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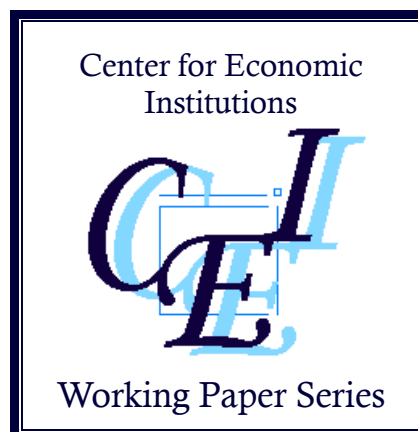
Working Paper Series

**"Survival of Service Firms in European
Emerging Economies"**

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Survival of Service Firms in European Emerging Economies[*]

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Abstract: Using a dataset of 126,591 service firms in 17 European emerging economies, this paper aims to estimate firm survivability in the years 2007–2015 and examine its determinants. We found that 31.3%, or 39,557 firms, failed during the observation period. At the same time, however, the failure risk greatly differed among regions, perhaps due to the remarkable gap in the progress of economic and political reforms. Moreover, the results of survival analysis revealed that large shareholding, labor productivity, and firm age played strong roles in preventing business failure beyond differences in regions and sectors.

Keywords: European emerging economies; Service industry; Survival analysis; Cox proportional hazards model

JEL Classifications: D22; G01; G33; L89; P34

1. Introduction

Emerging economies in Central and Eastern Europe (CEE) and the former Soviet Union (FSU) were profoundly challenged by a wave of crises, starting from the global financial shock in 2008, followed by the EU sovereign debt crisis and the military conflict in Ukraine. By virtue of several attempts made in recent years, we are now revealing the magnitude of the European crises in these economies (Wise et al., 2015; Brada and Wachtel, 2016; Havlik and Iwasaki, 2017). However, evidence regarding the service industry is scarce, although the sector has the largest employment in the region and, thus, is crucial for the stability of the national economy.

In this article, using a hand-crafted dataset of 126,591 non-financial service firms in 17 European emerging economies, we will first trace their survival during the period of 2007–2015 and, then, examine the determinants of survivability. For the latter aim, we will estimate a Cox proportional hazards model, paying a special attention to ownership structure, financial soundness, productivity, solvency, firm size, and age that are repeatedly verified as having roles preventing management failure in the literature (Manjón-Antolín and Arauzo-Carod, 2008; Alfano and Chen, 2012; Varum and Rocha, 2012; Dai et al., 2016). In the survival analysis, we will also examine the possible impact of a country's progress in economic and political reforms, taking into account the premature state of emerging economies. We expect the findings in this paper to contribute to the limited literature on the impact of European crisis shocks on emerging markets.

2. Data and methodology

We use data from Bureau van Dijk's Orbis database. Based on its 2006/07 and 2015/16 archives, we identified non-financial service companies that satisfied the following two conditions: first, they were actually operating at the end of 2006 in 17 European emerging economies; second, their survival status was traceable until the end of 2015. In this regard, we classify failed firms as those being liquidated, bankrupt, and/or dissolved. Companies in the category of mergers/acquisitions are not considered as failed based on the argument of Lanine and Vander Vennet (2007). Bailed-out firms were excluded from the sample. As a result, we confirmed that a total of 126,591 companies met the above conditions. In addition to survival status, we also collected from the Orbis database a series of firm-level covariates that enabled us to examine the determinants of survival for 84,772 of the above

126,591 firms in addition to two covariates related to progress in economic and political reforms provided by the European Bank for Reconstruction and Development (EBRD) and the Freedom House. The covariates used in our empirical analysis are exhibited in **Table 1**.

In the following sections, by estimating a non-parametric Kaplan-Meier cumulative hazard function and survival function referring to the survival status of 126,591 firms, we will first report the survivability of service firms in all 17 emerging economies in the period from 2007 to 2015 and those by country group (Central European country group—Czech Republic, Hungary, Poland, Slovakia; East European country group—Bosnia, Bulgaria, Croatia, Macedonia, Montenegro, Romania, and Serbia; Baltic country group—Estonia, Latvia, and Lithuania; and FSU country group—Moldova, Russia, and Ukraine) and by sector according to the NACE Rev. 2 industrial classification.

Next, we will perform a survival analysis of a total of 84,772 service firms, employing a semi-parametric Cox proportional hazards model, in which the effect of a covariate upon the hazard rate is supposed to be proportional throughout the observation period. In the Cox model, the form of the hazard function $h(t)$ is assumed in the following way:

$$h(t|x_{i1}, \cdots, x_{in}) = h_0(t)\exp(\beta_1 x_{i1} + \cdots + \beta_n x_{in}), \qquad h_0(t) > 0,$$

where $x_{i1}, x_{i2}, x_{i3}, \cdots, x_{in}$ are covariates associated with the ith observation; and $\beta_1, \beta_2, \beta_3, \cdots, \beta_n$ are their respective parameters to be estimated. In this model, the baseline hazard $h_0(t)$ depends only on time t, while covariates enter the model linearly. The above equation is estimated through the maximum likelihood method by taking the logarithms of both sides and transforming the equation into the following linear model:

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

To deal with the right censoring, we adopt the Breslow approximation. Every parameter estimate β reported in this paper is a hazard ratio. The impact of endogeneity on our results is minimized as our data and estimation approach satisfy restrictions specified by Liu (2012).

3. Estimation of firm survivability

Table 2 reports the survival status of 126,591 service firms in 17 European emerging economies in the period of 2007–2015. From this table, we conjecture that the European crises dealt fatal damage to a large number of service companies in CEE and FSU countries. Actually, we found that 39,557, or 31.3% of 126,591 firms, failed during the observation period. The Nelson-Aalen estimate of cumulative hazard function for all 17 countries is 0.3650. The damage of the crises on the service industry in emerging economies was highly likely to be larger than that in developed economies.

At the same time, however, **Table 2** also proves that there is a remarkable gap between country groups from this perspective: In fact, the exit rate (Nelson-Aalen cumulative hazard function) for Central European countries has a value of 0.1366 (0.1456), while that for FSU countries is a much larger value of 0.3713 (0.4484). In other words, service firms in FSU countries faced a risk of management failure almost 3 times greater than that of their counterparts in Central Europe. With regard to companies in East European and Baltic countries, they had almost the same level of failure risk (0.2353 (0.2634) versus 0.2337 (0.2599)), which is at an intermediate level between Central European and FSU countries. Panels (a) and (b) in **Figure 1** display time series changes in firm survivability in all 17 emerging economies and by country group, respectively. The log-rank test for equality of survivor functions for the four country groups strongly rejects the null hypothesis (χ^2=4131.51, p=0.000) and, hence, backs up the above findings. To sum up, the above results imply that transformation to a democratic and market-oriented system strongly affected the destiny of service firms in the former socialist emerging economies.

According to **Table 2** and Panel (c) in **Figure 1**, there are certain differences in the survivability of service firms depending on the sectors they belong to: The exit rate (Nelson-Aalen cumulative hazard function) for wholesale and retail trade sector shows the highest value of 0.3521 (0.4206) among 7 sectors, while the accommodation and food service sectors have the lowest failure risk of 0.2203 (0.2443). The log-rank test for the 7 sectors rejects the null hypothesis (χ^2=1223.63, p=0.000), suggesting that the impact of European crises varied not only between country groups but also within the service industry. Therefore, in the next section, we report results based on the Cox model by country groups and sectors, in addition to aggregate estimates.

4. Results of survival analysis

The overall picture is presented in **Table 3**, where in the first three columns we report the aggregate results across all 17 countries and then contrast them with specific outcomes by country groups. In **Table 4**, we show results across NACE-defined sectors. On the whole, a high value of Harrell's C-statistic indicates sufficient explanatory power of the fitted models reported in these tables.

Ownership structure plays an important role with respect to the survival rate, in that large shareholding is the single most important exit-preventive factor (**Table 3**) with its impact well leveled across sectors (**Table 4**). Its impact is the strongest among firms from Eastern Europe, as the coefficient (0.1975) is way below the threshold of 1.0; in other groups, the effect is comparable. This finding underlines the significance of the extent of control that large shareholding represents: through management and the supervisory board, majority ownership facilitates more direct executive control of the company, which translates into its efficiency (Hanousek et al., 2015), especially in owner-controlled firms (Durand and Vargas, 2003).

A complementary finding shows a similarly preventive role of foreign ownership, albeit with lower impact then the extent of control. However, country group results reveal that the position of foreign ownership pertains only to the FSU group; otherwise, coefficients are statistically insignificant. Similarly, foreign ownership improves the survival rate for firms operating in trade, transportation, and storage (**Table 4**, Models [1] and [2]); for other sectors, coefficients are statistically insignificant. Further, aggregate results indicate that the economic significance of foreign ownership is low when progress in enterprise reforms or democratization is accounted for and whose economic impact on firm survival is substantial (**Table 3**, Models [2] and [3]). The above results intuitively match. In emerging markets, foreign owners are documented to bring not only investments to firms, but also better management practices and improved corporate governance, that substitute for less developed institutions (Estrin et al., 2009). Thus, foreign owners bring reforms on a micro level (Model [1]), and they likely substitute for the impact of economic and political reforms when these factors are added into the specifications (Models [2] and [3]).

Firm performance variables exhibit mostly economically insignificant effects (**Table 3**). Relative profitability, measured by ROA, has neutral impact on firm survival, as the

coefficients oscillate around 1.0 across all country groups (or sectors). Similarly, a firm's solvency shows a less than negligible exit-preventive effect. On the other hand, firms with higher labor productivity have better survival chances. While the effect is not dramatically large, it is far from being marginal and correlates well with the predictions of Melitz (2003) and the findings of Esteve-Pérez and Mañez-Castillejo (2008). The largest exit-preventive impact can be found for firms operating in trade, transportation, and storage, plus those engaged in scientific and technical activities (**Table 4**). This finding underscores the significance of productivity in service firms as exit-preventing factor, since Duarte and Restuccia (2010) document the increasing role of services in determining cross-country aggregate productivity outcomes.

Finally, the size of a firm on the aggregate level shows a marginally negative effect that is driven by the results of the FSU group, though. This result might reflect difficulties with management and the operation of larger units that historically dominated the FSU economic landscape (Havlik and Iwasaki, 2017). On the other hand, larger firms in the Baltic and Eastern European groups have better or neutral survival chances, respectively; this finding reflects similar results in the literature (Varum and Rocha, 2012). The age of a firm mildly improves its survival chances (**Table 3**) irrespective of the sector (**Table 4**). Age brings stability, but since the coefficients of its squared term equal one, it seems not to matter how old a firm gets.

As a robustness check, we estimated alternative parametric survival models and found that their estimates are quite similar to those of the Cox model (see **Appendix**).

5. Conclusions

Employing firm-level data from 17 European emerging economies, we found that 39,557, or 31.3%, of 126,591 service firms had a failure of management during the period of 2007–2015, suggesting a strong blow caused by recent financial and political crises in the CEE and FSU regions. However, the magnitude of the crises greatly differed among regions, perhaps due to the remarkable gap in the progress of economic and political transformation. Furthermore, the results of survival analysis revealed that large shareholding, labor productivity, and firm age significantly impacted firm survival beyond the difference in regions and sectors. These findings provide specific insights into the consequences of the European crises in emerging economies.

References

Alfaro, L., Chen, M. X., 2012. "Surviving the Global Financial Crisis: Foreign Ownership and Establishment Performance." *American Economic Journal: Economic Policy* 4(3): 30-55.

Brada, J. C., Wachtel, P. (eds.), 2016. *Global Banking Crisis and Emerging Markets*. Palgrave Macmillan, New York.

Dai, M., Harris, R., Lu, Y., Liu, H., 2016. "Exports and Firm Survival: Do Trade Regime and Productivity Matter?" *Applied Economics Letters* 23(6): 457-460.

Duarte, M., Restuccia, D., 2010. "The Role of the Structural Transformation in Aggregate Productivity." *Quarterly Journal of Economics* 125(1): 129-173.

Durand, R., Vargas, V., 2003. "Ownership, Organization, and Private Firms' Efficient Use of Resources." *Strategic Management Journal* 24(7): 667-675.

Esteve-Pérez, S., Mañez-Castillejo, J. A. 2008. "The Resource-based Theory of the Firm and Firm Survival." *Small Business Economics* 30(3): 231-249.

Estrin, S., Hanousek, J., Kočenda, E., Svejnar, J., 2009. "Effects of Privatization and Ownership in Transition Economies." *Journal of Economic Literature* 47(3): 699-728.

Hanousek, J., Kočenda, E., Shamshur, A. 2015. "Corporate Efficiency in Europe." *Journal of Corporate Finance* 32: 24-40

Havlik, P., Iwasaki, I. (eds.), 2017. *Economics of European Crises and Emerging Markets*. Palgrave Macmillan, Singapore.

Lanine, G., Vander Vennet, R. 2007. "Microeconomic Determinants of Acquisitions of Eastern European Banks by Western European Banks." *Economics of Transition* 15(2): 285-308.

Liu, X. 2012. *Survival Analysis: Models and Applications*. John Wiley & Sons: Chichester.

Manjón-Antolín, M. C., Arauzo-Carod, J. M., 2008. "Firm Survival: Methods and Evidence." *Empirica* 35(1): 1-24.

Melitz, M. J., 2003. "The Impact of Trade in Intra-industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71: 1695–1725.

Varum, A. C., Rocha, V. C., 2012. "The Effect of Crisis on Firm Exit and the Moderating Effect of Firm Size." *Economics Letters* 114(1): 94-97.

Wise, C., Armijo, L. E., Katada, S. N. (eds.), 2015. *Unexpected Outcomes: How Emerging Markets Survived the Global Financial Crisis*. Brookings Institute Press, New York.

Table 1. Definitions and descriptive statistics of covariates used in the empirical analysis

Variable name	Definition [a]	Descriptive statistics		
		Mean	S.D.	Median
Large shareholding	Dummy for firms with a dominant and block shareholder(s)	0.8207	0.3836	1
Foreign ownership	Dummy for ultimate ownership of foreign investors	0.0369	0.1886	0
ROA	Return on total assets (%) [b]	9.9162	20.4993	5.5500
Labor productivity	Natural logarithm of operating revenue per employee in Euros	-0.1337	1.6343	-0.1462
Solvency ratio	Solvency ratio (%) [c]	33.7765	34.3356	28.8000
Size	Natural logarithm of total number of employees	4.1920	0.9471	4.0073
Age	Years in operation since the company's establishment	9.6097	9.5192	8
Age^2	Squared value of the Age variable	182.9596	1502.6760	64
Enterprise reform	EBRD index of enterprise reform [d]	2.5204	0.5060	2.3000
Democracy	Freedom House index of democracy [e]	3.2502	0.7957	2.7500

Notes :

[a] Values in 2006

[b] Computed using the following formula: (profit before tax/total assets) × 100

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

[d] It is a five-grade index ranging from 1 to 4+. A score of 1 denotes a marginal reform, while a score of 4+ denotes a high reform level similar to the standards and performance typical of advanced industrial economies.

[e] Computed by 7 minus the value of the original index, which ranges from 1.00 (best) to 7.00 (worst)

Source : Covariates from large shareholding to Age^2 were extracted from the Bureau van Dijk (BvD) Orbis database (https://webhelp.bvdep.com). Covariates of enterprise reform and democracy were obtained from the website of the European Bank for Reconstruction and Development (EBRD) and the Freedom House (http://www.ebrd.com/home; https://freedomhouse.org/).

Table 2. Survival status of 126,591 service firms in 17 European emerging economies: 2007–2015

	Number of firms operating at the end of 2006 (a)	Number of failed firms by the end of 2015 (b)	Exit rate (b/a)	Nelson-Aalen cumulative hazard function			
				Coef.	S.E.	[95% confidence interval]	
All 17 European emerging economies	126,591	39,557	0.3125	0.3650	0.0018	0.3614	0.3686
Breakdown by country group							
Central European countries [a]	17,946	2,452	0.1366	0.1456	0.0029	0.1400	0.1515
Eastern European countries [b]	18,603	4,378	0.2353	0.2634	0.0040	0.2557	0.2713
Baltic countries [c]	5,153	1,204	0.2337	0.2599	0.0075	0.2456	0.2751
FSU countries [d]	84,889	31,523	0.3713	0.4484	0.0025	0.4435	0.4534
Breakdown by sector (NACE Rev. 2 section)							
Wholesale and retail trade (Section G)	68,549	24,135	0.3521	0.4206	0.0027	0.4153	0.4260
Transportation and storage (Section H)	11,744	3,306	0.2815	0.3230	0.0056	0.3121	0.3342
Accommodation and food service activities (Section I)	5,303	1,168	0.2203	0.2443	0.0072	0.2307	0.2588
Information and communication (Section J)	6,299	1,693	0.2688	0.3064	0.0075	0.2921	0.3214
Real estate activities (Section L)	8,498	2,677	0.3150	0.3688	0.0072	0.3550	0.3831
Professional, scientific, and technical activities (Section M)	11,277	2,895	0.2567	0.2905	0.0054	0.2801	0.3013
Other service industries (Sections N–S)	14,921	3,683	0.2468	0.2784	0.0046	0.2695	0.2875

Notes:

[a] Czech Republic, Hungary, Poland, Slovakia

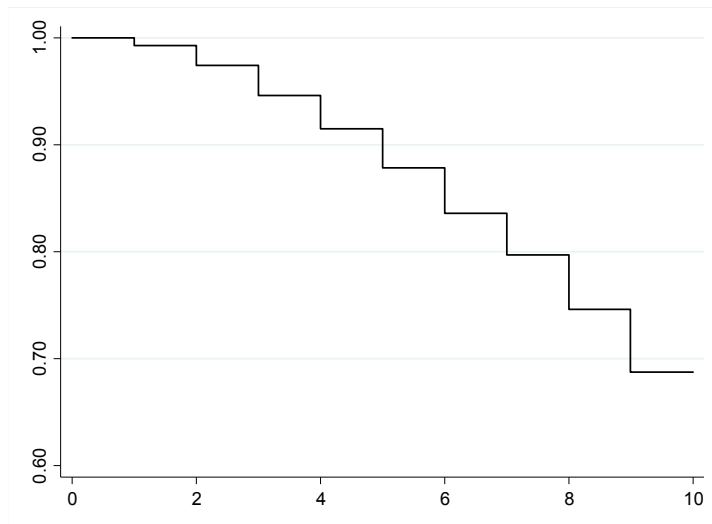[b] Bosnia, Bulgaria, Croatia, Macedonia, Montenegro, Romania, and Serbia

[c] Estonia, Latvia, and Lithuania
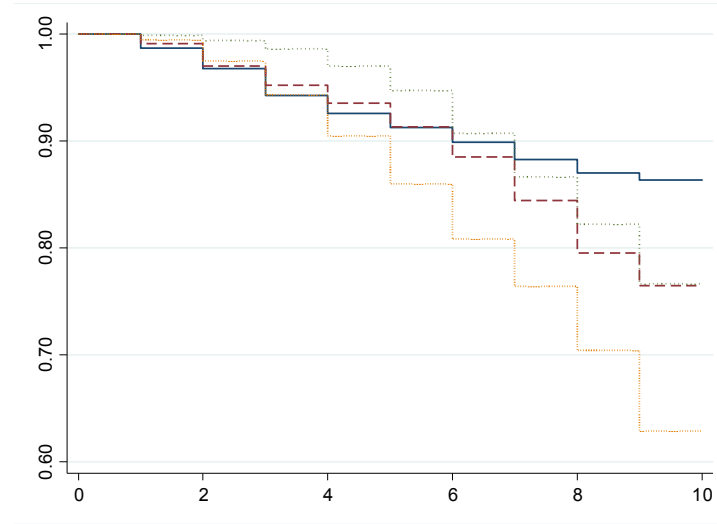
[d] Moldova, Russia, and Ukraine

Source: Authors' estimations

Fig. 1. Kaplan-Meier survival function by country group and sector[a]

(a) All 17 European emerging economies

(b) Country group — Central European countries (solid); Eastern European countries (dashes); Baltic countries (dots); FSU countries (tight dots)

Log-rank test for equality of survivor functions: $\chi^2 = 4131.51$, $p = 0.000$

(c) Sector (NACE Rev. 2 section) — Section G (solid); Section H (dashes); Section I (dots); Section J (tight dots); Section L (long dashes); Section M (short dashes); Sections N –S (long dashes and dots)
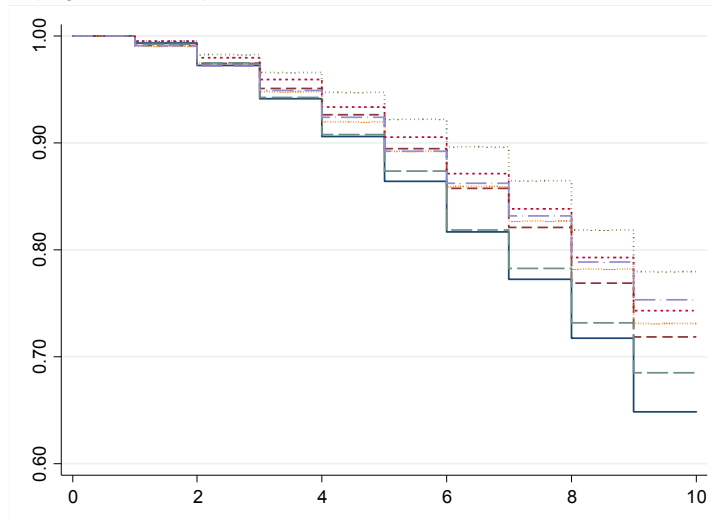
Log-rank test for equality of survivor functions: $\chi^2 = 1223.63$, $p = 0.000$

Note: The industrial classification in Panel (c) corresponds with the sectoral breakdown in Table 2.

Source: Authors' estimations

Table 3. Results of survival analysis for 17 European emerging economies and by country group

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Target country	All 17 European emerging economies			Central European countries [a]	Eastern European countries [b]	Baltic countries [c]	FSU countries [d]
Large shareholding	0.3162 ***	0.3199 ***	0.3030 ***	0.2535 ***	0.1975 ***	0.2446 ***	0.3216 ***
	(-79.68)	(-78.14)	(-82.60)	(-19.50)	(-37.26)	(-16.83)	(-69.65)
Foreign ownership	0.8227 ***	0.9227 *	0.9941 *	0.9763	1.1291	0.7320	1.1248 *
	(-4.28)	(-1.75)	(-1.83)	(-0.20)	(1.46)	(-1.36)	(1.72)
ROA	1.0033 ***	1.0023 ***	1.0016 ***	0.9956	1.0037 **	0.9855 ***	1.0014 ***
	(7.15)	(4.77)	(3.43)	(-1.21)	(2.14)	(-3.28)	(2.73)
Labor productivity	0.8747 ***	0.8910 ***	0.8989 ***	0.9898	0.8619 ***	1.0009	0.8977 ***
	(-29.77)	(-24.74)	(-22.75)	(-0.49)	(-9.63)	(0.03)	(-20.33)
Solvency ratio	0.9916 ***	0.9915 ***	0.9917 ***	0.9918 ***	0.9884 ***	0.9917 ***	0.9927 ***
	(-32.05)	(-33.23)	(-32.69)	(-6.87)	(-12.48)	(-4.03)	(-26.47)
Size	1.0850 ***	1.0889 ***	1.0799 ***	0.9588	1.0480 **	0.8764 **	1.1025 ***
	(11.84)	(12.35)	(11.13)	(-1.22)	(1.98)	(-2.42)	(12.90)
Age	0.9370 ***	0.9432 ***	0.9456 ***	0.9677 ***	0.9614 ***	0.9727 **	0.9314 ***
	(-34.13)	(-29.75)	(-28.68)	(-6.53)	(-8.17)	(-2.34)	(-32.92)
Age^2	1.0001 ***	1.0001 ***	1.0001 ***	1.0001 ***	1.0003 ***	1.0000	1.0003 ***
	(27.79)	(24.99)	(24.08)	(6.97)	(6.27)	(-0.13)	(17.89)
Enterprise reform		0.6684 ***					
		(-22.25)					
Democracy			0.7228 ***				
			(-26.74)				
Country-level fixed effects	Yes	No	No	Yes	Yes	Yes	Yes
NACE division-level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	84772	84772	84772	9671	10440	2975	61686
Log pseudolikelihood	-276733.03	-276485.98	-276341.37	-8891.28	-20700.21	-4606.41	-226869.05
Harrell's C-statistic	0.7121	0.7166	0.7175	0.7004	0.7169	0.7492	0.6948
Wald test (χ^2)	14029.94 ***	14469.20 ***	15207.85 ***	17760.70 ***	13938.90 ***	47663.11 ***	10794.58 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Table 1 provides detailed definitions and descriptive statistics of the covariates. 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.

[a] Czech Republic, Hungary, Poland, and Slovakia

[b] Bosnia, Bulgaria, Croatia, Macedonia, Montenegro, Romania, and Serbia

[c] Estonia, Latvia, and Lithuania

[d] Moldova, Russia, and Ukraine

Source: Authors' estimations

Table 4. Results of survival analysis by sector

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Target sector (NACE Rev. 2 section)	Wholesale and retail trade (Section G)	Transportation and storage (Section H)	Accommodation and food service activities (Section I)	Information and communication (Section J)	Real estate activities (Section L)	Professional, scientific, and technical activities (Section M)	Other service industries (Sections N–S)
Large shareholding	0.2977 ***	0.2978 ***	0.3894 ***	0.4329 ***	0.3348 ***	0.3420 ***	0.3617 ***
	(-67.70)	(-23.01)	(-10.09)	(-10.90)	(-17.03)	(-20.94)	(-18.95)
Foreign ownership	0.7855 ***	0.6411 ***	1.0375	1.0463	1.2582	0.8474	0.7985
	(-3.82)	(-2.73)	(0.14)	(0.36)	(1.03)	(-1.24)	(-1.41)
ROA	1.0040 ***	1.0078 ***	0.9972	1.0001	1.0022	1.0007	1.0037 ***
	(6.35)	(4.70)	(-1.21)	(0.07)	(1.24)	(0.47)	(2.72)
Labor productivity	0.8752 ***	0.8767 ***	0.9618	0.9219 ***	0.9063 ***	0.8550 ***	0.9241 ***
	(-24.06)	(-7.64)	(-1.25)	(-3.57)	(-5.10)	(-9.95)	(-4.30)
Solvency ratio	0.9902 ***	0.9913 ***	0.9966 ***	0.9946 ***	0.9946 ***	0.9929 ***	0.9939 ***
	(-25.99)	(-10.50)	(-2.77)	(-4.98)	(-6.20)	(-8.13)	(-7.68)
Size	1.0861 ***	1.0409 *	1.0391	1.1322 ***	1.1442 ***	1.0493 *	1.0254
	(9.75)	(1.67)	(0.77)	(3.76)	(4.06)	(1.85)	(0.98)
Age	0.9179 ***	0.9693 ***	0.9443 ***	0.9300 ***	0.9400 ***	0.9243 ***	0.9382 ***
	(-37.56)	(-5.64)	(-5.28)	(-8.01)	(-4.10)	(-12.51)	(-9.24)
Age^2	1.0006 ***	1.0001 ***	1.0006 ***	1.0006 ***	1.0002	1.0006 ***	1.0001 ***
	(17.60)	(5.68)	(4.18)	(6.47)	(0.36)	(9.17)	(9.04)
Country-level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE division-level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	50915	6851	2652	4267	4455	8119	7513
Log pseudolikelihood	-179500.88	-14853.62	-4319.01	-8400.66	-9408.53	-16290.02	-14003.42
Harrell's C-statistic	0.7148	0.6928	0.6478	0.6634	0.6747	0.7126	0.6984
Wald test (χ^2)	10909.68 ***	886.31 ***	174.40 ***	332.03 ***	502.49 ***	1229.14 ***	749.10 ***

Notes: This table contains results from the survival analysis using the Cox proportional hazards model. Table 1 provides detailed definitions and descriptive statistics of the covariates. 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' estimations

Appendix. Estimation results of parametric survival models for robustness check

Model	Table 3 Model [1]	[1]	[2]	[3]	[4]	[5]	[6]
Assumption of survival distribution	Cox propotional hazards	Exponential	Weibull	Gompertz	Log-normal	Log-logistic	Generalized gamma
Large shareholding	0.3162 ***	0.3636 ***	0.2996 ***	0.3004 ***	0.6559 ***	0.6036 ***	0.5858 ***
	(-79.68)	(-80.35)	(-77.99)	(-77.78)	(69.99)	(74.69)	(73.90)
Foreign ownership	0.8227 ***	0.8147 ***	0.8162 ***	0.8146 ***	0.0761 ***	0.0857 ***	0.0932 ***
	(-4.28)	(-4.64)	(-4.36)	(-4.39)	(3.23)	(3.85)	(4.20)
ROA	1.0033 ***	1.0031 ***	1.0035 ***	1.0035 ***	-0.0019 ***	-0.0017 ***	-0.0017 ***
	(7.15)	(7.04)	(7.19)	(7.18)	(-7.25)	(-7.11)	(-7.23)
Labor productivity	0.8747 ***	0.8809 ***	0.8689 ***	0.8686 ***	0.0768 ***	0.0690 ***	0.0681 ***
	(-29.77)	(-30.02)	(-29.83)	(-29.84)	(28.47)	(29.03)	(29.65)
Solvency ratio	0.9916 ***	0.9922 ***	0.9913 ***	0.9912 ***	0.0046 ***	0.0042 ***	0.0042 ***
	(-32.05)	(-31.65)	(-32.06)	(-32.06)	(29.83)	(30.87)	(32.04)
Size	1.0850 ***	1.0720 ***	1.0911 ***	1.0910 ***	-0.0423 ***	-0.0396 ***	-0.0417 ***
	(11.84)	(10.83)	(12.09)	(12.07)	(-10.27)	(-10.76)	(-11.88)
Age	0.9370 ***	0.9410 ***	0.9340 ***	0.9340 ***	0.0284 ***	0.0316 ***	0.0323 ***
	(-34.13)	(-33.44)	(-34.56)	(-34.54)	(21.98)	(31.22)	(33.20)
Age^2	1.0001 ***	1.0001 ***	1.0001 ***	1.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***
	(27.79)	(26.78)	(28.47)	(28.47)	(-7.30)	(-7.05)	(-26.52)
Country-level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NACE division-level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	74308	74308	74308	74308	74308	74308	74308
Log pseudolikelihood	-276733.03	-61038.66	-54793.46	-55943.11	-55524.67	-54877.45	-54775.80
Wald test (χ^2)	14029.94 ***	15578.40 ***	13379.35 ***	13317.52 ***	10860.09 ***	12094.65 ***	11557.85 ***

Notes : This table contains results from the survival analysis using 6 parametric estimators for a robustness check. Table 1 provides detailed definitions and descriptive statistics of the independent variables. Models [1] to [3] report hazard ratios, while Models [4] to [6] report regression coefficients. 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' estimations