis, we also explore the impact of institutional quality (IQ) on firm survival. In our analysis we understand the institutional quality as a system of rules and norms within economy and society that influence how well it functions and achieves its goals. It encompasses various aspects like the effectiveness of laws and regulations, the degree of corruption, and the efficiency of government

[3] In addition, the survival of firms during economic crises has been observed to exhibit asymmetric responsiveness to fluctuations in economic activity. Recent findings by Skufi and Geršl (2025), based on an analysis of the Albanian economy, indicate that defaults among non-financial corporations become increasingly sensitive to macroeconomic conditions, particularly in the tails of the distribution --i.e., during extreme economic events.

services in accordance with the seminal works of North (1991), Acemoglu et al. (2001), and Kaufmann et al. (2009).

A high level of institutional quality is crucial for economic development, social stability, and the overall well-being of a society. Under normal conditions, institutional quality significantly affects firm resilience, particularly in emerging markets where governance effectiveness varies. Institutional quality variables, including rule of law, government effectiveness, and regulatory quality, significantly impacted business resilience, with stronger institutions providing more effective crisis management and support mechanisms (Baumöhl et al., 2019). However, empirical studies on the impact of institutional quality on firm survival during crises have yielded mixed results, with some indicating a positive effect (Che et al., 2017) and others suggesting a negative or negligible impact (Abildgren et al., 2013; Al-Gamrh et al., 2018).

There are several key institutional dimensions assessed in empirical studies that provide a ground for their potential impact on firm survival. In terms of the rule of law, strong legal enforcement reduces business uncertainty and enhances contract security (La Porta et al., 1998). As for government effectiveness, efficient bureaucracies ensure timely financial aid and economic relief measures (Demmou et al., 2021). Political stability might play a role because political uncertainty discourages investment and leads to lower firm survival rates (Acemoglu and Robinson, 2019). Regulatory quality fits the list since transparent and stable regulations improve firm adaptability in crisis situations (World Bank, 2022). Voice and accountability might not exhibit a direct impact, but democratic institutions with public participation foster business confidence and resilience (Kaufmann et al., 2020). Finally, effective control of corruption seems to be a desired property because corruption distorts financial aid distribution and weakens business confidence, negatively impacting firm survival (OECD, 2021).

The empirical studies underscore that the relationship between institutional quality and firm survival during crises is complex and context-dependent, varying across different countries, industries, and types of institutions. Based on the relevant literature, we formulate the related Null Hypothesis, H4: State institutional rigidity has no effect on firm survival probability.

2.4 Firm-specific factors affecting survival

More detailed insights into factors behind firm survival during economic shocks come from empirical studies assessing firm-specific factors that we also employ in our analysis. In terms of a legal form of incorporation, the legal structure of firms affects their financial flexibility and governance mechanisms, which in turn influence survival probabilities. Research suggests that limited liability companies (LLCs) and corporations have higher survival rates than sole proprietorships due to better capital access and risk-sharing mechanisms (Klapper et al., 2006).

Ownership structure plays a crucial role in firm survival. Family-owned firms tend to exhibit higher resilience due to long-term strategic planning, conservative financial policies, and relational capital (Bennedsen et al., 2020). However, state-owned enterprises (SOEs) may have an advantage in crises due to preferential access to credit and government bailouts (Megginson and Netter, 2001).

As for the board structure, corporate governance literature suggests that board composition affects firm resilience. Firms with larger, independent, and diverse boards are more likely to navigate crises effectively due to better risk oversight and strategic guidance (Coles et al., 2008).

The obvious survival factor is firm performance. Pre-pandemic financial performance was a key determinant of firm survival during COVID-19. Firms with higher profitability, liquidity, and lower leverage demonstrated greater resilience (Demmou et al., 2021), and standard performance metrics have been linked to survival probabilities (Beck and Keil, 2022).

In terms of listing status, publicly listed firms often benefit from better capital market access and financial transparency, increasing their ability to withstand economic downturns (Demirgüç-Kunt et al., 2020). However, research indicates that privately held firms may have greater strategic flexibility, allowing them to adapt more effectively to sudden disruptions (Campbell et al., 2022).

Firm size remains one of the most critical predictors of survival. Larger firms generally have greater access to financial resources, diversified revenue streams, and economies of scale, which enhance resilience (Crespo Cuaresma et al., 2022). On other hand, smaller firms were disproportionately affected, experiencing greater challenges compared to larger firms, which could lead to a reallocation of economic activity towards more productive firms (Bruhn et al., 2023). Moreover, the survival prospects of SMEs are closely tied to the nature of their banking relationships (Carbó-Valverde et al., 2016). Firms with longer or trust-based ties to financial institutions are more likely to access emergency credit lines or negotiate more flexible repayment terms, reducing the likelihood of exit.[4] However, some studies highlight that small and medium-sized enterprises (SMEs) with digital capabilities adapted better during COVID-19 due to their agility (Brem et al., 2021).

Finally, a firm age is also one of the key factors behind its survival. Older firms tend to have established networks, brand recognition, and accumulated financial reserves, leading to higher survival rates (Coad et al., 2013). However, younger firms may exhibit greater adaptability, particularly in industries with high innovation intensity (Fahlenbrach et al., 2020).

[4] However, these relationships are also influenced by broader economic conditions, particularly monetary policy. In their exploration of how monetary policy influences bank profitability and lending behavior, Papavangjeli, Bode, and Vorpsi (2024) suggest that in low-interest-rate environments, banks experience compressed net interest margins, which can reduce their willingness to lend. When banks face diminished profitability, they may tighten credit conditions, limiting firms' access to essential financing, especially during periods of heightened credit risk. This dynamic presents a significant challenge to firm survival, particularly for those dependent on credit to sustain operations during economic downturns.

For firm-specific characteristics, we do not formulate individual hypotheses. However, when commenting on our results, we implicitly consider a null hypothesis that firm-specific characteristics do not produce an impact on firm survival.

Despite extensive research, gaps remain in understanding firm survival in emerging European markets. Few studies analyze the interaction between firm-specific, socio-economic, and institutional factors. Additionally, most research focuses on short-term survival, overlooking long-term recovery trajectories associated with major periods of distress, like a recent pandemic. Finally, emerging European markets remain underexplored compared to advanced economies in terms of institutional influences on firm resilience. This study aims to bridge these gaps by analyzing firm survival across multiple emerging European economies, incorporating firm-specific, socio-economic, and institutional quality variables. By doing this, we offer a comprehensive, cross-country analysis of firm survival determinants in post-COVID Europe.

3. Data and methodology

3.1 Data coverage

We have assembled a dataset that allows us to trace the survival status of firms from 17 emerging markets in Europe. Firm-level data were obtained from ORBIS, a company information database compiled by Bureau van Dijk, a Moody's Analytics company. As of 2025, ORBIS is the world's largest commercial database of firm-level records, containing information on over 400 million firms and organizations across various industries. It provides data on both public and private companies in European emerging markets. The key advantage of the Orbis database is that it retains data for inactive firms, which is an important property for survival analysis. Firms included in our dataset strictly satisfy two conditions: (i) they were in business by the end of 2019 (i.e., before the global Covid pandemic), and (ii) they provided all necessary economic information needed for our analysis.

For our study, we selected a total of 59,722 public and private companies operating at the end of 2019 in 17 emerging markets in Europe. From the perspective of economic and transformation development, the countries are divided into three groups. Group I consists of five Central European EU-member states (Czechia, Hungary, Poland, Slovakia, and Slovenia); Group II is formed by six Eastern European EU-member states (Bulgaria, Croatia, Estonia, Latvia, Lithuania, and Romania); Group III consists of six Eastern European countries that are not EU members (Albania, Bosnia and Herzegovina, Moldova, Montenegro, Nort Macedonia, and Serbia). Using the archive data of Orbis, we have also traced the survival status of the sampled firms in those countries each year during the period from 2020 to 2023. In Table 1, we present comprehensive information about the survival status

of firms in each country and by country groups. Further, in Figure 1, we present an aggregate graphical description of the dynamics showing the number of failed firms, their exit rates, and estimates of the hazard function during the period under research.

From the Orbis databases, we were able to obtain detailed information about all the firms. In Appendix Table A1, we present the composition of sample firms by listing status, industry sector, and number of employees. All this information is provided for individual countries as well as the three country groups. Finally, we extracted from the Orbis database also firm-level characteristics of these companies that serve as survival determinants. These characteristics include (a) legal form of incorporation, (b) ownership, (c) board structure, (d) firm performance, (e) listing status, (f) firm size, and (g) firm age. The observation period of the variables of gross margin, solvency ratio, and labor productivity is 2017–2019, while that of other variables is 2019. Detailed information covering the list of firm-level characteristics, along with their descriptive statistics, is provided in Appendix Table A2.

In addition to the firm-level data, we also gathered detailed state-level data from the World Bank database in order to assess the role of country-level characteristics. From the World Development Indicators and World Governance Indicators, we extracted six socio-economic (SE) variables (Population density, Economic growth, National income, Service industry, International tourism, Health expenditure), and six institutional quality (IQ) variables (Rule of law, Government effectiveness, Political stability, Regulatory quality, Voice and accountability, Control of Corruption). In the Appendix Table A3, we report the values of these 12 variables by state. With the aim of not omitting the role of specific SE or IQ variables and extracting their combined effects, we followed recent standard practice in the literature, and using these variables, we conducted a principal component analysis (PCA; eg. Che et al., 2017; Baumöhl et al., 2019; Iwasaki et al., 2022). With the PCA, we generated two SE comprehensive indices and one IQ comprehensive index. In Appendix Table A4, we show that the first two principal components, representing two SE comprehensive indices (scores), together explain 61.4% of the total variance in the six SE variables. The IQ comprehensive index, measured by the first principal component alone, explains 82.1% of the total variance in the six IQ variables.

3.2 Methodology

We analyze how the COVID-19 pandemic and Russo-Ukrainian war impact firm survival in emerging European markets, as well as the influence of regional socio-economic preconditions and national institutional rigidity while controlling for firm-specific characteristics; indicators are reported in Appendix Table A2. We employ a survival model that bypasses the necessity of proxies to capture company failure risk that might preclude accurate comparison. Further advantage is that, in comparison

to the standard logit models, a survival model allows for the probability of the firm failure to vary over time. Specifically, we employ the Cox proportional hazards model (Cox, 1972) because the technique does not require assumptions on the baseline hazard function (unlike parametric survival models) and the results do not suffer incorrect assumption bias (Pappas et al., 2017).[5] This feature makes it an effective tool and the most commonly used model in empirical survival literature (Manjón-Antolín and Arauzo-Carod, 2008). The Cox technique uses a time-to-failure as an observable variable.

The Cox proportional hazards model assumes that the hazard denoting the probability of an event (a firm exiting the market) $h_0(t)$ depends on time t and a set of relevant covariates x_{in}:

$$h(t \mid x_{i1},\ldots,x_{in}) = h_0(t)\exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_n x_{in}) = h_0(t)\exp(\mathbf{x}^{\mathrm{T}}\boldsymbol{\beta}), \quad h_0(t) > 0, \tag{1}$$

where β_1, β_2,…, and β_n are the parameters to be estimated. Specification (1) defines the hazard rate at time t for subject i, which depends on a vector of covariates $\boldsymbol{x}$. Considering two observations, i and i', that differ in their covariates (values of x_i), with the following linear representation:

$$\eta_i = \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_n x_{in} \tag{2}$$

and

$$\eta_i' = \beta_1 x_{i1}' + \beta_2 x_{i2}' + \ldots + \beta_n x_{in}', \tag{3}$$

then the so-called hazard ratios for these two observations are defined as (note that they are independent of time t):

$$\frac{h_i(t)}{h_{i'}(t)} = \frac{h_0(t)\exp(\eta_i)}{h_0(t)\exp(\eta_{i'})} = \frac{\exp(\eta_i)}{\exp(\eta_{i'})}. \tag{4}$$

Estimates of parameters β are obtained from the maximum likelihood estimation of the logarithmic transformation of specification (1), which is represented by the following linear model:

$$ln\, h\,(t|x_{i1},\ldots,x_{in}) = ln\, h_0\,(t) + \sum_{j=1}^{n} b_j x_{ij}. \tag{5}$$

Variables in (5) are defined in the same way as in (1).

Our estimation strategy follows examples of approaches adopted recently by Esteve-Pérez et al. (2004), Taymaz and Özler (2007), Iwasaki (2014), Iwasaki and Kočenda (2020), Iwasaki et al. (2022), Baumöhl et al. (2019, 2020), Fatema et al. (2025). In our results, we will present each parameter β in the form of a hazard ratio, due to its straightforward interpretation—a hazard ratio indicates how the probability of a firm exiting the market is multiplied when a specific covariate x (e.g., a firm survival determinant in a form of an independent variable) changes by one unit. If an estimate is over 1, we may consider a determinant (covariate x) to be a risk factor, increasing the probability of firm's exit.

[5] Parametric survival models represent an empirical alternative but they require distributional assumptions for the baseline hazard. Differences in distributional assumption thus imply potential problems of misspecification. We account for this issue in our robustness checks.

Similarly, if an estimate is below 1, such a determinant (covariate) is considered to be a preventive factor inhibiting a firm's exit from the market. Statistically significant estimates below 1 are economically more significant preventive factors if they are further from 1; the opposite applies to estimates larger than 1. The following example can serve as a useful illustration of the meaning of economic significance. A statistically significant estimate of a hazard ratio denotes percent change in survival probability by a one-unit change of a covariate in question.[6] We estimate parameters using the Breslow approximation method, which accounts for right-censoring cases, meaning that method accounts for firms that survived throughout the entire observation period.

We acknowledge that under certain conditions an endogeneity issue may arise in the survival analysis. This happens if: (i) an independent variable is a future variable, (ii) the estimation period is very short, or (iii) the dependent variable is continuous (Liu, 2012). Under these circumstances, an instrumental variable (IV) method or a two-stage residual inclusion method (2SRI) should be applied (Liu, 2012; Carlin and Solid, 2014). However, as we showed earlier in Subsection 3.1, all independent variables in our analysis can be considered as being predetermined, which minimizes the endogeneity problem arising from simultaneity between dependent and independent variables (Iwasaki, 2014). In addition, in our analysis, we employ firm-level data from a relatively long span (from 2017 to 2023). Finally, the dependent variable is a discrete (binary) variable as it is observed on a yearly basis. In this respect, none of the three conditions voiced by Liu (2012) applies to our analysis.

To assess the robustness of the estimation results derived from the Cox model, we further compare results with alternative survival models that make different assumptions regarding the probability density and that employ different analytical approaches to examine survival probabilities. Specifically, we further use (1) the Weibull survival model, (2) the log-logistic survival model, (3) the Weibull accelerated failure time (AFT) model, and (4) the complementary log-log (CLL) model (see Appendix Table A7).

We test Hypotheses H1 and H2 by regressing the survival probability of sample firms in 2020-2023 onto a set of region variables and a dummy variable for countries sharing borders with Russia or Ukraine (the latter is called as "War zone neighborhoods" variable). Results are reported in Table 2.

To test Hypothesis H3, we estimate the Cox proportional hazard model with six SE variables consisting of (1) population density, (2) economic growth, (3) national income, (4) service industry, (5) international tourism, and (6) health expenditure. We further estimate the model with the first (7)

[6] Statistical significance is assessed via the *z* statistics reported in parentheses beneath the hazard ratios. For all estimations we also report the results of the Wald test and show that all standard regression coefficients are statistically different from zero.

and second component scores (8) of these six variables that are labelled as the SE comprehensive score I and II, respectively (see Appendix Table A4). Results are reported in Table 3.

To test Hypothesis H4, we first estimate six IQ variables comprising (1) Rule of law, (2) Government effectiveness, (3) Political stability, (4) Regulatory quality, (5) Voice and accountability, (6) Control of corruption as a proxy for state institutional rigidity. As a comprehensive IQ index, the first principal component of these 6 variables is also estimated (see Appendix Table A4). Results are reported in Table 4.

In the regression estimation, we control for a series of firm attributes using the 15 variables from the joint-stock company to firm age and the NACE division-level industry fixed effects. Recall that definitions and descriptive statistics of the above-mentioned variables are presented in Appendix Table A2, while Appendix Table A5 presents a correlation matrix of firm-specific characteristics that exhibit very low correlations, thus warranting their inclusion in the analysis. Finally, Appendix Table A6 performs a univariate comparison between surviving and failed firms and confirms statistically significant differences between the two using the values listed in Appendix Table A2.

3. Results

We found that out of the 59,722 sample firms, 4,291 (7.2%) failed in management during the observation period of 2020–2023. As displayed in Figure 1, the number of failed firms remained relatively stable over the first three years, ranging from 788 in 2020 to 953 in 2022, before experiencing a sharp increase to 1,659 in 2023. This finding suggests that governments and financial institutions in emerging Europe protected domestic firms from the COVID-19 pandemic crisis by providing them with compensation grants for businesses complying with temporary closure requests, as well as other subsidies, urgent bank credits, and similar support measures. However, once the COVID-19 pandemic ended and the series of government and financial institution support measures ceased, many firms with weak management structures went bankrupt. This pattern is similar to what was observed in many developed countries, including the US, UK, and Japan.

In emerging Europe, the significant increase in firm exits from 2022 to 2023 is also highly likely to be associated with the Russian invasion of Ukraine in February 2022.

Although this trend was widely observed across emerging Europe, the impact of the COVID-19 pandemic and the Russo-Ukrainian war varied significantly between regions and countries. As shown in Table 1 and Figure 2, the firm exit rate for the period 2020–2023 tended to be higher in EU member states than in non-EU countries. Romania recorded the highest exit rate of 10.87%, followed by Latvia, Hungary, and Croatia. In contrast, the exit rate in Bosnia and Herzegovina was only 0.64%, and other non-EU countries such as Albania, Montenegro, and Moldova also recorded low firm exit

rates among the 17 emerging market economies. This only seemingly surprising finding may be closely related to the fact that Central and Eastern European EU member states, with their strong national institutional settings, imposed stricter restrictions on domestic business activities following instructions from Brussels to protect public health during the COVID-19 pandemic (Egger and Magni-Berton, 2024), compared to non-EU countries (Yan et al., 2020). Specifically, Aidukaite et al. (2021) document that, despite some differences, the CEE governments in EU members implemented measures to combat the first wave of the pandemic by providing extensive protection for jobs and enterprises corresponding to the existing welfare systems.[7] Hence, our results are in accord with their evidence.

3.1 Baseline estimation results

Our baseline estimation results of the Cox proportional hazards model are presented in Tables 2-4. Recall that a statistically significant estimate of the hazard ratio smaller (greater) than one denotes a percentage change positively (negatively) impacting survival probability by one unit change of a covariate in question.

We first present our baseline estimation overall results for the whole set of 17 countries, and then account for different country groups to provide a regional comparison. Initially, the results for all countries are presented, and model [1] in Table 2 shows the effects of firm-level control variables while controlling for country-fixed effects; in addition, model [2] introduces the effect of the war-zone variable. Both models exhibit intuitively expected and consistently similar results linked to firm-specific variables and negative impact of the war-zone proximity. More details on firm-specific factors are reported later on.

Then, the other two models include regional variables instead of country-fixed effects. In Models [3] and [4], the various dummy variables for two groups of the EU member states and two groups varying according to the beginning of the EU membership show statistically significant hazard ratios greater than 1.0. The results might be grounded in the fact that during the COVID pandemic, the EU regulations, adopted by individual EU members, were transformed into strict restrictions on domestic business activities with the aim to protect public health and placed less emphasis on protecting economic dynamics (Egger and Magni-Berton, 2024). Based on individual coefficient values, the results indicate that, if firm attributes remain constant, the risk of firm exit in countries that joined the EU was about 50% or more higher than in non-EU countries. Therefore, Hypothesis H1 is rejected.

[7] Aidukaite et al. (2021) focus on Hungary, Lithuania, Poland, and Slovakia.

Furthermore, in all Models [2] to [4], the variable for war-zone neighborhoods also exhibits significant hazard ratios greater than 1.0. This result indicates that, *ceteris paribus*, firm exits in countries sharing borders with conflicting nations (i.e., Russia and Ukraine) were significantly higher than in other countries. The consistent finding across models is also indirectly in line with recent assessments on the war impact voiced by Caldara et al. (2022), Martins et al. (2023), and Auer et al. (2025). The lower survival chances for firms in war-zone neighborhood countries also mean that we reject Hypothesis H2.

In addition, we are also able to assess the impact of firm-specific controls. These variables capture relevant firm-specific characteristics that are usually the primary goal of survival analyses. In our case, we employ firm-specific variables as controls so that the effects of regional comparison, and later on that of socio-economic and institutional quality indicators, are free from their impact. Nevertheless, the inclusion of firm-specific characteristics enables us to provide valuable inferences. First, legal incorporation exhibits a positive impact on firm survival. The effect is much stronger for cooperatives than joint-stock companies, hinting that greater flexibility and personal involvement of the cooperatives is a favorable property in times of distress. Second, ownership structure enables varying inferences. Higher ownership concentration is linked with a greater risk of firm exit, similar to that of foreign ownership, albeit at a milder level. The latter result might be linked to the fact that during the pandemic, foreign owners had to chiefly cope with their home operations and put less emphasis on their outside expositions. Statistically insignificant effects preclude assessment of state ownership. Bord structure provides ambiguous results since the effects are either weak, close to one, (board independence), and statistically insignificant (board gender diversity). Firm performance indicators show intuitively correct directions – better performance is associated with better survival chances; albeit the impact of labor productivity is only weak. The listing status shows a very strong impact as listed firms exhibit remarkable survival chances. The evidence points to better capital market access and financial transparency being potentially behind listed firms' ability to withstand economic downturns, which is in line with the findings of Demirgüç-Kunt et al. (2020). Finally, larger and older firms exhibit better survival chances, albeit the effect of the age factor is very small.

In the next step, we assess the impacts of initial socio-economic conditions reported in Table 3. Their impact is the substance of Hypothesis H3. As shown in Table 3, the estimates for the first five country-level socio-economic variables, ranging from population density to international tourism, exhibit significant hazard ratios greater than 1.0. These results suggest that in emerging Europe, higher population density (as a proxy for infection risk), faster economic growth, higher national income levels, larger service industry, and greater economic dependence on international tourism prior to the COVID-19 pandemic were risk factors for business activities during the period of 2020–2023. Despite

their sometimes seemingly counterintuitive impacts, the results are quite plausible when we acknowledge that they materialize during severe distress caused chiefly by the COVID pandemic and numerous economic and social restrictions imposed by the governments. First, higher pre-crisis growth rates led to a larger rebound during the crisis, and more firms that made the wrong predictions about future development went out of business. Further, the negative effect of income levels should be associated with the dramatic fall in the demand for entertainment, eating out, and a number of services that, under normal conditions, were simple parts of daily life. Such a fall was more substantial during a pandemic, and thus, the economic shock to firms, especially in the service sector, was stronger. In addition, potential restrictions on credit access imposed by banks during the distress might negatively affect firms and their survival.[8] Finally, negative impacts associated with population density, the service industry, and international tourism exhibit intuitively expected directions. At the end, for five socio-economic indicators, we reject Hypothesis H3 on the grounds of their harmful impact with respect to firm survival.

In contrast, the significant hazard ratio of 0.812 for the variable representing health expenditure indicates that implementing health steps aimed at mitigating the human toll of the COVID-19 pandemic positively affected the labor force and helped to reduce the negative impact on company activities. However, increased health expenditures might improve survival status among some companies, while strict restrictions on business activities surely harmed survival chances of many other firms, as we showed earlier in Table 2. Still, in this case, Hypothesis H3 is rejected as the health expenditures variable can be linked with the improvement of firm survival chances.

The findings for all socio-economic indicators are further backed up by the SE comprehensive indices with significant hazard ratios greater than 1.0, indicating that the overall negative impact of socio-economic proxies on firm survival prevails.[9] Finally, the war-zone neighborhoods variable shows statistically and economically significant hazard ratios greater than 1.0. The result means that after controlling for a number of socio-economic preconditions, the negative impact of the Russo-Ukrainian war on business activities in neighboring countries was quite resilient.

Finally, in Table 4, we present the impact of all country-level institutional quality variables, including the IQ comprehensive index. All reported estimated effects are statistically significant, with hazard ratios being greater than 1.0. This is quite a strong result as it indicates that in emerging European countries with strong institutional frameworks, more firms were forced to exit the market.

[8] Similar empirical results were obtained for Japanese firms.

[9] The PCA-based socio-economic comprehensive indices (scores) are not directly interpretable as they represent synthetic measures that capture variance across several different socio-economic indicators. As such, they capture a combined impact of those indicators.

The finding that stronger institutional quality correlates with higher exit rates seems to be counterintuitive at first sight. Still, empirical studies reporting a negative or negligible impact of institutional quality on firm survival during crises (Abildgren et al., 2013; Al-Gamrh et al., 2018) can be linked to our findings. However, in our case, the result is most likely driven by stricter regulations and restrictions imposed on corporate activities with the aim of prioritizing saving lives (Egger and Magni-Berton, 2024), compared to more relaxed regulations in countries with weaker institutions (Yan et al., 2020). Hence, we are able to reject Hypothesis H4. Similarly, as in Table 3, the effect of the variable for the war-zone neighborhoods reported in Table 4 repeatedly shows significant hazard ratios greater than 1.0. The finding indicates that even after controlling for various state-level institutional quality factors, the negative impact of the Russo-Ukrainian war on business activities in neighboring countries remained very strong in 2022 and 2023, proving its statistical robustness.

3.2 Robustness Checks

In order to verify the validity of our results, we performed various robustness checks on the baseline results reported above.

First, we assess the robustness of the estimation results derived from the Cox model by comparing our results with those of the alternative survival models that make different assumptions regarding the probability density and that employ different analytical approaches to examine survival probabilities. Specifically, we further use (1) the Weibull survival model, (2) the log-logistic survival model, (3) the Weibull accelerated failure time (AFT) model, and (4) the complementary log-log (CLL) model. The evidence presented in Appendix Table A7 shows that the four alternative survival models produce similar results to those from the Cox model. These findings indicate that the baseline results reported in Tables 2 to 4 are not strongly influenced by the proportional hazards assumption of the Cox model.

Second, we re-estimated the model to control for differences in firm size and age based on the median values. In Appendix Table A8, we report results for four groups of firms: larger, smaller, older, and younger firms; the criterion for dividing the sample into pairs of groups is whether the respective values are above or below the median for the respective variables. As shown in Appendix Table A8, the main empirical findings are consistent with our baseline results regardless of differences in firm size and firm age.

Third, in Appendix Table A9, we report results for groups of firms differentiated according to the industry in which they operate. The evidence in Appendix Table A9 suggests that our predictions regarding the impact of country-level preconditions and the war do not apply to the agricultural sector and banks (financial sector) due to statistically insignificant results. However, for other industries,

Hypotheses H2 to H4 were strongly rejected, and our findings were not affected by the differences in firms operating in the remaining industries. The findings are quite interesting, as the stability of the agriculture sector during distress is quite comforting from a simple human existence perspective. Further, the relative resilience of banks is a good sign since the state of the banking sector indirectly impacts firm performance and firm survival via credit availability and its conditions to finance private sector development. In this respect, our findings correlate with arguments voiced by Beck and Demirgüç-Kunt (2006), Skufi and Geršl (2023), and Beyer and Dautović (2025). Further, the detailed results show that bank profitability (gross margin) acts as a preventive factor against failure, and so does the bank's ability to meet its long-term debt obligations (solvency ratio), which is in line with key credit risk determinants explaining business failure identified by Jakubík and Teplý (2011); similar findings apply to other sectors in agreement with the literature.[10]

Lastly, we conducted additional estimations where we differentiated among the three country groups. As shown in Appendix Table A10, socio-economic conditions and national institutional settings prior to 2020 do not sufficiently explain the differences in firm survival probability within Central European EU member states during the observation period. In fact, all country-level variables and the war zone neighborhood variable are statistically insignificant in Models [1] and [2]. In contrast, estimates derived from Models [3] to [6] confirm that our predictions regarding the effects of country-level preconditions and the war on firm survival hold true, even when the empirical analysis is restricted to a specific region in emerging Europe.

4. Conclusions

Private corporate sectors in CEE countries developed as part of the economic transformation during the 1990's and had to cope with a number of hurdles along the way – the major ones included transformation itself (Estrin et al., 2005), integration of many countries into the European Union business structures (Hanousek et al., 2015), and the global financial crisis (Baumöhl et al., 2019). The Covid pandemic and the Russian invasion of Ukraine represent the most recent struggles the CEE countries had and have to cope with. In our analysis, we contribute to the knowledge of the firm survival determinants in emerging European markets and provide valuable information for industry and policymakers. We analyze firm survival on a large dataset covering 17 CEE markets during the

[10] Due to the importance of the banking sector for firm survival, banks in the CEE countries should incorporate new variables into their bank risk models to improve their resilience during crises and shocks. Specifically, for improved bank risk management, the CEE banks should incorporate geopolitical location indicators into risk models for clients and counterparties, as well as country-level institutional quality indicators that could work as risk moderators or amplifiers. Given the potential relevance for bank risk models (risk management and credit assessment), even new variables could be considered by financial institutions (war-zone proximity, COVID policy stringency index, PCA-based indices of socio-economic fragility, etc).

period of both recent exogenous impacts. We estimate the Cox proportional hazards model and analyze firms across country groups, accounting for both state-level and firm-specific characteristics.

In our empirical analysis, (null) Hypotheses H1 to H4 about no effect of various factors or events were strongly rejected by the baseline estimations of the Cox proportional hazards model. These results remain fairly robust regardless of differences in estimation methods, firm size/age, industrial sector, and region as they do not exhibit material differences from those obtained from baseline model estimates.

We show that in emerging Europe, firm exit was more prevalent in EU member states than in non-EU countries during the COVID-19 pandemic. This is likely due to the stricter restrictions imposed on business activities in countries with rigid institutional frameworks compared to those with weaker institutions, in an effort to protect citizens' lives from coronavirus infections.

Further, socio-economic preconditions also play a crucial role in determining firm survival in emerging Europe. In particular, the significant hazard ratios greater than 1.0 for the variables of population density, the service industry, and international tourism, and the significant hazard ratio less than 1.0 for the health expenditures effectively capture the unique characteristics of the pandemic crisis.

Finally, the Russo-Ukrainian war has produced a significant impact on firm survival in emerging Europe as well. Most empirical results indicate that firm exit rates in countries sharing borders with Russia or Ukraine were 40–50% higher than in other countries. War is likely to have serious repercussions not only for the countries directly involved but also for the rest of emerging Europe.

With respect to the summary of our findings, we argue that more targeted support for SMEs in war-adjacent regions would help to positively impact firm survival. Moreover, due to the importance of the banking sector for firm survival, banks in the CEE countries should incorporate new variables into their bank risk models to improve their resilience during crises and shocks. Specifically, for improved bank risk management, the CEE banks should incorporate geopolitical location indicators into risk models for clients and counterparties, as well as country-level institutional quality indicators that could work as risk moderators or amplifiers. Given the potential relevance for bank risk models (risk management and credit assessment), even new variables could be considered by financial institutions (war-zone proximity, COVID policy stringency index, PCA-based indices of socio-economic fragility, etc).

This study comprehensively examines firm survival in emerging European markets during two overlapping systemic shocks: the COVID-19 pandemic and the Russo-Ukrainian war. Drawing on a

robust dataset of nearly 60,000 firms across 17 countries, we analyze how socio-economic pre-conditions, institutional quality, and firm-specific attributes influence firm exit probabilities between 2020 and 2023.

Our empirical analysis, based on the Cox proportional hazards model, strongly rejects all four null hypotheses, revealing that both internal and external determinants significantly shape firm survival. EU member states experienced higher firm exit rates, likely due to stricter pandemic-related restrictions enforced under stronger institutional regimes. In contrast, non-EU countries with more flexible policy environments often reported lower exit rates.

Socio-economic preconditions—particularly population density, tourism dependency, and health expenditures—emerged as key factors shaping firm resilience. Health spending, in particular, showed a protective effect, while other indicators often amplified vulnerabilities. The role of institutional quality was more complex. While strong institutions are typically associated with economic resilience, their more stringent regulatory responses may have inadvertently increased firm exit risks during the pandemic crisis period. This nuanced result underscores the importance of balancing public health protection with economic sustainability during large-scale disruptions.

Crucially, the Russo-Ukrainian war introduced additional and persistent external stress, particularly for firms in neighboring countries. Our analysis shows that proximity to the conflict significantly elevated firm exit rates, highlighting geopolitical exposure as a non-negligible survival determinant.

Finally, while this study focuses on firms, we emphasize the central role of the banking sector in providing the liquidity and credit necessary for firm survival, especially in bank-centric financial systems prevalent in the region. Credit access, loan restructuring, and counter-cyclical lending were vital in mitigating firm failures during the crisis.

Our findings suggest that resilience strategies should be multidimensional from a policy perspective. Tailored support for SMEs in war-adjacent and tourism-dependent regions, investments in health infrastructure, and flexible, crisis-responsive institutional frameworks are essential. Moreover, banks should enhance their risk management models by incorporating geopolitical and institutional variables, such as war-zone proximity and socio-economic fragility indices, to support firms in future crises better. These issues are left as avenues for further research.

References

Abildgren, K., Buchholst, B., Staghøj, J. (2013). Bank-firm relationships and the survival of non-financial firms during the financial crisis 2008-2009. *ECB Working Paper* No. 1516.

Acemoglu, D., and Robinson, J. A. (2019). *The narrow corridor: States, societies, and the fate of liberty*. Penguin Books.

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, 91(5), 1369–1401. https://doi.org/10.1257/aer.91.5.1369

Aidukaite, J., Saxonberg, S., Szelewa, D., and Szikra, D. (2021). Social policy in the face of a global pandemic: Policy responses to the COVID-19 crisis in Central and Eastern Europe. *Social Policy and Administration*, 55(2), 358-373.

Al-Gamrh, B., Ku Ismail, K. N. I., Al-Dhamari, R. (2018). The role of corporate governance strength in crisis and non-crisis times. *Applied Economics*, 50(58), 6263-6284.

Ashraf, S., and Sarhan, A. A. (2024). Foreign ownership and business group affiliation strategies of European hospitality SMEs during difficult times: A double-edged sword. *Current Issues in Tourism, 27*(3), 356-375.

Audretsch, D. B., Aronica, M., Belitski, M., Caddemi, D., and Piacentino, D. (2025). The impact of government financial aid and digital tools on firm survival during the COVID-19 pandemic. Forthcoming in *Small Business Economics*. https://doi.org/10.1007/s11187-025-01014-5

Auer, C., Bosello, F., Bressan, G., Delpiazzo, E., Monasterolo, I., Otto, C., Parrado, R, and Reyer, C. P. (2025). Cascading socio-economic and financial impacts of the Russia-Ukraine war differ across sectors and regions. *Communications Earth and Environment*, 6(1), 194.

Bai, C., Quayson, M., and Sarkis, J. (2022). COVID-19 pandemic digitization lessons for sustainable development of micro, small, and medium-sized enterprises. *Sustainable Production and Consumption, 29*, 198–211. https://doi.org/10.1016/j.spc.2021.09.022

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Bartik, A. W., Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., and Stanton, C. (2020). The impact of COVID-19 on small business outcomes and expectations. *PNAS, 117*(30), 17656–17666. https://doi.org/10.1073/pnas.2006991117

Baumöhl, E., Iwasaki, I., Kočenda, E. (2020). Firm survival in new EU member states. *Economic Systems*, 44(1), 100743.

Baumöhl, E., Iwasaki, I., Kočenda, E., 2019. Institutions and Determinants of Firm Survival in European Emerging Markets. *Journal of Corporate Finance*, 58, 431-453.

Beck, T., and Demirgüç-Kunt, A. (2006). Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint. Journal of Banking and Finance, 30(11), 2931-2943.

Beck, T., and Keil, J. (2022). Financial structure and the impact of COVID-19 on SME financing. *Journal of Banking and Finance, 134*, 106338.

Behr, P., Foos, D. and Norden, L., 2015. Cyclicality of SME lending and government involvement in banks. Deutsche Bundesbank Discussion Paper No. 39/2015. Available at: https://www.bundesbank.de/resource/blob/703606/4a03ff0b1d4f124a7ef27c4786db7fdf/mL/2015-12-10-dkp-39-data.pdf

Bělín, M., Veselkova, M. (2024). The job retention scheme in Slovakia: Impact on dismissals and firm survival in the COVID-19 pandemic. *Eastern European Economics*, 62(3), 361-383.

Beyer, A. and Dautović, E., 2025. Bank transparency and market efficiency. ECB Working Paper Series No. 3031. Frankfurt am Main: European Central Bank. Available at: https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp3031~ae6136032e.en.pdf

Bonin, J.P., Hasan, I., Wachtel, P. (2005). Privatization matters: Bank efficiency in transition countries. Journal of Banking and Finance, 29, 215-78.

Bonin, J.P., Hasan, I., Wachtel, P. (2015). Banking in transition countries. In: The Oxford Handbook of Banking, Second edition, Oxford University Press: Oxford, 963-983.

Brem, A., Viardot, E., and Nylund, P. A. (2021). Implications of the COVID-19 pandemic on the business model innovation of startups. *Journal of Business Research, 134*, 241–256.

Bruhn, M., Demirguc-Kunt, A., and Singer, D. (2023). Competition and firm recovery post-COVID-19. *Small Business Economics, 61*(2), 145-167.

Büntgen, U., Cejka, T., and Thomas, P. W. (2021). Rethinking a sustainable truffle sector under global crises. *Erdkunde, 75*(4), 301-320.

Caldara, D., Conlisk, S., Iacoviello, M., and Penn, M. (2022). The Effect of the War in Ukraine on Global Activity and Inflation. FEDS Notes No. 2022-05-27-2. https://doi.org/10.17016/2380-7172.3141.

Carbó-Valverde, S., Rodríguez-Fernández, F., and Udell, G. F. 2016. Trade Credit, the Financial Crisis, and SME Access to Finance. Journal of Money, Credit and Banking, 48(1), 113–143.

Che, Y., Lu, Y., and Tao, Z. (2017). Institutional quality and new firm survival. *Economics of Transition*, 25(3), 495-525.

Chhatwani, M., Mishra, S. K., Varma, A., and Rai, H. (2022). Psychological resilience and business survival chances: A study of small firms in the USA during COVID-19. Journal of Business Research, 142, 277-286.

Cowling, M., Liu, W., and Ledger, A. (2015). Small business financing under the UK Labour government (1997–2010). *International Small Business Journal, 33*(1), 35–58.

Cox, D. R. (1972). Regression models and life-tables. Journal of the Royal Statistical Society. Series B. 34(2), 187-220.

Crespo Cuaresma, J., Hlouskova, J., and Obersteiner, M. (2022). The COVID-19 pandemic and firm survival: Evidence from a global dataset. *Economics Letters, 209*, 110130.

De Vet, J. M., Nigohosyan, D., Ferrer, J. N., Gross, A. K., Kuehl, S., Flickenschild, M. (2021). Impacts of the COVID-19 pandemic on EU industries (pp. 1-86). Strasbourg, France: European Parliament.

Demirgüç-Kunt, A., Peria, M. S. M., and Tressel, T. (2020). The global financial crisis and the capital structure of firms: Was the impact more severe among SMEs and non-listed firms?. *Journal of Corporate Finance*, 60, 101514.

Demmou, L., Calligaris, S., Franco, G., Dlugosch, D., McGowan, M. A., and Sakha, S. (2021). Insolvency and debt overhang following the COVID-19 outbreak: Assessment of risks and policy responses. *OECD Economics Department Working Papers, No. 1651*.

Desalegn, G., Tangl, A., and Fekete-Farkas, M. (2022). From short-term risk to long-term strategic challenges: Reviewing the consequences of geopolitics and COVID-19 on economic performance. *Sustainability, 14*(8), 4456.

Egger, C., Magni-Berton, R. (2024). A Comparative Journey into COVID-19 Policies in Europe. In: Egger, C., Magni-Berton, R., de Saint-Phalle, E. (eds) *Covid-19 Containment Policies in Europe. International Series on Public Policy*, pp. 1-20. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-52096-9_1

Ergungor, O.E., 2010. Bank branch presence and access to credit in low- to moderate-income neighborhoods. Journal of Money, Credit and Banking, 42(7), 1321–1349.

Esteve-Pérez, S., Sanchis Llopis, A., Sanchis Llopis, J. A., (2004). The determinants of survival of Spanish manufacturing firms. Review of Industrial Organization, 25, 251-273.

European Commission. (2021). The impact of COVID-19 on European businesses: Evidence from surveys. Retrieved from https://ec.europa.eu/

European Investment Bank. (2021). Firms' access to finance in the EU: The impact of COVID-19. Luxembourg: EIB Publications.

Fatema, F., Bhuiyan, M. R. U., Islam, M. M., and Rahman, M. R. (2025). Innovation and business survival during Covid-19 pandemic: firm-level evidence from Europe. *Innovation: The European Journal of Social Science Research*, 1-28.

Figueira-de-Lemos, F., Silva, S. C., Pinto, R. P., and Kury, B. (2024). Impacts and Trends on Global Supply Chain After COVID-19 Outbreak. *Thunderbird International Business Review*, 66(6), 531-547.

Geršl, A., Jakubík, P., Kowalczyk, D., Ongena, S., Peydró, J. L. (2015). Monetary conditions and banks' behaviour in the Czech Republic. *Open Economies Review*, 26, 407-445.

Gong, H. (2024). How market turmoil affects investors' investment psychology. *Communications in Humanities Research*, 39(1), 129-135.

Gopalan, S., and Reddy, K. (2025). Global Value Chain Disruptions and Firm Survival During COVID-19: An Empirical Investigation. Emerging Markets Finance and Trade, 1-14.

Guerrieri, V., Lorenzoni, G., Straub, L., and Werning, I. (2020). Macroeconomic implications of COVID-19: Can negative supply shocks cause demand shortages? *NBER Working Paper No. 26918*.

Hamelin, A., and Lefebvre, V. (2025). The Virus and the Citadel: exploring the performance impact of business group affiliation for small businesses throughout the COVID-19 pandemic. *Small Business Economics*, 1-32.

Hanousek, J., Kocenda, E., Shamshur, A. 2015. Corporate efficiency in Europe. *Journal of Corporate Finance*, 32, 24-40.

Iwasaki, I. (2014). Global financial crisis, corporate governance, and firm survival: The Russian experience. Journal of Comparative Economics, 42(1), 178-211.

Iwasaki, I., Kočenda, E., 2020. Survival of Service Firms in European Emerging Economies. Applied Economics Letters, 27(4), 340-348.

Iwasaki, I., Kocenda, E., Shida, Y., 2022. Institutions, Financial Development, and Small Business Survival: Evidence from European Emerging Economies. *Small Business Economics*, 58(3), 1261–1283.

Jakubík, P., Teplý, P. (2011). The JT index as an indicator of financial stability of corporate sector. *Prague Economic Papers*, 20(2), 157–176.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance matters VIII: Aggregate and individual governance indicators, 1996–2008 (Policy Research Working Paper No. 4978). World Bank. https://doi.org/10.1596/1813-9450-4978

Kaufmann, D., Kraay, A., and Mastruzzi, M. (2020). The Worldwide Governance Indicators. *World Bank Report*.

Laeven, L. and Levine, R., 2008. Bank governance, regulation, and risk taking. NBER Working Paper No. 14113. Cambridge, MA: National Bureau of Economic Research.

Liu, X. (2012). Survival Analysis: Models and Applications. John Wiley and Sons: Chichester.

Maneenop, S., and Kotcharin, S. (2023). Comparative evidence on the impact of the COVID-19 outbreak and vaccine discovery on the global transportation industry. *Transportation Research Interdisciplinary Perspectives, 14*(2), 100678.

Manjón-Antolín, M. C., Arauzo-Carod, J. M. (2008). Firm survival: Methods and evidence. Empirica, 35(1), 1-24.

Martins, A. M., Correia, P., Gouveia, R. (2023). Russia-Ukraine conflict: The effect on European banks' stock market returns. *Journal of Multinational Financial Management*, 67, 100786.

North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.

North, D. C. (1991). Institutions. *Journal of Economic Perspectives*, 5(1), 97–112. https://doi.org/10.1257/jep.5.1.97

OECD. (2021). The role of government policies in supporting firm resilience during COVID-19. Retrieved from https://www.oecd.org/

Özşuca, E. A. (2023). Firm survival in times of crisis: Do innovation and financing constraints matter? Insights from the COVID-19 pandemic. *Eastern European Economics*, 61(5), 421-456.

Pandey, D. K., Al-ahdal, W. M., and Nor, S. M. (2024). Impact of firm characteristics and country-level governance on global energy stocks during crises. *Research in International Business and Finance, 60*, 101765.

Papavangjeli, M. Geršl, A., 2024. Monetary Policy, Macro-financial Vulnerabilities, and Macroeconomic Outcomes. IES Working Paper 20/2024.

Papavangjeli, M., Bode, A., Vorpsi, B. 2024. Monetary Policy and Bank Profitability: Unveiling Non-Linearities in an Era of Low Interest Rates and Flattening Yield Curves. Bank of Albania Working Paper 08(95)2024.

Pappas, V., Ongena, S., Izzeldin, M., Fuertes, A. M. (2017). A survival analysis of Islamic and conventional banks. Journal of Financial Services Research, 51(2), 221-256.

Pham, T. B. D., and Nguyen, H. P. (2022). What exacerbates the probability of business closure in the private sector during the COVID-19 pandemic? Evidence from World Bank Enterprise Survey Data. *Journal of Asian Finance, Economics and Business, 9*(3), 27-38.

Sarker, B. Factors affecting firm-level job cuts during the COVID-19 pandemic: A cross-country evidence. Forthcoming in *International Journal of Finance and Economics*. https://doi.org/10.1002/ijfe.2995

Skufi, L. and Geršl, A. (2023) Using Macrofinancial Models to Simulate Macroeconomic Developments During the COVID-19 Pandemic: The Case of Albania. *Eastern European Economics* 61(5), 517-553.

Skufi, L., Geršl, A., 2025. Does FX Hedge Mitigate the Impact of Exchange Rate Changes on Credit Risk? Evidence from a Small Open Economy," IES Working Paper 04/2025.

Taymaz, E., Özler, S. (2007). Foreign ownership, competition, and survival dynamics. Review of Industrial Organization, 31, 23–42.

Teece, D. J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.

Webster, A., Khorana, S., and Pastore, F. (2022). The labour market impact of COVID-19: Early evidence for a sample of enterprises from Southern Europe. *International Journal of Manpower, 43*(5), 823-841.

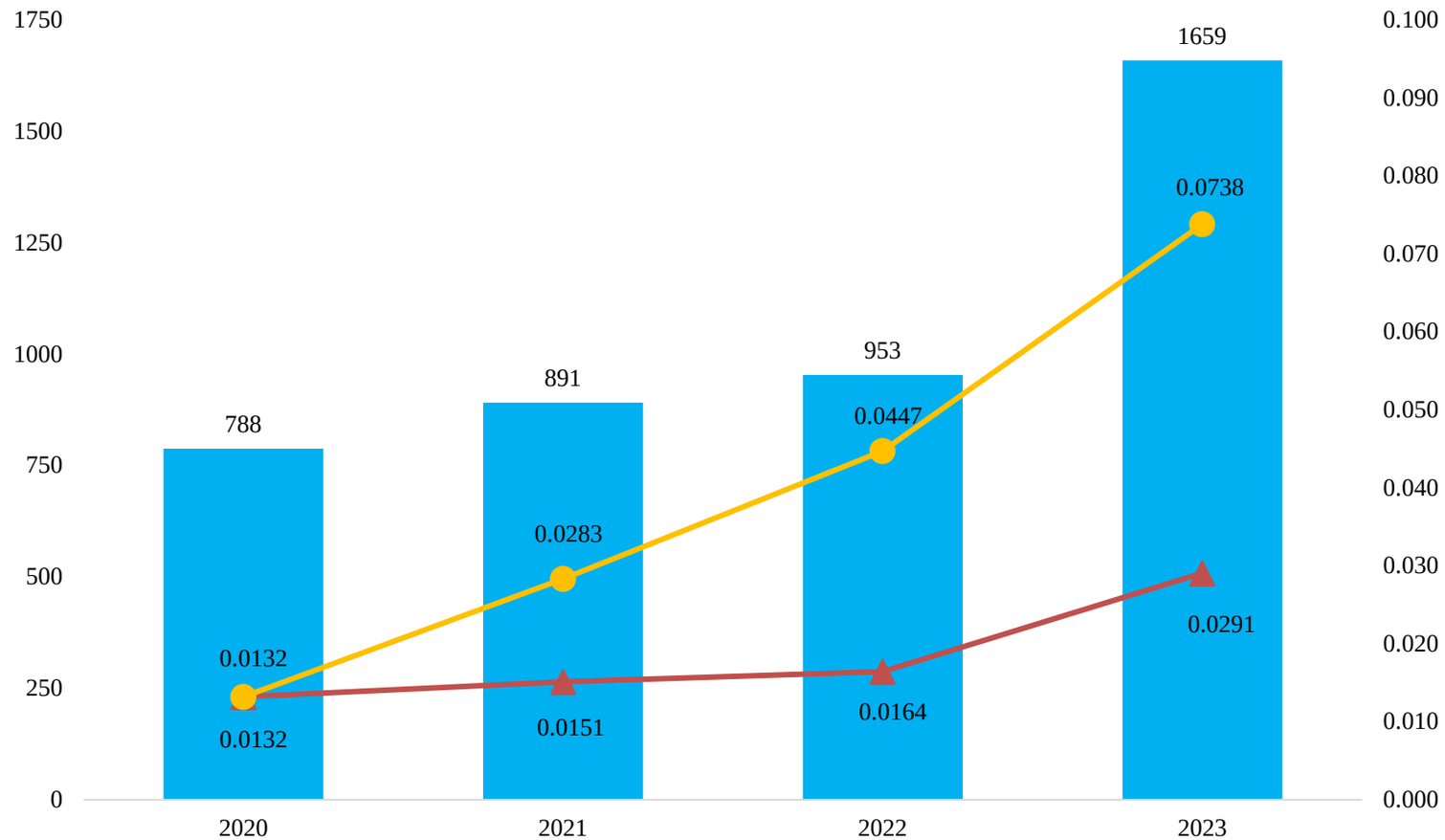
Yan, B., Zhang, X., Wu, L., Zhu, H., and Chen, B. (2020). Why do countries respond differently to COVID-19? A comparative study of Sweden, China, France, and Japan. *The American review of public administration*, 50(6-7), 762-769.

Table 1. Firm survival status by region and state

Region/State	Total number of firms surviving at the end of 2019 (A)	Total number of firm exits by the end of 2023 (B)	Exit rate (B/A)	Number of firm exits by year				Nelson-Aalen cumulative hazard function			
				2020	2021	2022	2023	Coef.	S.E.	[95% confidence interval]	
Central European EU member states	30,314	2,127	0.0702	381	463	479	804	0.0721	0.0016	0.0691	0.0752
Czechia	5,394	374	0.0693	55	97	66	156	0.0711	0.0037	0.0643	0.0787
Hungary	6,007	501	0.0834	87	98	130	186	0.0860	0.0038	0.0788	0.0939
Poland	14,199	897	0.0632	185	158	221	333	0.0647	0.0022	0.0606	0.0691
Slovakia	1,412	87	0.0616	13	31	15	28	0.0631	0.0068	0.0511	0.0778
Slovenia	3,302	268	0.0812	41	79	47	101	0.0838	0.0051	0.0744	0.0945
East European EU member states	23,995	1,956	0.0815	371	397	408	780	0.0840	0.0019	0.0804	0.0878
Bulgaria	6,271	231	0.0368	44	46	57	84	0.0373	0.0025	0.0328	0.0425
Croatia	2,282	187	0.0819	39	50	49	49	0.0846	0.0062	0.0733	0.0976
Estonia	1,016	83	0.0817	18	22	15	28	0.0843	0.0093	0.0680	0.1045
Latvia	1,890	204	0.1079	44	32	31	97	0.1121	0.0079	0.0977	0.1286
Lithuania	2,747	187	0.0681	37	26	47	77	0.0698	0.0051	0.0605	0.0806
Romania	9,789	1,064	0.1087	189	221	209	445	0.1131	0.0035	0.1065	0.1201
Non-EU East European states	5,413	208	0.0384	36	31	66	75	0.0390	0.0027	0.0341	0.0447
Albania	103	2	0.0194	0	0	1	1	0.0195	0.0138	0.0049	0.0780
Bosnia and Herzegovina	1,238	8	0.0065	1	1	3	3	0.0065	0.0023	0.0033	0.0130
Moldova	103	3	0.0291	2	0	1	0	0.0293	0.0169	0.0095	0.0909
Montenegro	188	15	0.0798	1	2	11	1	0.0214	0.0107	0.0080	0.0571
North Macedonia	874	31	0.0355	10	7	0	14	0.0489	0.0076	0.0362	0.0662
Serbia	2,907	149	0.0513	22	21	50	56	0.0522	0.0043	0.0445	0.0613

Source: Estimated by the authors based on data derived from Orbis database

Figure 1. Number of failed firms, exit rate, and Nelson-Aalen estimate of the cumulative hazard function in 17 European emerging markets: 2020-2023



Notes:

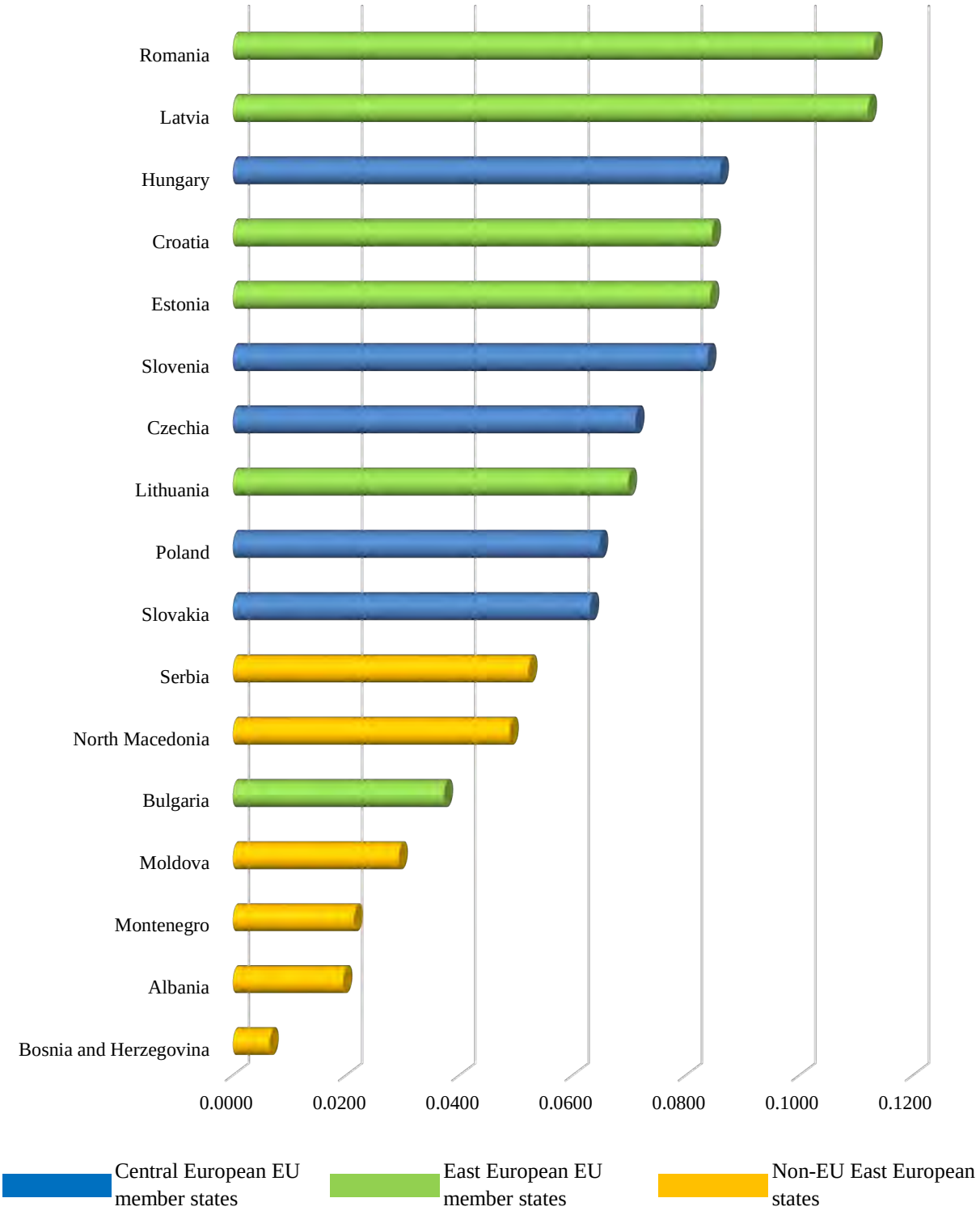
Number of failed firms (left axis)

Exit rate (right axis)

Nelson-Aalen estimate of the cumulative hazard function (right axis)

Source: Illustrated by the authors based on data derived from Orbis database

Figure 2. Illustrated comparison of 17 European emerging markets in terms of Nelson-Aalen cumrative hazard function for the period of 2020-2023



Source: Illustrated by the authors based on Table 1

Table 2. Baseline estimation of the Cox proportional hazards model: Regional comparison

Model	[1]	[2]	[3]	[4]
Region variables				
Central European EU member states			1.57518 ***	
			(5.66)	
East European EU member states			1.59758 ***	
			(6.01)	
EU 2004 membership				1.59431 ***
				(5.78)
EU 2007/2013 membership				1.58320 ***
				(5.88)
War zone neighborhoods		1.56966 ***	1.43377 ***	1.43145 ***
		(13.36)	(9.98)	(9.58)
Firm-level control variables				
Joint-stock company	0.77482 **	0.84610	0.76021 ***	0.75563 ***
	(-2.33)	(-1.64)	(-2.58)	(-2.66)
Limited liability company	0.60488 ***	0.70890 ***	0.65005 ***	0.64670 ***
	(-4.79)	(-3.51)	(-4.28)	(-4.34)
Partnership	0.64478 ***	0.67987 ***	0.62849 ***	0.61964 ***
	(-2.99)	(-2.80)	(-3.28)	(-3.41)
Cooperative	0.51732 ***	0.58601 ***	0.52766 ***	0.52417 ***
	(-3.79)	(-3.17)	(-3.74)	(-3.79)
Ownership concentration	1.64770 ***	1.59696 ***	1.58502 ***	1.57335 ***
	(5.89)	(5.75)	(5.59)	(5.48)
Foreign ownership	1.10910 ***	1.15314 ***	1.15563 ***	1.15674 ***
	(2.60)	(3.59)	(3.64)	(3.66)
State ownership	0.99676	1.00378	1.00997	1.01229
	(-0.04)	(0.04)	(0.11)	(0.14)
Board independence	0.99785 ***	1.00107 **	1.00091 *	1.00093 *
	(-2.88)	(2.18)	(1.81)	(1.85)
Board gender diversity	0.99941	0.99945	0.99946	0.99948
	(-1.21)	(-1.13)	(-1.10)	(-1.06)
Gross margin	0.90833 ***	0.90837 ***	0.90856 ***	0.90873 ***
	(-13.60)	(-13.79)	(-13.69)	(-13.65)
Solvency ratio	0.93116 ***	0.92862 ***	0.92883 ***	0.92872 ***
	(-18.60)	(-19.47)	(-19.43)	(-19.42)
Labor productivity	0.99918 ***	0.99933 ***	0.99926 ***	0.99926 ***
	(-8.23)	(-8.39)	(-9.10)	(-9.11)
Listed companies	0.29665 ***	0.24914 ***	0.27338 ***	0.27316 ***
	(-5.27)	(-6.08)	(-5.65)	(-5.66)
Firm size	0.82266 ***	0.81850 ***	0.82032 ***	0.81980 ***
	(-9.24)	(-9.62)	(-9.49)	(-9.52)
Firm age	0.98854 ***	0.98829 ***	0.98858 ***	0.98851 ***
	(-5.03)	(-5.36)	(-5.22)	(-5.24)
Country fixed efects	Yes	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes
N	59722	59722	59722	59722
Log pseudolikelihood	-45646.53	-45781.64	-45762.42	-45762.49
Wald test (χ^2)	76719.20 ***	82760.65 ***	53322.93 ***	71215.92 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. *z* statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels,

Source: Authors' estimation

Table 3. Baseline estimation of the Cox proportional hazards model: Impact of socio-economic preconditions

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Country-level socio-economic variables							
Population density	1.00157 ***						
	(2.60)						
Economic growth		1.06464 **					
		(2.41)					
National income			1.61535 ***				
			(8.38)				
Service industry				1.02473 ***			
				(3.25)			
International tourism					1.03340 ***		
					(5.82)		
Health expenditure						0.81218 ***	
						(-7.65)	
SE comprehensive score I							1.12302 ***
							(6.58)
SE comprehensive score II							1.22792 ***
							(10.72)
Region variable							
War zone neighborhoods	1.57133 ***	1.40092 ***	1.42088 ***	1.56694 ***	1.60813 ***	1.22693 ***	1.08212 **
	(13.39)	(5.73)	(9.69)	(13.34)	(14.10)	(4.28)	(2.60)
Firm-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed efects	No	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	59722	59722	59722	59722	59722	59722	59722
Log pseudolikelihood	-45778.25	-45778.45	-45747.67	-45776.75	-45765.75	-45751.51	-45707.91
Wald test (χ^2)	2870.18 ***	49713.09 ***	2911.01 ***	2864.42 ***	49783.77 ***	83348.27 ***	49747.00 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. z statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

Source: Authors' estimation

Table 4. Baseline estimation of the Cox proportional hazards model: Impact of state institutional quality

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Country-level institutional quality variables							
Rule of law	1.56948 ***						
	(9.40)						
Government effectiveness		1.17658 ***					
		(3.94)					
Political stability			1.36627 ***				
			(5.58)				
Regulatory quality				1.23248 ***			
				(3.97)			
Voice and accountability					1.75895 ***		
					(8.07)		
Control of corruption						1.09127 **	
						(2.03)	
IQ comprehensive score							1.05064 ***
							(6.00)
Region variable							
War zone neighborhoods	1.40315 ***	1.56303 ***	1.59204 ***	1.54398 ***	1.42663 ***	1.53178 ***	1.50498 ***
	(9.53)	(13.20)	(13.93)	(12.72)	(9.89)	(11.54)	(11.71)
Firm-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed efects	No	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	59722	59722	59722	59722	59722	59722	59722
Log pseudolikelihood	-45742.67	-45774.11	-45767.17	-45773.94	-45751.53	-45779.64	-45764.70
Wald test (χ^2)	71466.84 ***	46608.82 ***	49879.45 ***	49685.58 ***	2909.31 ***	66889.38 ***	63408.63 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. z statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

Source: Authors' estimation

Appendix Table A1. Composition of sample firms in 17 European emerging markerts by listing status, industry sector, and number of employees

	All 18 European emerging markets	Central European EU member states						East European EU member states							Non-EU East European states						
		Region total	Czechia	Hungary	Poland	Slovakia	Slovenia	Region total	Bulgaria	Croatia	Estonia	Latvia	Lithuania	Romania	Region total	Albania	Bosnia and Herzegovina	Moldova	Montenegro	North Macedonia	Serbia
Composition by listing status																					
Listed	1417	476	11	17	393	24	31	423	69	116	15	14	26	183	518	0	152	69	35	99	163
Unlisted	58305	29838	5383	5990	13806	1388	3271	23572	6202	2166	1001	1876	2721	9606	4895	103	1086	34	153	775	2744
Composition by industry																					
Agriculture, forestry, and fisheries	1632	837	294	257	137	13	136	639	177	52	17	71	49	273	156	3	22	5	1	27	98
Mining and manufacturing	24275	13213	2531	2366	6288	663	1365	8775	2257	933	426	554	779	3826	2287	9	494	49	42	391	1302
Construction	4648	1832	284	329	946	103	170	2353	631	237	51	192	278	964	463	15	115	15	14	60	244
Services	29167	14432	2285	3055	6828	633	1631	12228	3206	1060	522	1073	1641	4726	2507	76	607	34	131	396	1263
Finance, banks and insurance	654	373	53	65	217	17	21	208	63	30	9	30	13	63	73	7	18	9	6	11	22
Composition by number of employees																					
1-99 employees	29596	14537	2741	3203	6216	723	1654	12498	3471	1101	578	1056	1293	4999	2561	2	554	39	95	454	1417
100-499 employees	25347	13153	2281	2316	6613	576	1367	9814	2412	988	381	735	1252	4046	2380	68	579	49	76	360	1248
500-999 employees	2788	1512	224	262	780	68	178	1013	240	107	36	65	128	437	263	17	57	7	13	39	130
1000 or more employees	1991	1112	148	226	590	45	103	670	148	86	21	34	74	307	209	16	48	8	4	21	112
Total	59722	30314	5394	6007	14199	1412	3302	23995	6271	2282	1016	1890	2747	9789	5413	103	1238	103	188	874	2907

Source: Calculated by the authors based on data derived from Orbis database

Appendix Table A2. Definitions and descriptive statistics of variables used in the empirical analysis

Variable name	Definition	Descriptive statistics [g]		
		Mean	S.D.	Median
Region variables				
Central European EU member states	Dummy variable for Central European EU member states	0.508	0.500	1
East European EU member states	Dummy variable for East European EU member states	0.402	0.490	0
EU 2004 membership	Dummy variable for countries that joined the EU in 2004	0.602	0.489	1
EU 2007/2013 membership	Dummy variable for countries that joined the EU in 2007 or 2013	0.307	0.461	0
Central European states	Dummy variable for Central European states	0.508	0.500	1
Baltic states	Dummy variable for Baltic states	0.095	0.293	0
War zone neighborhoods	Dummy variable for countries sharing borders with Russia or Ukraine	0.622	0.485	1
Country-level socio-economic (SE) variables [a]				
Population density	Mean value of the World Development Indicator of population density in the period of 2017-2019 (people per sq. km of land area)	95.212	29.873	103.105
Economic growth	Mean value of the World Development Indicator of real GDP growth rate in the period of 2017-2019 (%)	4.512	1.109	4.833
National income	Mean value of the World Development Indicator of adjusted net national income per capita in the period of 2017-2019 (constant 2015 US$, log-transformed)	9.244	0.342	9.402
Service industry	Mean value of the World Development Indicator of value added of services to GDP in the period of 2017-2019 (%)	57.506	2.297	56.828
International tourism	Mean value of the World Development Indicator of total number of foreign tourists to total population in the period of 2017-2019	2.838	2.857	2.267
Health expenditure	Mean value of the World Development Indicator of current health expenditure to GDP in the period of 2017-2019 (%)	6.721	0.826	6.533
SE comprehensive score I	First principal component score of the six SE variables above [b]	0.000	1.407	0.527
SE comprehensive score II	Second principal component score of the six SE variables above [b]	0.000	1.304	0.097
Country-level institutional quality (IQ) variables [a]				
Rule of law	Mean value of the World Governance Indicator of rule of law in the period of 2017-2019	0.437	0.377	0.407
Government effectiveness	Mean value of the World Governance Indicator of government effectiveness in the period of 2017-2019	0.410	0.418	0.537
Political stability	Mean value of the World Governance Indicator of political stability in the period of 2017-2019	0.507	0.303	0.514
Regulatory quality	Mean value of the World Governance Indicator of regulatory quality in the period of 2017-2019	0.725	0.344	0.735
Voice and accountability	Mean value of the World Governance Indicator of voice and accountability in the period of 2017-2019	0.598	0.278	0.719
Control of corruption	Mean value of the World Governance Indicator of control of corruption in the period of 2017-2019	0.207	0.429	0.172
IQ comprehensive score	First principal component score of the six IQ variables above [b]	0.000	2.219	0.893
Firm-level control variables [c]				
Joint-stock company	Dummy variable for open joint-stock companies	0.169	0.374	0
Limited liability company	Dummy variable for limited liability companies	0.741	0.438	1
Partnership	Dummy variable for partnerships	0.036	0.187	0
Cooperative	Dummy variable for cooperatives	0.020	0.141	0
Ownership concentration	Average ownership share per shareholder/member	0.423	0.200	0.333
Foreign ownership	Dummy variable for ultimate ownership of foreign investors	0.225	0.417	0
State ownership	Dummy variable for ultimate ownership of the state	0.054	0.226	0
Board independence	Proportion of outside/independent directors	18.008	35.162	0.000
Board gender diversity	Proportion of female directors	20.597	31.378	0.000
Gross margin	Gross margin (%) [d e]	0.376	2.536	0.640
Solvency ratio	Solvency ratio (%) [d f]	0.725	4.849	2.324
Labor productivity	Turnover per employee (log-transformed) [d]	129.947	222.689	134.074
Listed companies	Dummy variable for listed companies	0.024	0.152	0
Firm size	Total number of employees (log-transformed)	4.860	0.862	4.605
Firm age	Years in operation	21.828	15.579	20

Notes:

[a] Appendix Table A3 reports variable values by state.

[b] Estimation results from principal component analysis are reported in Appendix Table A4.

[c] Observation period of the variables of gross margin, solvency ratio and labor productivity was 2017–2019, while that of other variables was 2019. Appendix Table A5 shows correlation matrix of firm-level control variables.

[d] Industry-adjusted value based on the method proposed by Eisenberg et al. (1998)

[e] Computed using the following formula: (gross profit/operating revenue) × 100

[f] Computed using the following formula: (shareholder funds/total assets) × 100

[g] Based on firm-level observations

Source: Country-level data from population density to control of corruption was obtained from the website of the World Bank (https://data.world.org/source/world-development-indicators; https://data.world.org/source/worldwide-governance-indicators). Firm-level raw data was extracted from the Orbis database.

Appendix Tabel A3. Values of country-level variables by state

State	Country-level socio-economic variables								Country-level institutional quality variables						
	Population density	Economic growth	National income	Service industry	International tourism	Health expenditure	SE comprehensive score I	SE comprehensive score II	Rule of law	Government effectiveness	Political stability	Regulatory quality	Voice and accountability	Control of corruption	IQ comprehensive score
Albania	104.550	3.295	8.177	45.940	2.031	6.703	-3.070	-0.402	-0.418	0.039	0.284	0.250	0.178	-0.531	-2.229
Bosnia and Herzegovina	66.154	3.320	8.436	54.251	0.313	8.837	-2.196	1.568	-0.218	-0.632	-0.392	-0.109	-0.236	-0.603	-4.085
Bulgaria	64.716	3.028	8.815	60.188	1.733	7.303	-0.901	1.228	-0.089	0.128	0.442	0.598	0.383	-0.189	-0.995
Croatia	71.353	3.095	9.388	59.452	14.771	6.737	1.540	2.872	0.320	0.502	0.720	0.447	0.460	0.053	0.143
Czechia	137.706	3.857	9.574	56.828	3.391	7.485	1.244	0.730	1.042	0.967	0.986	1.242	0.846	0.537	2.755
Estonia	30.926	4.354	9.686	61.700	4.609	6.702	0.862	0.875	1.232	1.121	0.618	1.586	1.195	1.399	3.886
Hungary	107.147	4.833	9.346	56.063	5.933	6.533	0.942	-0.012	0.530	0.458	0.765	0.598	0.456	0.059	0.441
Latvia	30.979	2.795	9.428	63.262	4.124	6.257	0.119	1.374	0.934	0.977	0.425	1.154	0.815	0.426	1.844
Lithuania	44.835	4.736	9.549	60.853	2.120	6.667	0.539	0.113	0.957	0.990	0.755	1.129	0.961	0.550	2.440
Moldova	94.307	3.935	8.054	53.907	0.059	6.780	-2.419	-0.503	-0.450	-0.508	-0.368	-0.044	-0.083	-0.748	-4.106
Montenegro	46.261	4.619	8.831	59.341	3.463	8.217	-0.480	1.358	-0.039	0.123	0.011	0.370	0.070	-0.043	-1.706
North Macedonia	74.861	2.624	8.462	54.619	0.370	6.657	-2.338	0.337	-0.309	-0.029	-0.154	0.467	-0.061	-0.393	-2.571
Poland	124.027	5.326	9.402	56.441	2.267	6.450	0.990	-0.980	0.390	0.537	0.514	0.898	0.719	0.644	1.040
Romania	84.658	6.080	9.072	57.527	0.607	5.473	0.070	-2.161	0.407	-0.159	0.209	0.428	0.549	-0.202	-1.177
Serbia	79.841	3.921	8.522	52.498	0.241	8.473	-1.962	0.809	-0.165	0.044	0.004	0.050	0.019	-0.428	-2.514
Slovak Republic	113.284	3.071	9.560	59.132	2.814	6.783	1.178	1.037	0.495	0.599	0.769	0.869	0.873	0.172	2.662
Slovenia	103.105	4.353	9.832	56.535	2.106	8.320	0.839	0.792	1.034	1.084	0.854	0.735	0.985	0.834	1.130

Source: See Appendix Table A2 for definition of the variables. Appendix Table A4 reports estimation results from principal component analysis performed to produce SE comprehensive scores I and II and IQ comprehensive score.

Appendix Table A4. Estimation results of principal component analysis

(a) Country-level socio-economic variables

Eigenvalue of the correlation matrix				Eigenvectors of the principal component		
Component no.	Eigenvalue	Difference	Cumulative percentage of total variance	Variables	Eigenvector of the first component	Eigenvector of the second component
1	1.9809	0.279	0.330	Population density	0.4972	-0.0456
2	1.7017	0.293	0.614	Economic growth	0.6230	0.0874
3	1.4088	0.811	0.849	National income	0.1853	0.5796
4	0.5980	0.348	0.948	Service industry	-0.3862	0.5292
5	0.2500	0.189	0.990	International tourism	-0.2155	0.4334
6	0.0607	.	1.000	Health expenditure	-0.3672	-0.4319

(b) Country-level institutional quality variables

Eigenvalue of the correlation matrix				Eigenvectors of the principal component	
Component no.	Eigenvalue	Difference	Cumulative percentage of total variance	Variables	Eigenvector of the first component
1	4.9237	4.502	0.821	Rule of law	0.3969
2	0.4217	0.093	0.891	Government effectiveness	0.4226
3	0.3288	0.168	0.946	Political stability	0.3812
4	0.1606	0.048	0.973	Regulatory quality	0.4250
5	0.1126	0.060	0.991	Voice and accountability	0.4179
6	0.0527	.	1.000	Control of corruption	0.4041

Source: Author's estimation. For definitions and descriptive statistics of the variables, see Appendix Table A2.

Appendix Table A5. Correlation matrix of firm-level control variables

	Joint-stock company	Limited liability company	Partnership	Cooperative	Ownership concentration	Foreign ownership	State ownership	Board independence	Board gender diversity	Gross margin	Solvency ratio	Labor productivity	Listed companies	Firm size	Firm age
Joint-stock company	1.000														
Limited liability company	-0.563	1.000													
Partnership	-0.088	-0.329	1.000												
Cooperative	-0.065	-0.243	-0.028	1.000											
Ownership concentration	-0.004	-0.171	-0.127	0.339	1.000										
Foreign ownership	-0.024	0.111	-0.083	-0.077	-0.054	1.000									
State ownership	0.034	-0.176	-0.045	-0.032	0.184	-0.100	1.000								
Board independence	0.474	-0.392	-0.087	0.062	0.087	-0.014	0.010	1.000							
Board gender diversity	0.002	-0.056	0.003	0.067	0.046	-0.051	0.056	0.001	1.000						
Gross margin	-0.064	0.055	0.088	-0.063	-0.072	-0.016	-0.074	-0.057	0.005	1.000					
Solvency ratio	0.041	-0.072	0.031	0.065	0.009	-0.042	0.045	-0.010	0.012	0.382	1.000				
Labor productivity	-0.022	0.006	0.086	0.012	0.018	0.132	-0.053	0.001	-0.060	0.061	0.014	1.000			
Listed companies	0.332	-0.261	-0.030	-0.022	-0.178	-0.026	-0.003	0.207	-0.001	-0.029	0.033	-0.164	1.000		
Firm size	0.191	-0.154	-0.023	-0.037	-0.052	0.210	0.079	0.093	-0.019	-0.026	-0.031	-0.122	0.154	1.000	
Firm age	0.242	-0.287	-0.039	0.230	0.046	-0.065	0.088	0.117	0.012	-0.039	0.153	-0.027	0.268	0.154	1.000

Source : Authors' estimation. For definitions and descriptive statistics of the variables, see Appendix Table A2.

Appendix Table A6. Univariate comparison between surviving and failed firms

Variable name	Surviving firms		Failed firms		Correlation coefficients with survival probability [c]
	Mean/ proportion	Median	Mean/ proportion [a]	Median [b]	
Central European EU member states	0.5085	1	0.4957	0	0.0066
East European EU member states	0.3977	0	0.4558 †††	0 ***	-0.0306 ***
EU 2004 membership	0.6019	1	0.6062	1	-0.0022
EU 2007/2013 membership	0.3043	0	0.3454 †††	0 ***	-0.0230 ***
Central European states	0.5085	1	0.4957	0	0.0066
Baltic states	0.0935	0	0.1105 †††	0 ***	-0.0150 ***
War zone neighborhoods	0.6160	1	0.7052 †††	1 ***	-0.0475 ***
Population density	95.2283	103.1050	95.0014	84.6580	0.0020
Economic growth	4.4975	4.7360	4.6995 ***	4.8330 ***	-0.0470 ***
National income	9.2410	9.4019	9.2846 ***	9.3876 ***	-0.0329 ***
Service industry	57.4950	56.8280	57.6583 ***	57.5270 ***	-0.0184 ***
International tourism	2.8286	2.2672	2.9625 ***	2.2672 ***	-0.0121 ***
Health expenditure	6.7366	6.5330	6.5087 ***	6.4500 ***	0.0713 ***
SE comprehensive score I	-0.0139	0.2506	0.1832 ***	0.5270 ***	-0.0362 ***
SE comprehensive score II	-0.0188	0.0972	0.2484 ***	0.1673 ***	-0.0529 ***
Rule of law	0.4329	0.4070	0.4964 ***	0.4070 ***	-0.0436 ***
Government effectiveness	0.4102	0.5370	0.4099	0.5020	0.0002
Political stability	0.5068	0.5140	0.5179 **	0.5140	-0.0095 **
Regulatory quality	0.7246	0.7350	0.7340 *	0.5980 **	-0.0071 *
Voice and accountability	0.5959	0.7190	0.6320 ***	0.5490 ***	-0.0336 ***
Control of corruption	0.2070	0.1720	0.2087	0.0590 **	-0.0010
IQ comprehensive score	-0.0102	0.8928	0.1380 ***	-0.0403	-0.0173 ***
Joint-stock company	0.1700	0	0.1498 †††	0 ***	0.0139 ***
Limited liability company	0.7392	1	0.7723 †††	1 ***	-0.0196 ***
Partnership	0.0371	0	0.0280 †††	0 ***	0.0126 ***
Cooperative	0.0207	0	0.0135 †††	0 ***	0.0132 ***
Ownership concentration	0.4214	0.3333	0.4391 ***	0.5000 ***	-0.0228 ***
Foreign ownership	0.2233	0	0.2410 †††	0 ***	-0.0110 ***
State ownership	0.0549	0	0.0440 †††	0 ***	0.0124 ***
Board independence	18.0493	0.0000	17.3763	0.0000 *	0.0049
Board gender diversity	20.5845	0.0000	20.7599	0.0000 ***	-0.0014
Gross margin	0.4544	0.7550	-0.6376 ***	-1.2042 ***	0.1112 ***
Solvency ratio	0.9073	2.5515	-1.6186 ***	-3.1765 ***	0.1346 ***
Labor productivity	132.4079	137.0852	98.4608 ***	96.8130 ***	0.0394 ***
Listed companies	0.0251	0	0.0047 †††	0 ***	0.0348 ***
Firm size	4.8670	4.6151	4.7604 ***	4.5326 ***	0.0320 ***
Firm age	22.1241	21	17.9925 ***	15 ***	0.0685 ***

Notes:

[a] ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, according to the *t* test (or Welch's test if the *F* test on the equality of variances rejects the null hypothesis that population variances are equal) in terms of the differences in the means. ††† denotes statistical significance at the 1% level, according to the Chi-square (χ^2) test in terms of the differences in the proportion between the two types of firms.

[b] ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, according to the Wilcoxon rank sum test in terms of the differences between the two types of firms.

[c] ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, in terms of the correlation coefficient with the binary dummy variable that assigns a value of 1 to surviving firms during the observation period of 2020-2023.

Source: Estimated by the authors based on data derived from Orbis database; See Appendix Table A2 for definition of the variables used.

Appendix Table A7. Robustness check: Estimation using alternative models

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Estimator	Weibull survival model		Log-logistic survival model		Weibull accelerated failure time model		Complementary log-log model	
Country-level socio-economic variables								
SE comprehensive score I	1.12620 ***		-0.07890 ***		-0.07834 ***		0.12016 ***	
	(6.58)		(-6.53)		(-6.57)		(6.70)	
SE comprehensive score II	1.23351 ***		-0.13850 ***		-0.13833 ***		0.20882 ***	
	(10.73)		(-10.63)		(-10.64)		(10.73)	
Country-level institutional quality variable								
Comprehensive IQ index		1.05139 ***		-0.03392 ***		-0.03306 ***		0.04982 ***
		(5.94)		(-5.97)		(-5.92)		(5.93)
Region variable								
War zone neighborhoods	1.08356 *	1.51965 ***	-0.05791 *	-0.28244 ***	-0.05290 **	-0.27609 ***	0.07664 **	0.41602 ***
	(1.94)	(11.71)	(-1.72)	(-11.72)	(-2.53)	(-11.63)	(2.05)	(11.68)
Firm-level control variables								
Joint-stock company	0.70302 ***	0.80740 **	0.24851 ***	0.15369 **	0.23226 ***	0.14114 **	-0.35200 ***	-0.21272 **
	(-3.21)	(-2.00)	(3.29)	(2.10)	(3.21)	(2.00)	(-3.21)	(-1.99)
Limited liability company	0.59906 ***	0.66295 ***	0.35980 ***	0.28954 ***	0.33773 ***	0.27119 ***	-0.50895 ***	-0.40779 ***
	(-4.90)	(-3.99)	(4.99)	(4.09)	(4.89)	(3.99)	(-4.88)	(-3.97)
Partnership	0.56560 ***	0.61532 ***	0.39441 ***	0.33597 ***	0.37561 ***	0.32038 ***	-0.56504 ***	-0.47985 ***
	(-3.96)	(-3.40)	(4.05)	(3.48)	(3.96)	(3.40)	(-3.94)	(-3.37)
Cooperative	0.47756 ***	0.55708 ***	0.51594 ***	0.41184 ***	0.48714 ***	0.38598 ***	-0.74049 ***	-0.58536 ***
	(-4.21)	(-3.38)	(4.39)	(3.55)	(4.21)	(3.38)	(-4.23)	(-3.39)
Ownership concentration	1.52984 ***	1.50161 ***	-0.29121 ***	-0.27810 ***	-0.28024 ***	-0.26821 ***	0.42930 ***	0.41111 ***
	(5.06)	(4.84)	(-5.12)	(-4.89)	(-5.05)	(-4.83)	(5.13)	(4.92)
Foreign ownership	1.14368 ***	1.16028 ***	-0.09793 ***	-0.10708 ***	-0.08849 ***	-0.09808 ***	0.13841 ***	0.15231 ***
	(3.30)	(3.66)	(-3.53)	(-3.87)	(-3.29)	(-3.65)	(3.42)	(3.77)
State ownership	1.02356	1.00527	-0.00135	0.00964	-0.01535	-0.00347	0.02847	0.00906
	(0.26)	(0.06)	(-0.02)	(0.16)	(-0.26)	(-0.06)	(0.32)	(0.10)
Board independence	1.00056	1.00024	-0.00036	-0.00015	-0.00037	-0.00016	0.00056	0.00022
	(0.90)	(0.45)	(-0.86)	(-0.41)	(-0.90)	(-0.45)	(0.92)	(0.41)
Board gender diversity	0.99953	0.99957	0.00033	0.00031	0.00031	0.00028	-0.00047	-0.00043
	(-0.93)	(-0.85)	(0.96)	(0.92)	(0.93)	(0.85)	(-0.93)	(-0.86)
Gross margin	0.90770 ***	0.90846 ***	0.06697 ***	0.06646 ***	0.06383 ***	0.06334 ***	-0.09588 ***	-0.09505 ***
	(-13.43)	(-13.33)	(13.41)	(13.30)	(13.26)	(13.16)	(-13.41)	(-13.30)
Solvency ratio	0.92791 ***	0.92560 ***	0.05053 ***	0.05222 ***	0.04931 ***	0.05100 ***	-0.07415 ***	-0.07664 ***
	(-19.17)	(-19.78)	(19.01)	(19.56)	(18.69)	(19.25)	(-19.15)	(-19.76)
Labor productivity	0.99914 ***	0.99918 ***	0.00058 ***	0.00055 ***	0.00057 ***	0.00054 ***	-0.00085 ***	-0.00081 ***
	(-10.18)	(-9.60)	(10.14)	(9.57)	(10.12)	(9.55)	(-10.17)	(-9.58)
Listed companies	0.27330 ***	0.25784 ***	0.85141 ***	0.88956 ***	0.85502 ***	0.89423 ***	-1.29081 ***	-1.34883 ***
	(-5.60)	(-5.88)	(5.65)	(5.94)	(5.60)	(5.87)	(-5.58)	(-5.87)
Firm size	0.81068 ***	0.81286 ***	0.14242 ***	0.14106 ***	0.13834 ***	0.13669 ***	-0.21117 ***	-0.20815 ***
	(-9.82)	(-9.72)	(9.85)	(9.78)	(9.79)	(9.69)	(-9.94)	(-9.83)
Firm age	0.98820 ***	0.98761 ***	0.00792 ***	0.00832 ***	0.00782 ***	0.00822 ***	-0.01169 ***	-0.01228 ***
	(-5.22)	(-5.48)	(5.21)	(5.45)	(5.22)	(5.48)	(-5.18)	(-5.44)
Country fixed efects	No	No	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	59722	59722	59722	59722	59722	59722	59722	59722
Log pseudolikelihood	-16670.54	-16730.07	-16646.08	-16704.66	-16670.54	-16730.07	-14028.95	-14088.25
Wald test (χ^2)	14847.06 ***	13250.77 ***	5611.90 ***	5601.93 ***	5302.42 ***	5076.42 ***	2833.71 ***	2778.24 ***

Note: This table presents the estimation results from the alternative models. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. The reported coefficients are hazard ratios (for Models [1] and [2]) or regression coefficients (for all the other models). Since the complementary log-log models [7] and [8] test the effect of covariates on the probability of firm exit, the signs of their coefficients are opposite to those of the other three models. The *z* - or *t* -values, calculated using robust standard errors, are provided in parentheses. The Wald test presents the results of testing the null hypothesis that all coefficients are zero. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation

Appendix Table A8. Robustness check: Estimation of the Cox proportional hazards model by firm size and age

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Target firm	Larger firms		Smaller firms		Older firms		Younger firms	
Country-level socio-economic variables								
SE comprehensive score I	1.13780 ***		1.11584 ***		1.08998 ***		1.15525 ***	
	(5.00)		(4.46)		(2.92)		(6.34)	
SE comprehensive score II	1.19749 ***		1.26480 ***		1.23263 ***		1.23508 ***	
	(6.93)		(8.42)		(6.96)		(8.59)	
Country-level institutional quality variable								
Comprehensive IQ index		1.04818 ***		1.05488 ***		1.06808 ***		1.04820 ***
		(3.95)		(4.67)		(4.93)		(4.40)
Region variable								
War zone neighborhoods	1.44079 *	1.46412 ***	1.40125 **	1.53560 ***	1.25792 **	1.35887 ***	1.03813 **	1.55001 ***
	(1.79)	(7.49)	(2.37)	(8.92)	(2.27)	(5.09)	(2.32)	(10.00)
Firm-level control variables								
Joint-stock company	0.67796 ***	0.76081 *	0.72639 **	0.85711	0.70200 **	0.76889 *	0.63106 ***	0.74956 *
	(-2.69)	(-1.91)	(-1.96)	(-0.98)	(-2.15)	(-1.68)	(-2.88)	(-1.83)
Limited liability company	0.60171 ***	0.64483 ***	0.60730 ***	0.69848 **	0.51759 ***	0.56062 ***	0.65355 ***	0.72224 **
	(-3.61)	(-3.14)	(-3.27)	(-2.42)	(-4.09)	(-3.72)	(-2.82)	(-2.18)
Partnership	0.53106 ***	0.56920 ***	0.60837 **	0.67725 **	0.50761 ***	0.53209 ***	0.58539 ***	0.63950 **
	(-3.09)	(-2.76)	(-2.49)	(-1.98)	(-2.91)	(-2.77)	(-2.80)	(-2.34)
Cooperative	0.37183 ***	0.43310 ***	0.59997 **	0.70869	0.43076 ***	0.46266 ***	0.29850 ***	0.36649 ***
	(-3.60)	(-3.07)	(-2.23)	(-1.53)	(-3.64)	(-3.42)	(-3.15)	(-2.63)
Ownership concentration	1.36663 ***	1.34232 **	1.71825 ***	1.67555 ***	1.44463 ***	1.41674 ***	1.52083 ***	1.45348 ***
	(2.59)	(2.43)	(4.77)	(4.56)	(2.80)	(2.70)	(3.73)	(3.30)
Foreign ownership	1.06062	1.07167	1.24658 ***	1.27272 ***	1.16392 **	1.16235 **	1.13682 ***	1.16308 ***
	(1.08)	(1.27)	(3.83)	(4.20)	(2.13)	(2.12)	(2.66)	(3.12)
State ownership	0.96182	0.92954	1.09590	1.10322	1.36057 ***	1.32783 **	0.69854 ***	0.68881 ***
	(-0.34)	(-0.64)	(0.68)	(0.73)	(2.75)	(2.55)	(-2.60)	(-2.69)
Board independence	1.00096	1.00036	1.00002	0.99999	0.99920	0.99911	1.00219 ***	1.00147 **
	(1.12)	(0.48)	(0.03)	(-0.01)	(-0.80)	(-1.04)	(2.82)	(2.28)
Board gender diversity	0.99916	0.99918	0.99992	0.99995	0.99827 *	0.99844 *	0.99998	1.00000
	(-1.13)	(-1.11)	(-0.12)	(-0.08)	(-1.88)	(-1.70)	(-0.04)	(0.00)
Gross margin	0.89223 ***	0.89179 ***	0.92312 ***	0.92488 ***	0.86800 ***	0.86897 ***	0.92571 ***	0.92631 ***
	(-10.69)	(-10.75)	(-8.48)	(-8.28)	(-11.72)	(-11.67)	(-9.05)	(-8.97)
Solvency ratio	0.93376 ***	0.93129 ***	0.92789 ***	0.92556 ***	0.92697 ***	0.92468 ***	0.94477 ***	0.94200 ***
	(-12.10)	(-12.53)	(-14.61)	(-15.12)	(-12.49)	(-12.92)	(-11.91)	(-12.47)
Labor productivity	0.99917 ***	0.99922 ***	0.99915 ***	0.99917 ***	0.99948 ***	0.99945 ***	0.99908 ***	0.99915 ***
	(-6.89)	(-6.44)	(-7.39)	(-7.14)	(-4.02)	(-4.12)	(-8.43)	(-7.82)
Listed companies	0.25614 ***	0.25108 ***	0.24993 ***	0.21760 ***	0.25717 ***	0.25113 ***	0.05635 ***	0.05326 ***
	(-5.24)	(-5.34)	(-2.71)	(-3.00)	(-5.34)	(-5.52)	(-2.88)	(-2.94)
Firm size	0.79286 ***	0.79599 ***	0.75415 **	0.78558 **	0.81350 ***	0.81471 ***	0.82643 ***	0.82972 ***
	(-7.18)	(-7.06)	(-2.56)	(-2.22)	(-6.13)	(-6.12)	(-7.06)	(-6.93)
Firm age	0.99278 **	0.99199 ***	0.98145 ***	0.98120 ***	1.00193	1.00148	0.95527 ***	0.95502 ***
	(-2.55)	(-2.79)	(-6.42)	(-6.55)	(1.05)	(0.79)	(-11.57)	(-11.58)
Country fixed efects	No	No	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	30743	30743	28979	28979	29559	29559	30163	30163
Log pseudolikelihood	-20463.18	-20487.02	-22202.43	-22237.94	-15033.58	-15050.02	-27690.54	-27733.33
Wald test (χ^2)	87934.76 ***	70214.14	38610.95 ***	34315.81 ***	105382.16 ***	88155.14 ***	65430.53 ***	64408.01 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. z statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation

Appendix Table A9. Robustness check: Estimation of the Cox proportional hazards model by industry

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Target industry (NACE Rev2 section classification)	Agriculture, forestry, and fishing (Section A)		Mining and manufacturing (Sections B–E)		Construction (Section F)		Services (Sections G–S)		Finance, banks and insurance (Section K)	
Country-level socio-economic variables										
SE comprehensive score I	1.11516		1.20608 ***		0.99117		1.11554 ***		0.8488	
	(0.60)		(6.07)		(-0.16)		(4.61)		-1.2600	
SE comprehensive score II	1.15507		1.27158 ***		1.19551 ***		1.20491 ***		0.8907	
	(1.06)		(7.75)		(2.59)		(6.99)		-1.2100	
Country-level institutional quality variable										
Comprehensive IQ index		0.97775		1.06588 ***		1.06692 **		1.04239 ***		0.9583
		(-0.32)		(4.69)		(2.28)		(3.67)		-0.7100
Region variable										
War zone neighborhoods	0.71346	1.09059	1.45269 **	1.59516 ***	1.66405 ***	1.78003 ***	1.36822 **	1.40292 ***	1.6303	1.2225
	(-0.66)	(0.30)	(2.24)	(8.22)	(2.76)	(4.58)	(2.43)	(7.03)	1.3600	0.7200
Firm-level control variables										
Joint-stock company	0.85764	0.94753	0.51778 ***	0.65948 *	1.10026	1.15842	0.68517 ***	0.76590 **	0.8833	0.9496
	(-0.20)	(-0.07)	(-2.90)	(-1.87)	(0.21)	(0.32)	(-2.80)	(-2.04)	-0.3000	-0.1300
Limited liability company	0.54766	0.62231	0.41910 ***	0.49494 ***	1.02903	1.13900	0.62422 ***	0.67248 ***	0.4999	0.5641
	(-0.74)	(-0.60)	(-3.88)	(-3.19)	(0.06)	(0.29)	(-3.84)	(-3.28)	-1.5800	-1.2900
Partnership	3.80851	4.48685	0.33061 ***	0.39418 ***	1.28832	1.25911	0.61726 ***	0.65693 **	1.8643	2.0148
	(1.40)	(1.59)	(-4.06)	(-3.42)	(0.48)	(0.43)	(-2.61)	(-2.29)	0.5200	0.5900
Cooperative	0.67043	0.80114	0.50300 **	0.65237	0.00115 ***	0.02230 ***	0.35251 ***	0.39596 ***	0.1030 ***	0.2230 ***
	(-0.43)	(-0.25)	(-2.40)	(-1.51)	(-4.57)	(-4.76)	(-4.01)	(-3.60)	-39.7500	-36.3700
Ownership concentration	1.70002	1.85861	1.49901 ***	1.49246 ***	1.97663 **	1.79764 **	1.61462 ***	1.59038 ***	2.0292	2.0529
	(0.79)	(1.06)	(3.07)	(3.04)	(2.36)	(2.02)	(4.17)	(4.02)	0.8200	0.8200
Foreign ownership	1.26707	1.23479	1.01755	1.04594	1.06917	1.04697	1.24340 ***	1.26124 ***	2.0406 **	2.0510 ***
	(0.53)	(0.48)	(0.28)	(0.72)	(0.36)	(0.25)	(4.04)	(4.31)	2.5000	2.5800
State ownership	0.99379	1.03446	0.87357	0.86351	0.97872	0.97889	1.09195	1.07028	1.6121	1.7028
	(-0.01)	(0.03)	(-0.71)	(-0.78)	(-0.06)	(-0.06)	(0.86)	(0.66)	0.9600	1.0900
Board independence	0.98544 **	0.98725 **	1.00049	0.99935	0.99791	0.99949	1.00186 **	1.00144 **	0.9984	1.0006
	(-2.38)	(-2.20)	(0.50)	(-0.75)	(-1.03)	(-0.29)	(2.22)	(2.09)	-0.3900	0.1700
Board gender diversity	1.00656	1.00583	0.99965	0.99964	1.00168	1.00188	0.99897	0.99900	0.9999	0.9999
	(1.54)	(1.40)	(-0.41)	(-0.44)	(0.99)	(1.11)	(-1.58)	(-1.54)	-0.0200	-0.0100
Gross margin	0.80401 ***	0.80559 ***	0.87530 ***	0.87552 ***	0.92506 ***	0.92489 ***	0.93814 ***	0.93955 ***	0.9401 *	0.9418 *
	(-3.55)	(-3.63)	(-11.90)	(-11.96)	(-3.62)	(-3.62)	(-6.34)	(-6.18)	-1.7800	-1.7700
Solvency ratio	0.87701 ***	0.87893 ***	0.92080 ***	0.91813 ***	0.91595 ***	0.91401 ***	0.94089 ***	0.93879 ***	0.9496 **	0.9509 *
	(-3.09)	(-2.97)	(-13.56)	(-14.02)	(-6.60)	(-6.66)	(-11.53)	(-11.94)	-2.0200	-1.9500
Labor productivity	1.00045	1.00071	0.99933 ***	0.99933 ***	0.99917 ***	0.99916 ***	0.99908 ***	0.99913 ***	0.9996	0.9996
	(0.60)	(0.97)	(-4.65)	(-4.53)	(-2.91)	(-2.96)	(-8.25)	(-7.74)	-0.5100	-0.5400
Listed companies	0.00339 ***	0.00751 ***	0.36981 ***	0.35906 ***	0.22758	0.19333	0.15775 ***	0.15324 ***	0.4746	0.4691
	(-6.55)	(-7.01)	(-3.46)	(-3.62)	(-1.44)	(-1.59)	(-4.11)	(-4.18)	-1.4700	-1.5100
Firm size	1.17284	1.15762	0.81182 ***	0.81564 ***	1.01589	1.00695	0.79802 ***	0.80150 ***	0.9053	0.9038
	(1.00)	(0.94)	(-5.85)	(-5.74)	(0.19)	(0.08)	(-8.12)	(-7.99)	-0.7200	-0.7400
Firm age	0.99756	0.99703	0.99439 **	0.99360 **	0.97782 ***	0.97734 ***	0.98280 ***	0.98218 ***	0.9989	0.9990
	(-0.16)	(-0.20)	(-2.19)	(-2.48)	(-3.68)	(-3.78)	(-4.47)	(-4.62)	-0.1400	-0.1300
Country fixed efects	No	No	No	No	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1632	1632	24275	24275	4648	4648	29167	29167	646	646
Log pseudolikelihood	-385.5	-386.2	-15693.7	-15726.7	-3229.9	-3232.7	-22059.2	-22084.8	-398.0	-398.8
Wald test (χ^2)	26914.8 ***	36222.4 ***	1341.4 ***	1295.3 ***	3352.0 **	4117.9 ***	82070.0 ***	55110.1 ***	6038.5 ***	5035.9 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. z statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors' estimation

Appendix Table A10. Robustness check: Estimation of the Cox proportional hazards model by country group

Model	[1]	[2]	[3]	[4]	[5]	[6]
Target country	Central European EU member states		East European EU member states		Non-EU East European states	
Country-level socio-economic variables						
SE comprehensive score I	0.99320		1.14525 ***		1.90394 ***	
	(-0.11)		(4.72)		(3.91)	
SE comprehensive score II	1.09949		1.40578 ***		1.40101 ***	
	(0.90)		(9.56)		(2.70)	
Country-level institutional quality variable						
Comprehensive IQ index		0.96707		0.99692		1.78839 ***
		(-1.17)		(-0.20)		(4.69)
Region variable						
War zone neighborhoods	1.01471	1.04689	1.29861 ***	2.02235 ***	1.52421 **	2.17944 ***
	(0.19)	(0.80)	(2.86)	(11.95)	(2.46)	(3.41)
Firm-level control variables						
Joint-stock company	0.66547 **	0.66304 **	0.69636 **	0.67191 **	0.72116	0.80046
	(-2.04)	(-2.06)	(-2.15)	(-2.46)	(-0.79)	(-0.55)
Limited liability company	0.56364 ***	0.56308 ***	0.51355 ***	0.54130 ***	0.53882 *	0.53177 *
	(-3.00)	(-3.00)	(-4.23)	(-4.09)	(-1.89)	(-1.91)
Partnership	0.58386 **	0.57986 **	1.00199	1.04079	0.01790 ***	0.02085 ***
	(-2.48)	(-2.52)	(0.00)	(0.08)	(-6.87)	(-8.92)
Cooperative	0.47260 ***	0.47111 ***	0.34151 ***	0.34629 ***	0.01640 ***	0.02366 ***
	(-2.98)	(-3.00)	(-2.83)	(-2.86)	(-5.66)	(-6.63)
Ownership concentration	1.65369 ***	1.64743 ***	1.51484 ***	1.55038 ***	1.21487	1.29446
	(4.29)	(4.29)	(2.69)	(2.85)	(0.44)	(0.58)
Foreign ownership	1.07500	1.07482	1.13038 **	1.13029 **	0.96750	0.95972
	(1.27)	(1.27)	(2.03)	(2.02)	(-0.16)	(-0.20)
State ownership	1.17676	1.17675	0.84000	0.89814	0.46674 *	0.45915 *
	(1.28)	(1.28)	(-1.28)	(-0.80)	(-1.85)	(-1.88)
Board independence	0.99823 *	0.99828	0.99978	1.00177 **	0.99859	0.99769
	(-1.65)	(-1.63)	(-0.23)	(2.24)	(-0.42)	(-0.70)
Board gender diversity	0.99943	0.99944	0.99961	0.99972	0.99877	0.99866
	(-0.74)	(-0.74)	(-0.57)	(-0.41)	(-0.61)	(-0.66)
Gross margin	0.90908 ***	0.90913 ***	0.91671 ***	0.91430 ***	0.85858 ***	0.85976 ***
	(-8.57)	(-8.56)	(-8.95)	(-9.22)	(-5.27)	(-5.25)
Solvency ratio	0.93579 ***	0.93572 ***	0.92855 ***	0.92819 ***	0.90447 ***	0.90562 ***
	(-11.91)	(-11.92)	(-12.85)	(-12.94)	(-6.02)	(-5.97)
Labor productivity	0.99931 ***	0.99932 ***	0.99891 ***	0.99909 ***	0.99861 **	0.99856 ***
	(-6.50)	(-6.38)	(-6.45)	(-5.51)	(-2.55)	(-2.89)
Listed companies	0.20976 ***	0.20936 ***	0.29472 ***	0.32720 ***	0.33512 **	0.30880 **
	(-3.76)	(-3.77)	(-2.96)	(-2.71)	(-2.14)	(-2.36)
Firm size	0.82741 ***	0.82690 ***	0.82198 ***	0.83268 ***	0.76043 ***	0.76834 ***
	(-6.39)	(-6.42)	(-6.20)	(-5.78)	(-2.93)	(-2.84)
Firm age	0.99189 ***	0.99192 ***	0.97845 ***	0.97990 ***	0.99651	0.99688
	(-3.13)	(-3.13)	(-4.64)	(-4.41)	(-0.41)	(-0.38)
Country fixed efects	No	No	No	No	No	No
NACE division-level industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	30314	30314	23995	23995	5413	5413
Log pseudolikelihood	-21325.44	-21325.41	-18915.77	-18960.47	-1622.35	-1617.45
Wald test (χ^2)	52360.38 ***	63215.02 ***	105759.03 ***	110020.51 ***	146045.95 ***	203659.66 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Appendix Table A2 provides detailed definitions and descriptive statistics of the independent variables. Regression coefficients are hazard ratios. Standard errors are computed using the Huber-White sandwich estimator. z statistics are reported in parentheses beneath the regression coefficients. The Wald test examines the null hypothesis that all coefficients are zero. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels,

Source: Authors' estimation