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UNDERSTANDING ORGANIZATIONAL RESILIENCE: A CROSS-COUNTRY ANALYSIS OF FACTORS INFLUENCING ORGANIZATIONAL MORTALITY

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ABSTRACT

This study delves into organizational resilience by investigating the factors contributing to organizational mortality, with a focus on the interplay between internal (endogenous) and external (exogenous) influences. Drawing on concepts from organizational ecology, the research seeks to provide a clearer understanding of how these factors impact the survival and adaptability of organizations. The study employs advanced techniques such as data mining, multiple linear regression, and Multivariate Adaptive Regression Splines (MARSplines) to analyze both stimulators and inhibitors of organizational mortality. The findings reveal that internal factors, particularly organizational size, significantly increase mortality risks. As organizations grow, they often face complexities, bureaucratic inefficiencies, and slower adaptability, which can make them more vulnerable to failure. On the external side, factors such as economic conditions, social dynamics, and morphological aspects play a critical role in determining organizational survival. However, certain factors—such as GDP per capita, emigration dynamics, and the number of hours worked per week—act as protective elements, reducing the likelihood of organizational mortality. This research offers a holistic approach by integrating insights from organizational ecology, finance, and management, providing a comprehensive view of how various factors interact to influence organizational resilience. It highlights the importance of understanding the non-linear and dynamic relationships between these factors over time, offering valuable insights for managers and strategists who aim to strengthen organizational survival. While the findings offer important implications, further research is recommended to validate the results and deepen our understanding of organizational mortality and resilience dynamics.

Keywords: cross-country analysis; organizational mortality; organizational resilience; morphological factors; social factors; economic factors; organizational factors; organizational ecology

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INTRODUCTION

Organizational mortality, the phenomenon of firms ceasing to exist, has long intrigued scholars in the field of organizational ecology. Understanding the factors influencing organizational mortality is crucial for developing strategies to enhance organizational resilience and longevity. While recent research has shown a growing interest in organizational resilience (Duchek, 2020; Do et al., 2022), empirical studies based on primary data remain scarce, leaving the field potentially underexplored (Hillman & Guenter, 2021). Organizational mortality and organizational resilience are closely intertwined. Organizations that invest in building resilience can better withstand disruptions, innovate, and adapt, ultimately reducing mortality risk and increasing their chances of long-term success. This study draws inspiration from seminal works in organizational ecology and aims to shed light on the interplay of endogenous and exogenous factors affecting organizational mortality. The study aims to understand the significant factors influencing organizational mortality and their manageability.

LITERATURE REVIEW

The field of organizational ecology emerged in the 1970s as a response to the need for a better understanding of the dynamics of organizations within their broader environments. It departed from traditional perspectives that primarily focused on internal factors such as leadership, strategy, and structure and instead placed greater emphasis on the external forces that shape organizational outcomes. Early studies in organizational ecology, such as the seminal work by Hannan and Freeman (1977), explored the population-level patterns of organizational mortality, highlighting density dependence and isomorphism's role (Hannan & Freeman, 1977). Over time, the field expanded, investigating factors like type of organization, their size, and organizational niche (Baum & Singh, 1994), the age and size of organizations (Hannan, 1998; Aldrich & Wiedenmayer, 1993; Audia & Greve, 2006), environmental dynamism, including technological advancements, regulatory changes, market shifts, niche-related factors, and competitive forces (Carley, 1997; Baum & Singh, 1994), resource dependence of the organizations (Pfeffer, & Salancik, 2003; Audia & Greve, 2006), strategic choice and decision-making patterns (Brunsman & Sharfman, 1993), adaptive strategies (Eisenhardt & Schoonhoven, 1990), and the ability to balance exploitation and exploration in reducing mortality risks and enhancing organizational resilience (O'Reilly III & Tushman, 2011).

Although the debate between environmental determinists and proponents of strategic choice goes on, there is still a lack of understanding of organizational resilience and mortality, key influencing factors, and their manageability. For instance, why do some organizations facing the same conditions in competitive markets fail while others succeed (Flamholtz & Aksehirli, 2000)? To answer this question, Tushman and Anderson (2001) examined the concept of "punctuated equilibrium" in the context of organizational mortality with an emphasis on sudden disruptions, leading to increased mortality risks for organizations that fail to adapt. On the contrary, the opponents argue that the internal capabilities of organizations need to be developed to empower them to respond effectively to unforeseen events and seize opportunities that may pose potential threats (Duchek, 2020). Some studies have embraced both perspectives, recognizing the roles of external factors and internal choices (Do et al., 2022). Additional notable works in this domain include Carmeli and Markman (2011), who discussed the importance of leadership and strategic agility in fostering organizational resilience, and Linnenluecke (2017), who reviewed the role of cultural and structural flexibility in resilience. Lastly, the work of Thornhill, White, and Raynor (2021) challenged traditional views by highlighting the 'spikey' nature of firm performance and its implications for resilience strategies. The recent study by Hillman and Guenter (2021) underscored the growing interest in organizational resilience. By combining the findings of fundamental works (Hannan & Freeman, 1977; Preisendörfer & Voss, 1990) and recent studies mentioned above, this study seeks to deepen the understanding of organizational resilience and mortality. However, a theoretical gap remains in considering the impact of individual organizations' exogenous and endogenous factors from an ecological perspective. The key research question is: what are the exogenous and endogenous factors that help organizations overcome mortality risks and enhance resilience?

Taking into account the primary debates in organizational ecology and the gaps identified in the literature, we propose the following hypotheses for our research.

H1: Endogenous factors related to organizational shape, size, and property type significantly impact organizational mortality.

Justification: The literature in organizational ecology highlights the importance of internal organizational characteristics, such as size and type, in determining mortality outcomes (Baum & Singh, 1994; Hannan, 1998). Organizations vary widely in their structures and resources, which can influence their ability to adapt and survive in changing environments. Studies have shown that organizational shape and property type can affect resilience by dictating how resources are allocated and how flexible the organization can be in response to external pressures.

H0: Exogenous factors, specifically economic and social factors of development, significantly increase mortality risks for organizations.

Justification: The field has long recognized the role of external environmental factors, such as economic conditions and social developments, in shaping organizational outcomes (Hannan & Freeman, 1977; Carley, 1997). Economic downturns, regulatory changes, and market shifts are critical exogenous factors that can increase mortality risks by creating challenges that require significant adaptation. The concept of "punctuated equilibrium" (Tushman & Anderson, 2001) emphasizes how sudden disruptions in the external environment can drastically affect organizational survival.

H2: Certain combinations of endogenous and exogenous factors have a greater significance in influencing organizational mortality than either set of factors alone.

Justification: While both internal and external factors individually impact organizational mortality, their interaction can provide a more comprehensive understanding of resilience and failure (Do et al., 2022). Organizations must navigate both internal capabilities and external challenges simultaneously, and the synergy between these factors often determines their overall resilience. For instance, a well-structured organization (endogenous factor) might better withstand economic downturns (exogenous factor), illustrating the compounded effect of these interactions. Recent studies, such as those by Hillman and Guenter (2021), have stressed the importance of examining these dynamics together to understand organizational mortality fully.

METHODOLOGY AND THE MAIN OUTCOMES

Data Collection and Analysis

The use of data mining in this research is validated by the need to analyze and understand the multifaceted factors influencing organizational mortality comprehensively. Given the complex interplay between organizational, morphological, economic, and social factors, data mining techniques provide a robust methodology for uncovering patterns and relationships that might not be evident through traditional analysis methods. Using secondary data, the authors categorized factors into four groups: organizational, morphological, economic, and social.

Research methods. The determination of relevant factors influencing enterprises' mortality (mortality rate) was conducted using the Sigma-restricted parameterization method (Univariate Tests of Significance and Pareto Chart of t-values) and correlation analysis. Multiple linear regression was constructed using the OLS method to quantitatively formalize the direction and degree of variation in organizational mortality of enterprises under the influence of relevant factors. A model of the relationship between the organizational mortality of enterprises and dependent variables with non-monotonic characteristics, which predict the possibility of regression switching points, was constructed using multivariate adaptive regression splines (MARSplines). The features of the impulsiveness of variation in organizational mortality of enterprises under the influence of relevant factors, considering lagged effects, were investigated based on vector autoregressive modeling.

Assessment procedure and results

The assessment procedure had five stages. The first stage involved data mining and secondary data collection for further analysis. At the second stage, sigma-restricted parameterization and correlation analysis were performed to determine relevant factors among chosen and select the set of key factors of organizational mortality. The third stage was devoted to the identification of the strength and impact analysis of relevant factors of organizational mortality via the OLS method. At the fourth stage, MARSplines were developed for the organizational mortality model. The fifth stage was designed as vector autoregressive modeling to reveal the impulsivity of variations in organizational mortality under the influence of relevant factors with consideration of lagged effects.

Stage 1. The data collection and structuring. At this stage, a list of statistical data on organizational mortality was formed for twelve countries (Bulgaria, Greece, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia, North Macedonia, Serbia, and Turkey) from 2009 to 2018. The year 2018 was selected as the last one to avoid the COVID-19 effect on mortality, gaining unbiased data. Four groups of indicators were created.

Organizational factors (L), which include the Death rate, the number of enterprise deaths in the reference period (t) distributed by the number of enterprises active in t period divided by proprietorship type into three subgroups: Subgroup 1 - Sole Proprietorship, L1; Subgroup 2 - Partnerships, Co-operatives, and Associations, L2; Subgroup 3 - Limited Liability Enterprise, L3.

Morphological factors (M) are related to the size and age of the organization. In different countries, the typology of sizes is quite different; in the current research, we chose size as a solid indicator of the number of employees. This group includes organizational mortality rates in four subgroups divided by the number of employees: Subgroup 1 - where the number of employees is zero, M1; Subgroup 2, where the number of employees is from one to four, M2; Subgroup 3, where the number of employees is from five to nine employees, M3; and Subgroup 4 – where number is more than ten employees, M4.

We have assumed that organizational mortality may be affected by the business environmental dynamic. The economic factors (E) include GDP per capita, E1; business investment share of GDP, E2; value added, E3; venture capital investments, E4; Household investment share of GDP, E5.

Social factors (S) may affect organizational mortality and resilience too, and consist of Emigration, S1; Gross Average Monthly Wages, S2; Total unemployment rate, S3; Hours worked per week of full-time employment, S4.

Stage 2. The identification of the relevant factors influencing organizational mortality. The implementation of this stage involved using Univariate Tests of Significance and a Pareto Chart of t-Values for the coefficients of the generalized regression model depicting the relationship between organizational mortality of enterprises and organizational, morphological, economic, and social factors (Figures 1-3). To execute this stage, the Statistics, Advanced Linear/Nonlinear Models, GRM Results toolkit was utilized.

Effect	Univariate Tests of Significance for Yd (Spreadsheet1.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	9,318935E+10	1	9,318935E+10	10,52046	0,001652
L1	2,498444E+10	1	2,498444E+10	2,82058	0,096493
L2	7,891531E+10	1	7,891531E+10	8,90902	0,003644
L3	9,653125E+09	1	9,653125E+09	1,08977	0,299287
Error	8,060702E+11	91	8,857915E+09		

Figure 1: One-factor test of the significance of the influence of organizational factors (L1, L2, L3) on organizational mortality.

Source: authors' work

Figure 1 presents the results of the one-factor test of the significance of the influence of organizational factors on organizational mortality, and it can be argued that only one effect, "Death rate" in the direction of "Partnership, Cooperatives, and Associations, L2" is statistically significant. The significance level (p-value) of Fisher's criterion for this effect is

0.0036, which is below the critical threshold of 0.05. This specific effect contributes the most to the overall model, as evidenced by the sum of squares of deviations (SS) being 7.89*10^10, the highest value. The contributions of other effects, namely "Sole proprietorship, L1," and "Limited Liability Enterprise, L3," are statistically insignificant. The confirmation of the significance of only one effect, L2, is reflected in the Pareto chart of t-values of the influence of organizational factors on organizational mortality (Figure 2), where only one bar (L2) intersects the critical threshold (red line).

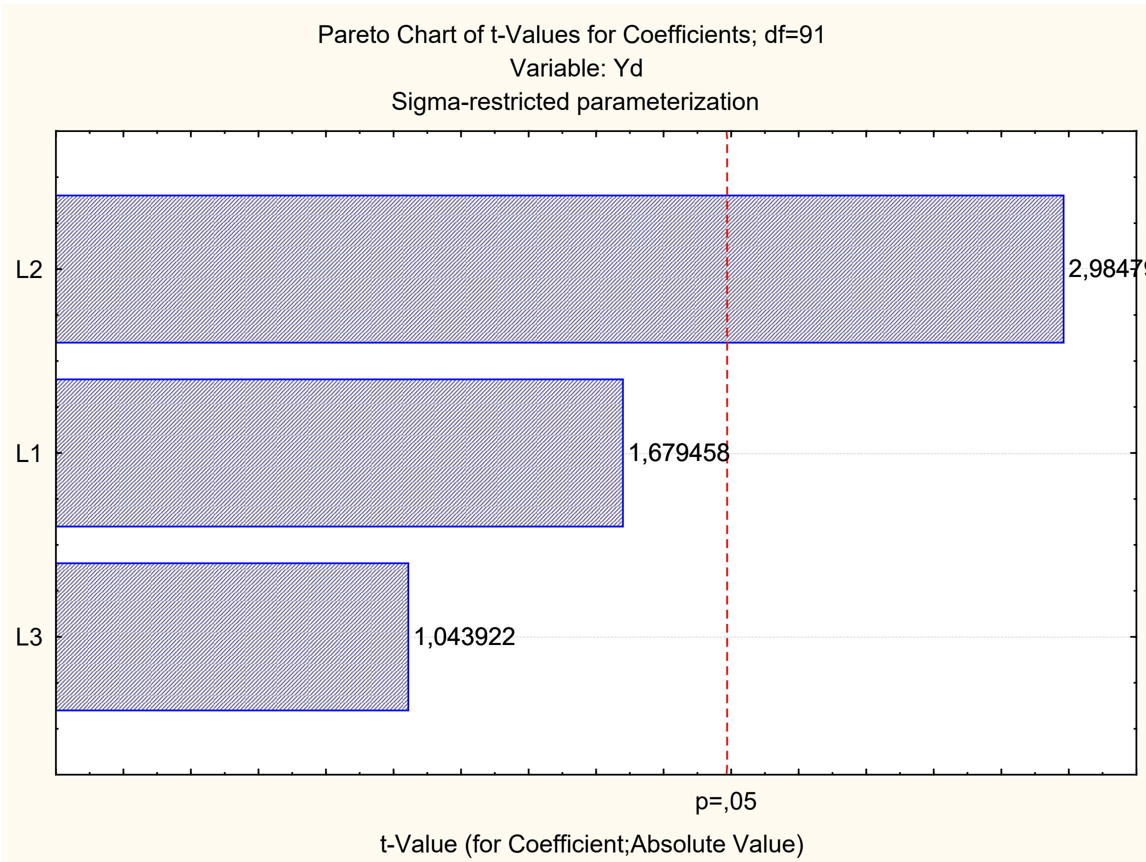


Figure 2: Pareto Chart of t-Values of the significance of the influence of organizational factors (L1, L2, L3) on organizational mortality.

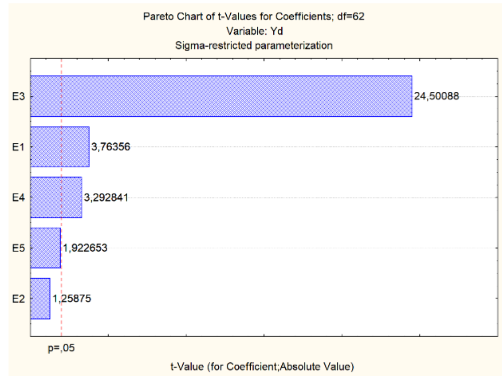
Source: authors' work

The Pareto chart (Figure 2) not only allows the identification of statistically significant effects of organizational mortality but also arranges them from the most influential to the least influential. This tool provides a graphical visualization of the 80/20 rule, highlighting the 80% of influential organizational factors, particularly L2, which is deemed relevant and proposed for further investigation.

The next steps were to replicate the same method for the economic, social, and morphological factors analysis and their impact on organizational mortality. The results of the one-factor test of the significance and Pareto chart of t-Values for these factors are presented in Figure 3.

Effect	Univariate Tests of Significance for Yd (Spreadsheet1.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	3,727603E+09	1	3,727603E+09	12,5416	0,000762
E1	4,209926E+09	1	4,209926E+09	14,1644	0,000374
E2	4,709290E+08	1	4,709290E+08	1,5845	0,212840
E3	1,784186E+11	1	1,784186E+11	600,2931	0,000000
E4	3,222688E+09	1	3,222688E+09	10,8428	0,001641
E5	1,098699E+09	1	1,098699E+09	3,6966	0,059120
Error	1,842758E+10	62	2,972191E+08		

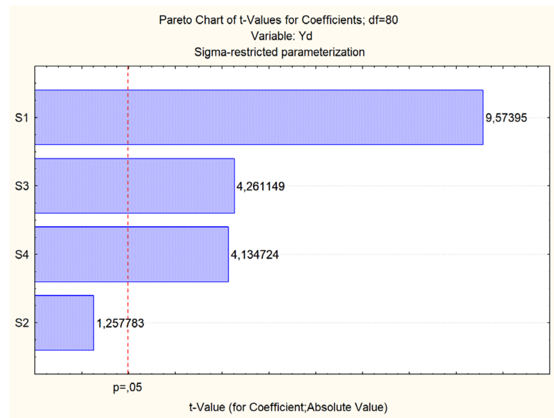
(a)



b)

Effect	Univariate Tests of Significance for Yd (Spreadsheet1.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	1,627976E+10	1	1,627976E+10	17,06278	0,000088
S1	8,745416E+10	1	8,745416E+10	91,66051	0,000000
S2	1,509419E+09	1	1,509419E+09	1,58202	0,212129
S3	1,732414E+10	1	1,732414E+10	18,15739	0,000055
S4	1,631140E+10	1	1,631140E+10	17,09594	0,000087
Error	7,632875E+10	80	9,541094E+08		

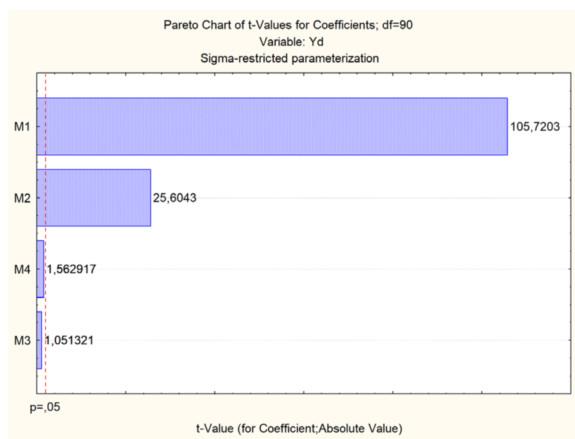
(c)



(d)

Effect	Univariate Tests of Significance for Yd (Spreadsheet1 M.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	6,041282E+06	1	6,041282E+06	1,03	0,312937
M1	6,557113E+10	1	6,557113E+10	11176,77	0,000000
M2	3,846114E+09	1	3,846114E+09	655,58	0,000000
M3	6,484363E+06	1	6,484363E+06	1,11	0,295926
M4	1,433073E+07	1	1,433073E+07	2,44	0,121582
Error	5,280059E+08	90	5,866733E+06		

(e)



(f)

Figure 3: One-factor test of the significance of the influence of economic factors (a), social factors (c), and morphological factors (e) on organizational mortality, and Pareto Chart of t-Values of their significance (b), (d), and (f) accordingly.

Source: authors' work

Based on the calculations (see Fig. 3), there are three statistically significant effects among economic factors: GDP per capita, E1; Value added, E3; and Venture capital investments, E4. The significance levels (p-values) of Fisher's criterion for these effects are 0.00037, 0.00000, and 0.00164, respectively, which are significantly below the critical threshold of 0.05.

Among these effects, E3 makes the largest contribution to the overall model, as evidenced by the sum of squares of deviations (SS) being 1.78*10^11, the highest value (see Fig. 3, a), confirmed by the Pareto chart for t-values (see Fig. 3, b). The confirmation of the significance of these three effects, E1, E3, and E4, is reflected in the Pareto chart of t-values of the influence of economic factors on organizational mortality (see Fig. 3, b), where the bars of E3, E1, and E4 intersect the critical threshold (red line).

The replication of the same method for the social factors analysis and their impact on organizational mortality is presented in Figure 3 (c, d), and the morphological factor analysis and its impact on organizational mortality is performed in Figure 3 (e, f) accordingly.

To determine relevant factors influencing the organizational mortality of enterprises (organizational, morphological, economic, and social factors), correlation analysis was performed (see Fig. 4). The correlation coefficients between the dependent variable Yd and the considered 16 factors indicate a strong relationship (not less than 0.7 in absolute value) between organizational mortality and factors M1, M2, M3, M4, E3, S1; a moderate relationship (ranging from 0.5 to 0.7 in absolute value) for one factor, S4; and a weak relationship (not less than 0.3 in absolute value) for the effects L1, E2, E5, S3. For further investigation of the impact of these factors on organizational mortality, it is necessary to consider only those indicators that have strong or moderate relationships. Additionally, analyzing the correlation dependencies for the subset of only the factor variables reveals a strong interrelationship among all factors within the morphological group, indicating the need to remove collinear factors from subsequent calculations. Considering the dependence of the factors within this group on the dependent variable and based on the results of sigma-restricted parameterization, it is suggested that only M1 and M2 be retained in the model.

Correlations (Spreadsheet1.sta)
Marked correlations are significant at p < ,05000
N=62 (Casewise deletion of missing data)

Variable	Yd	L1	L2	L3	M1	M2	M3	M4	E1	E2	E3	E4	E5	S1	S2	S3	S4
Yd	1,00	-0,30	-0,26	0,16	0,99	0,86	0,91	0,82	0,02	-0,40	0,95	-0,24	0,38	0,83	0,28	-0,34	0,55
L1	-0,30	1,00	0,16	0,05	-0,26	-0,45	-0,32	-0,31	-0,08	0,09	-0,42	-0,04	-0,09	-0,28	-0,24	0,23	-0,54
L2	-0,26	0,16	1,00	0,49	-0,25	-0,29	-0,21	-0,20	0,02	0,18	-0,30	-0,01	-0,23	-0,29	-0,33	-0,10	-0,25
L3	0,16	0,05	0,49	1,00	0,14	0,24	0,29	0,37	-0,18	0,37	0,17	-0,09	0,11	0,15	-0,44	-0,42	-0,33
M1	0,99	-0,26	-0,25	0,14	1,00	0,79	0,88	0,77	0,02	-0,39	0,92	-0,29	0,37	0,81	0,27	-0,30	0,54
M2	0,86	-0,45	-0,29	0,24	0,79	1,00	0,91	0,88	0,04	-0,36	0,90	0,01	0,34	0,75	0,27	-0,42	0,50
M3	0,91	-0,32	-0,21	0,29	0,88	0,91	1,00	0,96	-0,10	-0,29	0,89	-0,14	0,34	0,74	0,15	-0,39	0,44
M4	0,82	-0,31	-0,20	0,37	0,77	0,88	0,96	1,00	-0,09	-0,20	0,84	-0,11	0,31	0,65	0,11	-0,43	0,36
E1	0,02	-0,08	0,02	-0,18	0,02	0,04	-0,10	-0,09	1,00	-0,22	0,15	0,26	0,17	-0,09	0,59	-0,26	-0,01
E2	-0,40	0,09	0,18	0,37	-0,39	-0,36	-0,29	-0,20	-0,22	1,00	-0,38	0,08	0,03	-0,37	-0,49	-0,35	-0,48
E3	0,95	-0,42	-0,30	0,17	0,92	0,90	0,89	0,84	0,15	-0,38	1,00	-0,09	0,33	0,75	0,34	-0,42	0,52
E4	-0,24	-0,04	-0,01	-0,09	-0,29	0,01	-0,14	-0,11	0,26	0,08	-0,09	1,00	-0,30	-0,36	0,09	-0,15	-0,17
E5	0,38	-0,09	-0,23	0,11	0,37	0,34	0,34	0,31	0,17	0,03	0,33	-0,30	1,00	0,61	0,06	-0,50	-0,14
S1	0,83	-0,28	-0,29	0,15	0,81	0,75	0,74	0,65	-0,09	-0,37	0,75	-0,36	0,61	1,00	0,05	-0,31	0,38
S2	0,28	-0,24	-0,33	-0,44	0,27	0,27	0,15	0,11	0,59	-0,49	0,34	0,09	0,06	0,05	1,00	0,20	0,53
S3	-0,34	0,23	-0,10	-0,42	-0,30	-0,42	-0,39	-0,43	-0,26	-0,35	-0,42	-0,15	-0,50	-0,31	0,20	1,00	0,25
S4	0,55	-0,54	-0,25	-0,33	0,54	0,50	0,44	0,36	-0,01	-0,48	0,52	-0,17	-0,14	0,38	0,53	0,25	1,00

Figure 4: The correlation matrix of the interdependence of relevant factors influencing organizational mortality, where N (hereinafter) stands for a number of observations.

Source: authors' work

Thus, taking into account the outcomes of the analysis of the relevance of factors influencing organizational mortality, obtained through the application of a one-factor test of significance, the Pareto-optimality diagram, and correlation analysis, the list of key factors is identified as follows: L2, M1, M2, E1, E3, E4, S1, S3, S4.

The selection of the factors above was based on independently assessing the impact of each of the four groups on organizational mortality without considering the mutual influence of the groups on each other. To account for the interrelation between groups of factors and to avoid artificially complicating the model, a one-factor test of significance was conducted (see Fig. 5), and a Pareto diagram was created (Fig. 6).

Effect	Univariate Tests of Significance for Yd (Spreadsheet1.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	2,733773E+06	1	2,733773E+06	9,89	0,002676
L2	1,191076E+05	1	1,191076E+05	0,43	0,514216
M1	1,473686E+10	1	1,473686E+10	53331,58	0,000000
M2	2,254185E+09	1	2,254185E+09	8157,72	0,000000
E1	2,462945E+06	1	2,462945E+06	8,91	0,004220
E3	7,343033E+05	1	7,343033E+05	2,66	0,108784
E4	5,303148E+05	1	5,303148E+05	1,92	0,171541
S1	2,076788E+06	1	2,076788E+06	7,52	0,008235
S3	0,000000E-01	1	0,000000E-01	0,00	1,000000
S4	1,934132E+06	1	1,934132E+06	7,00	0,010610
Error	1,519788E+07	55	2,763252E+05		

Figure 5: One-factor test of the significance of the influence of relevant factors (preselected at the precious steps) of all four groups on organizational mortality.

Source: authors' work

The results of the one-factor test of significance for factors from all four groups simultaneously on organizational mortality (see Fig. 5) show that five effects are statistically significant: M1, M2, E1, S1, S4. The significance level (p-value) for these effects reaches values of 0.000000 for M1, 0.000000 for M2, 0.042220 for E1, 0.038970 for S1, and 0.010116 for S4, respectively, which are all significantly lower than the critical value of 0.05. The contribution of statistically significant effects is distributed as follows: M1, M2, E1, S1, S4. All other factors, namely L2, E3, E4, and S3, are identified as statistically *insignificant*. Confirmation of the significance of these five effects, M1, M2, E1, S1, S4, is represented by the Pareto diagram of t-values of the significance of the factors' impact on organizational mortality (Figure 6), where the five bars of M1, M2, E1, S1, S4 intersect the critical value line (red line).

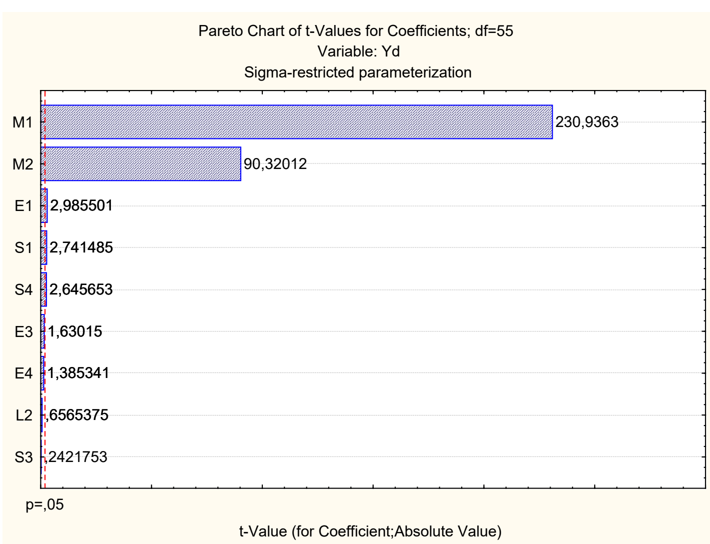


Figure 6: Pareto Chart of t-Values of the significance of the influence of relevant factors (M1, M2, E1, S1, S4, E3, E4, L2, S3), preselected at previous stages on organizational mortality.

Source: authors' work

As a result of calculations, the set of key factors of organizational mortality was narrowed down from nine to five factors: M1, M2, E1, S1, and S4.

Stage 3. Identification of the strength and direction of the impact of relevant organizational, morphological, economic, and social factors on organizational mortality of enterprises. To implement this stage, we built a multiple linear regression using the Ordinary Least Squares (OLS) method, considering only the factors L2, M1, M2, E1, E3, E4, S1, S3, and S4. At this stage, we utilized the capabilities of the Statistica software package and the Multiple Regression tool. The obtained results are presented in Figure 7.

	Regression Summary for Dependent Variable: Yd (Spreadsheet1.sta) R= ,99997264 R?= ,99994528 Adjusted R?= ,99993632 F(9,55)=1117E2 p<0,0000 Std.Error of estimate: 525,67					
N=65	Beta	Std.Err. of Beta	B	Std.Err. of B	t(55)	p-level
Intercept			12011,36	3818,749	3,1454	0,002676
L2	-0,000813	0,001238	-7,05	10,739	-0,6565	0,514216
M1	0,836522	0,003622	1,01	0,004	230,9363	0,000000
M2	0,212175	0,002349	1,08	0,012	90,3201	0,000000
E1	-0,003624	0,001214	-0,05	0,017	-2,9855	0,004220
E3	0,006562	0,004026	0,02	0,014	1,6301	0,108784
E4	-0,001796	0,001296	-9062,62	6541,795	-1,3853	0,171541
S1	-0,005948	0,002170	-0,00	0,002	-2,7415	0,008235
S3	0,000370	0,001526	9,06	37,419	0,2422	0,809545
S4	-0,004015	0,001517	-261,56	98,864	-2,6457	0,010610

Figure 7: The results of the regression analysis of the dependence of organizational mortality on the relevant factors of the four groups.

Source: authors' work

Based on the outcomes of regression analysis (see Fig. 7), the model of linear multiple regression dependence of organizational mortality on relevant factors from the four groups (organizational, morphological, economic, and social) was formulated as follows:

$$Y_d = 12011.36 - 7.05 \cdot L2 + 1.01 \cdot M1 + 1.08 \cdot M2 - 0.05 \cdot T1 + 0.02 \cdot E3 \\ -9062.62 \cdot E4 - 0.004 \cdot S1 + 9.06 \cdot S3 - 261.56 \cdot S4 \quad (1)$$

Model (1) is adequate and accurate, confirmed by the coefficient of determination at the level of 0.99 and with a highly significant F-statistic value at the level of 11172*10^2, which significantly exceeds the critical threshold. However, not all considered factor variables (L2, M1, M2, E1, E3, E4, S1, S3, S4) were statistically significant; leaving only 5 (M1, M2, E1, S1, S4). This fact confirmed the results obtained in the previous stage. Therefore, we excluded the statistically insignificant factors and performed a regression analysis of the dependence of organizational mortality on relevant factors from the four groups (see Fig. 8).

	Regression Summary for Dependent Variable: Yd (Spreadsheet1.sta) R= ,99996675 R?= ,99993351 Adjusted R?= ,99992896 F(5,73)=2196E2 p<0,0000 Std.Error of estimate: 530,61					
N=79	Beta	Std.Err. of Beta	B	Std.Err. of B	t(73)	p-level
Intercept			10092,20	2989,311	3,3761	0,001181
M1	0,837646	0,001801	1,02	0,002	465,0758	0,000000
M2	0,212178	0,001595	1,08	0,008	133,0369	0,000000
E1	-0,003063	0,000991	-0,04	0,013	-3,0916	0,002819
S1	-0,003846	0,001812	-0,00	0,001	-2,1218	0,037249
S4	-0,003414	0,001098	-223,62	71,925	-3,1090	0,002676

Figure 8: The results of the regression analysis of the dependence of organizational mortality on the relevant factors of the four groups, narrowed to the set of five factors (M1, M2, E1, S1, S4).

Source: authors' work

The outcomes of regression analysis (see Fig. 8) allowed for modifying the model of linear multiple regression dependence of organizational mortality in the following way:

$$Y_d = 10092.20 + 1.02 \cdot M1 + 1.08 \cdot M2 - 0.04 \cdot E1 - 0.003 \cdot S1 - 223.62 \cdot S4 \quad (2)$$

Thus, the analysis of the finalized form of the function Y_d, and coefficients in the model (2) led us to the following conclusions:

1. Organizational factors (the form of proprietorship) do not have a statistically significant impact on the organizational mortality of enterprises.
2. The ***stimulators*** of organizational mortality, i.e., factors whose increase is accompanied by an increase in the dependent variable, are M1 and M2, i.e., factors from the morphological group, namely:
   a. An increase of one unit in the mortality rates by size (the number of employees is zero) leads to a 1.02 increase in organizational mortality.
   b. An increase in mortality rates by size (number of employees from one to four employees) leads to a 1.08 increase in organizational mortality, at a higher rate than M1.
3. The ***inhibitors*** of organizational mortality, i.e., factors when increased are accompanied by a decrease in the dependent variable, are E1, S1, and S4.
   a. An increase of one unit in GDP per capita, E1, leads to a 0.04 decrease in the level of organizational mortality, indicating a significantly lower variation rate compared to the factor.
   b. An increase of one unit in Emigration, S1, leads to a 0.003 decrease in the level of the dependent variable.
   c. An increase of one unit in the factor Hours worked per week of full-time employment, S4, leads to a 223.62 decrease in organizational mortality, indicating significantly higher variation rates compared to the considered factor variable.

These conclusions and the accuracy and adequacy of the model (2) are confirmed by the obtained values: the coefficient of determination, which indicates that 99.99% of the variation in the dependent variable is explained by the variation in the five considered factor variables; the statistical significance of all the examined factors based on the Student's t-test and the p-value (not exceeding the critical level of 0.05); almost complete agreement between the observed and predicted levels of organizational mortality according to the linear regression model (see Fig. 9); and conformity to the normal distribution of residuals in the linear regression model for the dependence of organizational mortality on relevant morphological, economic, and social factors (Fig. 10).

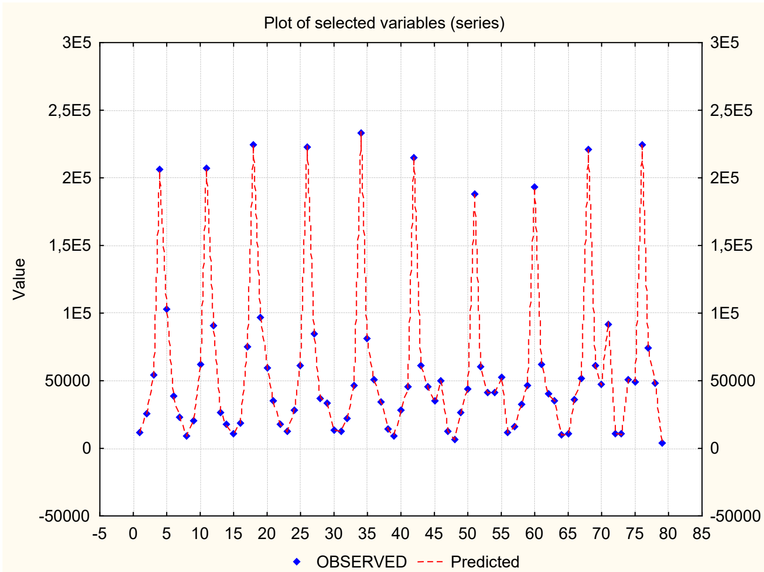


Figure 9: The correspondence between the observed and predicted levels of organizational mortality according to the linear regression model.

Source: authors' work

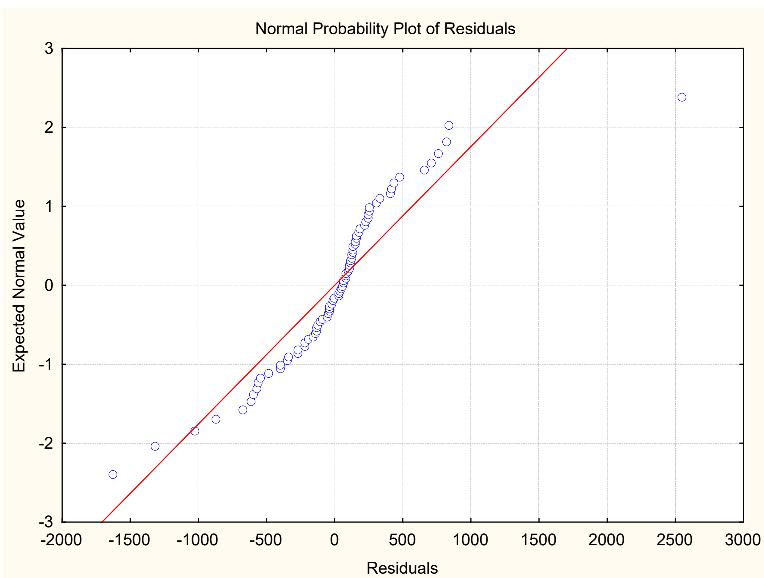


Figure 10: Graph of conformity to the normal distribution of residuals in the linear regression model of organizational mortality dependence on relevant morphological, economic, and social factors.

Source: authors' work

Stage 4. Multivariate adaptive regression splines (MARSplines) development for the organizational mortality model.

Multivariate adaptive regression splines (MARSplines) represent a powerful non-parametric method for capturing complex dependencies within datasets. It involves a set of basis functions and coefficients entirely determined by the input data array. MARSplines are particularly useful in scenarios involving regression switching points, where relationships between variables exhibit abrupt changes, and in cases where non-monotonic dependencies between effects and responses exist. Overall, MARSplines serve as a valuable tool for data analysis and modeling, offering a more comprehensive and accurate representation of intricate relationships present in the data. For those reasons, data mining and developing MARSplines were designed to check regression switching points (mortality rates in different subgroups, differentiated by number of employees) using the application of multivariate adaptive regression splines (MARSplines).

The general equation of multivariate adaptive regression MARsplines for m non-zero components can be expressed as a combination of weighted sums of basis functions and their products as follows:

$$Y_d = f(X) = s_0 + \sum_{j=1}^{m} s_j \cdot O_j(X) \qquad (3)$$

$$O = \{(x_i - t)_+, (t - x_i)_-\}_{t \in \{x_{1i}, \dots, x_{Ni}\}, \; i=1,\dots,n}$$

where s_0 – constant, an intercept;

s_j – constant, a parameter of the multivariate adaptive regression equation;

m – the total number of basis functions;

X – is the vector of input regressors;

$O_j(X)$ – j-th basis function from the O set or the product of two or more such functions.

Developing a model of organizational mortality dependence on relevant morphological, economic, and social factors based on multivariate adaptive regression splines (MARSplines) included not only formalizing basis functions but also defining terms that allow determining possible combinations of basis functions, taking into account the number of references to key factors. Moving on to the practical implementation of the model's impact of morphological, economic, and social factors on organizational mortality in the form of multivariate adaptive regression splines, the following parameters were obtained: the number of independent variables - 5, the number of dependent variables - 1, the number of terms - 4, the number of basis functions - 3, the order of interaction (number of components of the product of basis functions) - 1, as well as the number of references to the factors-regressors: the highest - 2 for M2, next 1 - M1, no references to other factors, were envisaged (see Fig. 11).

Model specifications	Model Summary (Spreadsheet1.sta Value
Independents	5
Dependents	1
Number of terms	4
Number of basis functions	3
Order of interactions	1
Penalty	2,000000
Threshold	0,000500
GCV error	374715,5
Prune	Yes

Dependents	Number of References to Each Predictor (Spreadshe Number of times each predictor is referenced (used) References (to Basis Functions)
M1	1
M2	2
E1	0
S1	0
S4	0

Figure 11: The fragment of specification parameters of the MARSplines Model
Source: authors' work

Coefficients, knots and basis functions	Model coefficients (Spreadsheet1.sta) NOTE: Highlighted cells indicate basis functions of type max(0, independent-knot), otherwise max(0, knot-independent) Coefficients Yd	Knots M1	Knots M2	Knots E1	Knots S1	Knots S4
Intercept	16410,00					
Term.1	1,01	1684,000				
Term.2	1,09		13893,00			
Term.3	-1,04		13893,00			

Figure 12: The fragment of a screenshot of the coefficients and terms of the MARSplines Model for identifying the influence of morphological, economic, and social factors on organizational mortality
Source: authors' work

Thus, based on the results of the calculations presented in Figure 12, where coefficients, terms, and parameters of the MARspline model for the influence of morphological, economic, and social factors on organizational mortality are provided, the model takes the following form:

Yd = 1,64099981758236e+004 + 1,01107556170301e+000*max(0; M1-1,68400000000000e+003) + 1,08944644535323e+000*max(0; M2-1,38930000000000e+004) - 1,04440262234505e+000*max(0; 1,38930000000000e+004-M2) (4)

The regression statistics were accomplished to test the accuracy and adequacy of the MAR-spline model for the influence of morphological, economic, and social factors on organizational mortality (see Fig. 13).

Regression statistics	Regression statistics (Spreads Yd
Mean (observed)	61152,16
Standard deviation (observed)	62951,88
Mean (predicted)	61152,16
Standard deviation (predicted)	62949,37
Mean (residual)	-0,00
Standard deviation (residual)	561,46
R-square	1,00
R-square adjusted	1,00

Figure 13: The results of regression statistics for the current MARSpline Model

Source: authors' work

Based on the results of checking (see Fig. 13), the following parameters of the accuracy and adequacy testing statistics for the MARspline Model of the influence of morphological, economic, and social factors on organizational mortality can be asserted: the coefficient of determination reaches a value of 1.00, indicating high model quality (Fig. 13); there are insignificant deviations between observed and predicted values of organizational mortality; and the normal distribution law of model residuals is confirmed.

Stage 5. Study of the impulsivity of variations in organizational mortality of enterprises under the influence of relevant factors with consideration of lagged effects using vector autoregressive modeling. The implementation of this stage was based on the use of the EViews software with the Quick/Estimate VAR/VAR Type - Unrestricted VAR/Endogenous Variables - Yd, M1, M2, E1, S1, S4/Lag Interval for Endogenous - 1 and 2 tools.

Selecting the current level of organizational mortality as the endogenous variable with lags of one and two years and the factors M1, M2, E1, S1, and S4 as the set of exogenous variables also with lags of one and two years, we formulated the general form of the VAR model for the vector autoregression of the dependency of organizational mortality on relevant morphological, economic, and social factors as follows:

$$Y_{dt} = s_1 \cdot Y_{dt-1} + s_2 \cdot Y_{dt-2} + s_3 \cdot M1_{t-1} + s_4 \cdot M1_{t-2} + s_5 \cdot M2_{t-1} + s_6 \cdot M2_{t-2} + s_7 \cdot E1_{t-1} + s_8 \cdot E1_{t-2} + s_9 \cdot S1_{t-1} + s_{10} \cdot S1_{t-2} + s_{11} \cdot S4_{t-1} + s_{12} \cdot S4_{t-2} + s_0 + \varepsilon_t \quad (5)$$

where Y_{dt} – level of organizational mortality at the time t;

Y_{dt-1}, Y_{dt-2} - the level of organizational mortality with lag delays of one and two years, respectively;

$M1_{t-1}, M1_{t-2}$ – the level of the factor "Deaths of enterprises differentiated by size (number of employees): number (Zero)" with lag delays of one and two years, respectively;

$M2_{t-1}, M2_{t-2}$ - the level of the factor "Deaths of enterprises differentiated by size (number of employees): From 5 to 9 employees" with lag delays of one and two years, respectively;

$E1_{t-1}, E1_{t-2}$ - the level of the factor "GDP per capita" with lag delays of one and two years, respectively;

$S1_{t-1}, S1_{t-2}$ - the level of the factor "Emigration" with lag delays of one and two years, respectively;

$S4_{t-1}, S4_{t-2}$ - the level of the factor "Hours worked per week of full-time employment" with lag delays of one and two years, respectively;

$s_1, s_2, s_3, s_4, s_5, s_6, s_7, s_8, s_9, s_{10}, s_{11}, s_{12}$ – constants, parameters of the regression equation which quantitatively characterize the strength and direction of the factors' influence on the outcome feature;

s_0 - constant, intercept of the regression equation, which determines the level of organizational mortality when all factors have zero values;

ε_t – residuals of the model at time t.

To determine the unknown parameters of the VAR model for the dependence of organizational mortality on relevant morphological, economic, and social factors, taking into account time lags, their standard errors, and t-statistics of significance, the EViews program was used to obtain the following results (Table 1).

Table 1 - Results of conducting vector autoregression for the dependence of organizational mortality and organizational, morphological, economic, and social factors with consideration of the lagged influence.

Vector Autoregression Estimates						
Date: 11/17/21 Time: 16:52						
Sample: 1 120						
Included observations: 19						
Standard errors in ( ) & t-statistics in [ ]						
	YD	M1	M2	E1	S1	S4
YD(-1)	77.66672	60.85889	15.76900	10.62217	56.47777	0.001531
	(32.0134)	(23.2540)	(8.77765)	(4.08040)	(60.2105)	(0.00145)
	[2.42607]	[2.61714]	[1.79649]	[2.60322]	[0.93800]	[1.05921]
YD(-2)	0.205730	-4.357421	4.439008	-2.703137	-19.61467	0.000192
	(15.8111)	(11.4849)	(4.33520)	(2.01527)	(29.7374)	(0.00071)
	[0.01301]	[-0.37940]	[1.02395]	[-1.34133]	[-0.65960]	[0.26930]
M1(-1)	-77.30965	-60.78815	-15.51076	-10.55085	-54.56867	-0.001558
	(33.1161)	(24.0550)	(9.08001)	(4.22096)	(62.2846)	(0.00149)
	[-2.33450]	[-2.52705]	[-1.70823]	[-2.49963]	[-0.87612]	[-1.04220]
M1(-2)	0.715563	4.934297	-4.092659	2.881425	21.67210	-0.000146
	(15.7457)	(11.4374)	(4.31726)	(2.00693)	(29.6144)	(0.00071)
	[0.04545]	[0.43142]	[-0.94798]	[1.43574]	[0.73181]	[-0.20481]
M2(-1)	-87.38222	-68.16607	-18.00753	-11.88505	-67.54490	-0.001754
	(34.6050)	(25.1365)	(9.48823)	(4.41072)	(65.0848)	(0.00156)
	[-2.52514]	[-2.71184]	[-1.89788]	[-2.69458]	[-1.03780]	[-1.12260]
M2(-2)	-1.639494	3.525066	-5.021487	3.142173	19.26790	-0.000376
	(16.8378)	(12.2307)	(4.61670)	(2.14613)	(31.6683)	(0.00076)
	[-0.09737]	[0.28822]	[-1.08768]	[1.46411]	[0.60843]	[-0.49435]
E1(-1)	4.755486	2.546423	2.217842	1.336790	3.286119	0.000446
	(3.44436)	(2.50192)	(0.94440)	(0.43902)	(6.47813)	(0.00016)
	[1.38066]	[1.01779]	[2.34842]	[3.04497]	[0.50726]	[2.87183]
E1(-2)	1.441273	2.345658	-0.988956	-1.015996	-4.878289	-0.000221
	(3.32196)	(2.41302)	(0.91084)	(0.42341)	(6.24792)	(0.00015)
	[0.43386]	[0.97209]	[-1.08576]	[-2.39953]	[-0.78079]	[-1.47674]

Table 1 - Continued

S1(-1)	-2.217685	-1.544952	-0.623347	-0.202330	-1.927326	-8.13E-05
	(0.89947)	(0.65336)	(0.24662)	(0.11465)	(1.69172)	(4.1E-05)
	[-2.46553]	[-2.36462]	[-2.52752]	[-1.76481]	[-1.13927]	[-2.00141]
S1(-2)	-1.834313	-1.474481	-0.320166	0.133554	-1.417984	-9.24E-05
	(1.33593)	(0.97040)	(0.36630)	(0.17028)	(2.51262)	(6.0E-05)
	[-1.37306]	[-1.51946]	[-0.87407]	[0.78433]	[-0.56435]	[-1.53269]
S4(-1)	75219.92	51217.22	22340.49	8256.031	63529.00	1.904941
	(20848.1)	(15143.7)	(5716.29)	(2657.29)	(39211.0)	(0.94105)
	[3.60799]	[3.38207]	[3.90822]	[3.10694]	[1.62018]	[2.02428]
S4(-2)	52013.50	39713.41	11120.07	-1617.260	46345.87	2.535641
	(37533.9)	(27264.0)	(10291.3)	(4784.05)	(70593.6)	(1.69421)
	[1.38577]	[1.45662]	[1.08053]	[-0.33805]	[0.65652]	[1.49665]
C	-5175257.	-3698110.	-1363083.	-257102.3	-4290399.	-138.0216
	(2251298)	(1635305)	(617277.)	(286949.)	(4234226)	(101.619)
	[-2.29879]	[-2.26142]	[-2.20822]	[-0.89599]	[-1.01327]	[-1.35822]
R-squared	0.957186	0.963238	0.944345	0.935796	0.900484	0.925068
Adj. R-squared	0.871558	0.889713	0.833034	0.807389	0.701452	0.775205
Sum sq. resids	1.73E+09	9.13E+08	1.30E+08	28120422	6.12E+09	3.526685
S.E. equation	16984.93	12337.56	4657.047	2164.887	31945.13	0.766669
F-statistic	11.17841	13.10093	8.483863	7.287719	4.524319	6.172734
Log likelihood	-201.0709	-194.9970	-176.4860	-161.9317	-213.0731	-10.96107
Akaike AIC	22.53378	21.89443	19.94589	18.41387	23.79717	2.522218
Schwarz SC	23.17998	22.54062	20.59209	19.06006	24.44336	3.168413
Mean dependent	42581.63	30468.05	11010.32	26776.16	64662.16	40.71579
S.D. dependent	47392.53	37150.79	11397.16	4932.815	58465.23	1.617015
Determinant resid covariance (dof adj.)		8.85E+28				
Determinant resid covariance		8.78E+25				
Log-likelihood		-729.2632				
Akaike information criterion		84.97508				
Schwarz criterion		88.85225				

Based on the data from graph "YD" in Table 1, we constructed the VAR model of vector autoregression for the dependence of organizational mortality on relevant morphological, economic, and social factors with consideration of time lags:

$$Y_{dt} = 77.6667 \cdot Y_{dt-1} + 0.2057 \cdot Y_{dt-2} - 77.3067 \cdot M1_{t-1} + 0.7156 \cdot M1_{t-2} - 87.3822 \cdot M2_{t-1} - 1.6395 \cdot M2_{t-2} + 4.7555 \cdot E1_{t-1} + 1.4413 \cdot E1_{t-2} - 2.2177 \cdot S1_{t-1} - 1.8343 \cdot S1_{t-2} + 75219.92 \cdot S4_{t-1} + 52013.50 \cdot S4_{t-2} - 5175257 \quad (6)$$

The analysis of the outcomes in Table 1 allows us to conclude that the following exogenous variables have a statistically significant impact on the organizational mortality of enterprises: $Y_{dt-1}, M1_{t-1}, M2_{t-1}, E1_{t-1}, S1_{t-1}, S1_{t-2}, S4_{t-1}, S4_{t-2}$, These correspond to the values of the dependent variable of organizational mortality and three factors (Deaths of enterprises differentiate by size: Subgroup 1, Subgroup 2, and GDP per capita) with a lag of 1 year, as well as two factors (Emigration, Hours worked per week of full-time employment) with time delays in the reflection of the regressor's influence for 1 and 2 years. The statistical significance of these five factors is confirmed with a probability of 0.95 using the calculated value of the Student's t-test, presented in Table 1 for each parameter of the VAR model (formula 6).

The adequacy and accuracy of the model (formula 5) are confirmed by the determined values shown in Table 1 for the coefficient of determination (R-squared) at the level of 95.72%. This means that 95.72% of the variation in the dependent variable Y_{dt} is explained by the variation in the factors

$$Y_{dt-1}, Y_{dt-2}, M1_{t-1}, M1_{t-2}, M2_{t-1}M2_{t-2}, E1_{t-1}, E1_{t-2}, S1_{t-1}, S1_{t-2}, S4_{t-1}, S4_{t-2}$$

with consideration of time lags. The F-statistic at the level of 11.18 significantly exceeds the critical value, indicating the statistical significance of the obtained model (formula 6). The Akaike information criterion (84.98) and Schwarz criterion (88.85) indicate a reasonably good fit of the statistical data by the constructed model.

Based on the identified and statically confirmed trends in the vector autoregression of organizational mortality and organizational, morphological, economic, and social factors with consideration of time lags, the following **conclusions** can be made:

The current value of organizational mortality of enterprises is determined by its previous value of 95.72%. Additionally, for every one-unit increase in the previous value, the current level of organizational mortality will increase by 77.67 units.

The indicator "Deaths of enterprises differentiated by size (number of employees): number (Zero)" acts as a deterrent for the dependent variable. Y_{dt} This means that an increase in the level of M1 by one unit will result in a decrease in organizational mortality by 77.31 units, with a lag of one year. Similarly, the indicator "Deaths of enterprises differentiated by size (number of employees: From 5 to 9 employees" acts as a deterrent f, Y_{dt}, and an increase in the level of M2 by one unit will lead to a decrease in organizational mortality by 87.38 units with a lag of one year.

On the other hand, the factor "GDP per capita" acts as a stimulator for Y_{dt}. An increase in the level of E1 by one unit will result in an increase in organizational mortality by 4.76 units with a lag of one year.

The specific nature of the influence of the indicators "Emigration" and "Hours worked per week of full-time employment" on the dependent variable is notable. For a one-unit increase in the value of each of these indicators with a lag of one year, the value of Y_{dt} will decrease by 2.22 units and increase by 75,219.92 units, respectively. With a lag of two years, the trend remains the same, and Y_{dt} will decrease by 1.83 units and increase by 52,013.50 units, respectively. This indicates that "Emigration" serves as a deterrent, while "Hours worked per week of full-time employment" acts as a stimulator for the dependent variable.

CONCLUDING REMARKS AND DISCUSSION

This study has analyzed the factors influencing organizational mortality (OM) by analyzing both endogenous and exogenous variables. The key findings and their implications are summarized as follows:

1. Endogenous Factors:

Size: Among endogenous factors, the size of an organization has been found to be a significant contributor to OM (with different values and time lags). Larger organizations tend to have higher mortality rates, likely due to increased complexity and bureaucracy. This complexity can lead to slower response times, inefficiencies, and difficulties in adapting to external changes, making larger organizations more vulnerable to OM. Additional research is needed to explore other contributing factors further, such as resource allocation challenges, communication problems, and organizational culture.

Type of Property: Contrary to expectations, the type of property is not a significant factor in organizational mortality.

2. Exogenous Factors:

GDP per Capita: GDP per capita has been identified as an inhibitor of OM. This finding suggests that economic stability and a developed business environment in countries with higher GDP per capita contribute to lower mortality rates. This could be due to better business opportunities, greater economic activity, and lower risk of business failure.

Emigration Dynamics: Emigration dynamics also serve as an inhibitor of OM. This can be attributed to several factors, including the positive effects of brain drain, resource allocation, and social cohesion in donor countries and the alleviation of labor shortages in host countries.

Hours Worked per Week: An increase in hours worked per week of full-time employment is associated with a decrease in OM. Possible explanations include improved productivity, increased business activity, and higher revenue generation due to longer working hours.

3. Combined Effects of Endogenous and Exogenous Factors:

Hypothesis H2: The study has confirmed that combinations of endogenous and exogenous factors have a significant impact on OM. The interaction between morphological (endogenous) factors and economic, social (exogenous) factors is particularly strong, supporting Hypothesis H2. This highlights the importance of considering both sets of factors together to understand their impact on organizational mortality fully.

Hypotheses Results:

H1: Endogenous factors related to organizational shape and size significantly impact OM. Size, in particular, is a critical factor.

H0: The analysis has not definitively established whether exogenous or endogenous factors are more significant overall, but it has identified key exogenous inhibitors such as GDP per capita, emigration dynamics, and hours worked per week.

H2: Certain combinations of endogenous and exogenous factors have a greater significance in OM, confirming that their interaction plays a crucial role.

Possible directions of deeper research might embrace the questions of network and alliance relationships and how the composition and quality of an organization's network and alliance relationships can impact its mortality risks. Current research is mostly cross-country analysis with a lack of detailed data on industry and market characteristics (except the E4 variable, "Venture capital investments," which is intended to identify start-up industries and hubs), so factors such as industry growth rates, market competition, technological disruptions, and regulatory environments can shape the likelihood of organizational mortality and should be investigated further. Moreover, the research might not have captured certain unobserved variables or external influences that could affect organizational mortality. Future studies could address these limitations and further enrich our understanding of organizational development and mortality. Further investigations are required to elucidate the positive effects of brain drain, as suggested by Kotenko et al. (2021).

This research has uniquely combined insights from organizational ecology, finance, and management to analyze organizational mortality. By integrating these diverse perspectives, the study provides a more holistic understanding of the factors influencing organizational resilience and mortality. Advanced data mining techniques such as multivariate adaptive regression lines (MARSplines) and vector autoregressive modeling (VAR) are novel approaches in this field. These methods allow for a more nuanced analysis of the interplay between internal and external factors, capturing non-linear relationships and dynamic effects over time.

Unlike traditional studies that often focus on either internal or external factors in isolation, this research has investigated the combined effects of endogenous and exogenous factors on organizational mortality. This comprehensive approach fills a significant gap in the existing literature. The findings of this research provide actionable insights for managers and policymakers. By understanding the factors that contribute to organizational resilience and mortality, organizations can develop more effective strategies to navigate environmental challenges and enhance their long-term survival.

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Appendix A
Initial Data Sample (fragment)

				Dependable	Organizational Factors			Morphological factors				h o
Indexes				**Death of enterprises, Yd**	**Death rate: number of enterprise deaths in the reference period (t) divided by the number of enterprises active in t , L1-L3**			**Deaths of enterprises by size (number of employee), S1-S4**				G E
		year		number	percentage (Sole proprietorship), **L1**	percentage (Partnership, co-operatives, associations, etc.), **L2**	percentage (Limited liability enterprise), **L3**	number (Zero), **S1**	number (From 1 to 4 employees), **S2**	number (From 5 to 9 employees), **S3**	number (10 employees or more), **S4**	U P y
1	**Bulgaria**	2009	#	25772	12.95	9.72	4.07	17861	6905	671	335	
2	**Greece**	2009	:	:	:	:	:	:	:	:	:	
3	**Croatia**	2009	:	:	:	:	:	:	:	:	:	
4	**Latvia**	2009	#	11899	21.01	7.97	12.58	5016	6055	566	262	
5	**Lithuania**	2009	#	26068	33.16	8.31	7.1	21571	3386	552	559	
6	**Hungary**	2009	#	53950	11.48	7.57	8.8	29884	21349	1618	1099	
7	**Poland**	2009	#	206614	11.09	5.53	8.65	164304	36672	4024	1614	
8	**Romania**	2009	#	103067	:	11.63	18.08	46424	52637	2665	1341	
9	**Slovakia**	2009	#	38351	12.87	3.57	4.07	32538	4725	591	497	
10	**North Macedonia**	2009	:	:	13.48	8.35	11.16	:	:	:	:	
11	**Serbia**	2009	:	:	:	:	:	:	:	:	:	
12	**Turkey**	2009	:	319775	14.05	16.98	7.98	247008	67429	3400	1938	
1	**Bulgaria**	2010	#	25650	13.45	9.66	4.39	16714	7535	751	650	
2	**Greece**	2010	:	:	:	:	:	:	:	:	:	
3	**Croatia**	2010	:	23096	:	:	:	15207	7022	581	286	
4	**Latvia**	2010	#	9018	19.34	5.12	7.58	5502	3139	272	105	
5	**Lithuania**	2010	#	20417	26.55	10.4	6	16547	3161	431	278	
6	**Hungary**	2010	#	62408	14.49	7.62	9.35	37063	22530	1619	1196	
7	**Poland**	2010	#	207003	11.02	4.49	6.24	172344	30344	3131	1184	
8	**Romania**	2010	#	91085	:	13.7	14.19	61438	27590	1382	675	
9	**Slovakia**	2010	#	26882	7.64	4.97	6.19	19454	6908	249	271	
10	**North Macedonia**	2010	:	:	24.8	8.03	10.71	:	:	:	:	
11	**Serbia**	2010	:	:	:	:	:	:	:	:	:	
12	**Turkey**	2010	:	320034	13.98	17.52	7.16	246784	68003	3348	1899	
1	**Bulgaria**	2011	#	39183	18.63	15.68	8.61	28469	9418	751	545	
2	**Greece**	2011	:	:	:	:	:	:	:	:	:	
3	**Croatia**	2011	:	17426	:	:	:	11706	5141	325	254	
4	**Latvia**	2011	#	10766	19.58	8.17	9.63	5663	4579	378	146	
5	**Lithuania**	2011	#	18927	22.52	4.74	4.64	16027	2415	304	181	
6	**Hungary**	2011	#	75249	21.12	8.1	8.98	49355	23588	1401	905	
7	**Poland**	2011	#	224670	11.84	4.55	6.5	186663	33104	3449	1454	

Source: mined by authors from open statistical sources, such https://w3.unece.org/PXWeb/en ; https://ec.europa.eu/eurostat/
The full dataset may be achieved in additional request.

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