

Liquidation of Micro-Enterprises as a Seasonal Phenomenon: Evidence from Poland

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Abstract: - The study aims to develop a quantitative model of the liquidation of microenterprises on the example of the Polish experience in 2013-2021. The primary objective is to isolate seasonal variations from the time series of monthly observations. The cognitive dimension of the study is in line with whether the liquidation of enterprises has the characteristics of a phenomenon repeated over time. Our research is pioneering in the cognitive issues it covers, including the instrumentation used. The analysis uses methods and research tools that identify statistically significant differences between average values of the number of business entities that deregistered from CEIDG (Central Registration and Information on Business). The study includes a post hoc test preceded by the analysis of variance (ANOVA), Welch and Brown-Forsythe tests, and the Kruskal-Wallis test. In the next step, we conducted seasonal decomposition based on additive and multiplicative variations and examined the correlation. The analysis enables positively verifying the hypothesis on the seasonality of the liquidation of enterprises.

Key-Words: closing a business, entrepreneurs, entrepreneurship, micro-enterprise, small business, COVID-19 pandemic.

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1 Introduction

Self-employment involves making decisions mainly of a conceptual, organizational, and financial nature. On the other hand, business success results from many factors in the internal and external environment of the organization. In the former, the entrepreneur can shape this area to a large extent, while the latter of these possibilities are already considerably limited. Generally, success is determined by the long-term staying of a profitable organization in the market [12]. In this light, there is a research field related to the liquidation of enterprises in quantitative and qualitative terms. This topic is not reflected in the current scientific achievements, even though analyzes of microenterprises are present in a rich catalog of publications.

This study analyses the time series of the monthly applications submitted to the Central Registration and Information on Business (CEIDG) for liquidating an enterprise in the form of a natural person engaged in business activity (so-called self-employment) over the period 2013-2021 in Poland. An acceptable generalization is to assume that micro-enterprises are the subject of the study. According to the January 2022 data, 99.03% of natural persons engaged in business activity are

entities employing up to 9 persons, i.e., entities that meet the definition criterion of micro-enterprise (3.41 million out of 3.45 million entities). The ratio of micro-enterprises to the total number of enterprises is 98.65%. On the other hand, natural persons engaged in business activity represent 71.27% of these entities, whereas in the general micro enterprises' population, 73.08% of them.

The study's primary objective is to develop a model of statistical repeatability of entrepreneurial behavior in terms of the decision-making on the liquidation of enterprises based on seasonal variations. Separate analyses were conducted during the crisis of the COVID-19 pandemic.

This study uses the classic approach to entrepreneurship that an entrepreneur is a person who, using appropriate personality traits, takes risks, initiates activities, and is the creator of economic activity [24]. An entrepreneur is a person who starts a business and makes organizational decisions. Failures that lead to business termination should be considered in this regard.

The cognitive aspect of the study is a methodology that includes the applied set of tools used in economic analysis. The research verifies the hypothesis of the occurrence of seasonality in the liquidation of all micro-enterprises in Poland. It determines existing differences in this respect under

the conditions of a relatively stable regulatory, economic-financial, technical-organizational, and market environment (without an analysis of industries that are assumed to be seasonal). This article enriches the current literature on the subject of microenterprises and their survival on the market or liquidation. Practical implications of the study include the environment of micro-enterprises, especially government and local government institutions, which, having their appropriate tools, can introduce instruments as a positive stimulation for entrepreneurs or at least not hinder their activities.

2 Literature Review

There is no doubt that a driver of economic growth in all countries is micro-enterprises that enable small entrepreneurs to create new jobs. In this way, they can combat poverty and increase social welfare [25, 27]. However, the current knowledge of entrepreneurship in developing countries is limited [9, 17]. Researchers agree that the institutional environment has a significant influence on "how" and "how many" aspects of entrepreneurial activities are implemented in a country [10]. At the same time, there is no ideal entrepreneurship model, especially in the application aspect. A study concerning the Silicon Valley entrepreneurship model provides evidence in this regard. This model was limited in adapting and solving the most contemporary relevant economic and social problems [1].

The COVID-19 pandemic is one of the current main issues affecting entrepreneurship. This problem emerged in late 2019, pointing out the socio-economic implications [22, 23]. While some analysts believe that the COVID-19 pandemic will cause a protracted global recession, others argue that the virus will stop soon, and the global economy will quickly return to normal. In general, epidemics affect the economy in multiple ways. However, economists' expectations may be proved wrong by Russia's special military operation against Ukraine. The impact of these Russian activities has been a subject of numerous estimates, but mainly of an *a priori* nature.

In this study, separate analyses focus on the economic impact of the COVID-19 pandemic on the liquidations of enterprises. Almost all sectors have experienced disruptions, for example, by restricting business activities. According to some authors, the pandemic has hurt start-ups, especially in developing countries where government support is limited [21]. The literature identifies the fear factor

as a meaningful indicator that limits entrepreneurial activity [18, 20].

Stimulating entrepreneurship and creating conditions conducive to its development is a concept of most public policies. On the one hand, organizational and fiscal improvements offer grants or low-interest repayable instruments. On the other hand, the barriers are erected and lead to a real market imbalance, which discriminates against entrepreneurial units that cannot meet many of the defined criteria for accessing offered support. Empirical research conducted over the past years does not give a clear answer as to the effectiveness of applied solutions. The success of the Italian model, introduced in 2012, provides a benefits package in tax incentives, public loan guarantees, and more flexible labor laws for firms registered as "innovative start-ups" [5]. At the same time, there are also very different opinions. The failure of pro-entrepreneurial solutions is related to the concept of dependent entrepreneurship, the empirical exemplification of which is the example of the wastefulness of public funds allocated for financing new enterprises [11, 15]. The evidence of the ineffectiveness of public action by design to be pro-entrepreneurial is also to find in recent research from Singapore, according to which the entrepreneurial state, which paradoxically creates a vision of the Singaporean state engaging in entrepreneurial activity, in reality, delays the transition to an entrepreneurial society. Thus, institutional actions may inadvertently create barriers to a more inclusive entrepreneurial community [2].

Regardless of public support, organizational and fiscal mechanisms, business environment, and individual entrepreneurial motives and aptitudes, a relational analysis requires permanent monitoring of national economy entities' quantitative structure. It is necessary from the perspective of each country [14].

Systematic quantitative analyses in an unchanging environment confirm or deny the effectiveness of existing regulations. These analyses identify negative global phenomena such as the COVID-19 pandemic or the Russian-Ukrainian armed conflict. The empirical research conducted immediately aftermath the COVID-19 pandemic outbreak and in the subsequent years of the pandemic indicates its devastating impact on small companies [6, 7, 19]. In Europe and the US, the COVID-19 pandemic more directly affected the self-employed than the non-self-employed, whereas small companies were more directly affected by the pandemic than large ones [4]. At the time of the

pandemic outbreak, micro-enterprises were particularly vulnerable to organizational and financial problems that could eventually result in the termination of their business. Governments supporting small and mid-size enterprises (SMEs) offered various assistance programs. The example of the United Kingdom, while demonstrating positive effects of implemented solutions to rescue organizations or maintain the sufficient financial strength of supported companies, at the same time proves that public support has largely failed to reach the companies in need of real help [3]. The research the small businesses in the US also proves the questionable effectiveness of government support [8].

Individual entrepreneurial failures, environmental failures, and those resulting from organizational and legal barriers contribute to the liquidation of enterprises. However, failure is not always at stake. Liquidation of enterprises is part of the theory of exit routes based on various determinants, both in business failure and success [16]. The issues of repeatability in this respect and periodic or point peaks are not represented in scientific research. In addition to the scientific and cognitive aspects, the concept of shaping the paradigm by identifying emerging deviations in the structure of the enterprise population is relevant for entrepreneurial countries.

3 Methods and Data

The formal and legal environment of enterprises can create significantly different constitutive conditions for entrepreneurial initiatives and the functioning of registered entities. Optimization solutions, including the building of structural organizational and financial dependencies, are the domain of large entities, or large ones, i.e., based on complex networks. The use of more favorable market conditions for the functioning of enterprises in the financial aspect is not the domain of sole proprietorships, although it is the type of entity that is the economic and social foundation of national economies. The simple legal form includes the registration aspect, and financial settlements are an encouragement for amateur entrepreneurs who, from the perspective of the benefits they bring to the economy, should be referred to as entrepreneurial leaders [14].

The main problem of the study provides a question: is the propensity to liquidate enterprises of a seasonal nature?

Based on the incremental analysis, the approach remains unrelated to the motivation inherent in

entrepreneurship, which is treated as a separate scientific discipline and fulfills a strictly economic policy. [26]. The implementation of the issue of the study introduces the verification of three hypotheses (assuming the existence of a relatively stable formal, legal and socio-economic environment of Polish enterprises).

H1: Liquidation of micro-enterprises is recurrent on an annual basis.

H2: Liquidation of micro-enterprises is seasonal.

H3: The COVID-19 pandemic has not contributed to an increase in the number of micro-enterprises liquidation in the short term.

The study used analytical tools, narrowed down to instruments that, based on monthly analysis based on one-way ANOVA (F-test), preceded by verification, meet the criteria of normal distribution (Kolmogorov-Smirnov and Shapiro-Wilk test) and homogeneity of variance (Levene's test). The criterion of homogeneity of variance is not met, and the second one of normality of the distribution of individual features is only partially met. Therefore, the number of deregistered enterprises in subsequent months, the Kruskal-Wallis (KW) non-parametric analysis of variance¹, and the Brown-Forsythe and Welch tests² we used to verify the research hypotheses. The authors used a post hoc test to isolate groups of months with significant differences to then determine which pairs of mean values differ the most from each other. The analytical process also included the separation of additive and multiplicative seasonal variations based on the 5-period moving average model. Using seasonal decomposition and correlation analysis allowed us to confirm or reject the presence of a pattern in the values of the trait analyzed.

4 Results and Discussion

Visual presentation of the time series (Fig. 1) makes it possible to identify unusual observations and possibly eliminate them, provided there are reasonable grounds for doing so. Deviations from the average values of the number of liquidated enterprises in the subsequent months in 2013-2021 appear in the form of one extreme size in April and nine outliers, two of which occurred in December. The number of extremes identified is small, and the data insignificant.

¹ It is often used instead of a standard one-way ANOVA when data are from a suspected non-normal population.

² There are preferred to the F-statistic if the assumption of the equality of the variance fails.

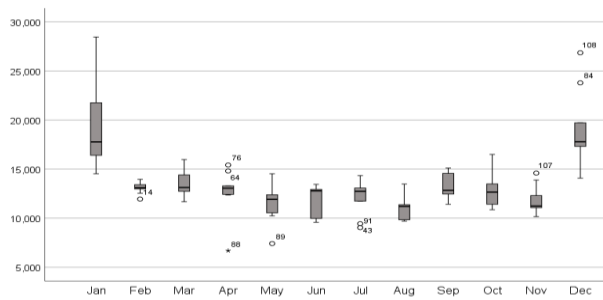


Fig. 1: Diagnostics of the dispersion of closure of micro-enterprises in the following months

The juxtaposition of the arithmetic mean with the standard deviation (Fig. 2) indicates the relatively high variation among the recorded values in January (CV=23.74%; CV - Coefficient of Variation), although it was classified as statistically insignificant. December was ranked second in terms of internal variance (CV=20.29%).

Arithmetic means were determined for twelve independent subgroups creating two different groups. One group covers two months - January and December - and the other the remaining months. The existence of the identified distribution is also confirmed by cluster analysis.

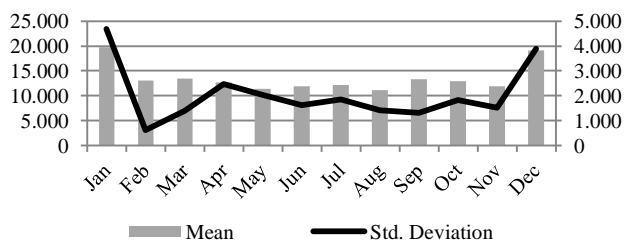


Fig. 2: Descriptive statistics

The existence of differences does not directly imply statistical significance in this regard. Determining this fact requires appropriate testing.

In further analysis, the authors used two approaches. The first is based on the 2013-2021 time series, and the second on the truncated 2013-2017 time series, corresponding to data obtained in a relatively unchanged external environment for companies. The research approach adopted was preceded by numerous graphical and computational simulations dictated by the COVID-19 pandemic outbreak in 2020 and the amended regulations governing sole proprietorship introduced in Poland in 2018. New legal and financial solutions taking into account, among others, exemptions from compulsory social contributions, except for health enterprises and the possibility of conducting limited economic activity without registration, have created more favorable - compared to existing solutions - financial conditions for undertaking the economic

activity. This situation, however, has been exploited not only by new entrepreneurs but also by experienced ones, combining the operation of several formally independent entities. Many entrepreneurs have taken advantage of existing preferences to open seemingly new entities, almost entirely formed from liquidated entities [13]. The rising inflation at the end of 2021 determined the adopted concept of division of the primary time series. Assessing the direction and intensity of changes in the quantitative structure of enterprises during periods of transition requires exceptional diligence in the research process.

4.1 Microenterprises Liquidated between 2013 and 2021 - Comparative Analysis of Means Values by Month (One-Way Analysis of Variance)

The criterion of normality of distribution analyzed by Shapiro-Wilk and Kolmogorov-Smirnov tests does not yield positive verification ($p < 0.05$) for two months (April, and June) for the 2013-2021 time series. The normality criterion was met for the truncated 2013-2017 time series. This discrepancy calls for further analysis (Table 1).

Table 1. Tests of Normality

Month	Kolmogorov-Smirnov ^a				Shapiro-Wilk ^b			
	Statistic		p		Statistic		p	
	A	B	A	B	A	B	A	B
Jan	.217	.333	.200*	.073	.217	.803	.226	.085
Feb	.199	.205	.200*	.200*	.199	.946	.799	.711
Mar	.231	.298	.183	.168	.231	.846	.579	.183
Apr	.340	.207	.004	.200*	.340	.928	.010	.583
May	.168	.329	.200*	.082	.168	.832	.789	.144
Jun	.267	.281	.064	.200*	.267	.791	.016	.068
Jul	.184	.289	.200*	.200*	.184	.794	.214	.072
Aug	.209	.245	.200*	.200*	.209	.840	.116	.165
Sep	.200	.296	.200*	.174	.200	.872	.475	.273
Oct	.161	.242	.200*	.200*	.161	.876	.471	.290
Nov	.217	.192	.200*	.200*	.217	.913	.272	.486
Dec	.271	.244	.055	.200*	.271	.956	.134	.781

Note: A. 2013-2021; B. 2013-2017; *. This is a lower bound of the true significance; a. Lilliefors Significance Correction, b. effect relevant to $p > 0.05$.

Also, the criterion of homogeneity of variance ($p > 0.05$) was not positively verified by Levene's test (Table 2). Failure to meet the above criterion provides a substantive rationale for using ANOVA analysis as a projection requiring verification by subsequent tests in addition to the normality test.

Table 2. Tests of Homogeneity of Variances

Series	Levene's Statistic	p
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2013	Based on Mean	3.882	.000
	Based on Median	1.927	.045
2021	Based on Median and with adjusted df	1.927	.065
	Based on trimmed mean	3.646	.000
2013	Based on Mean	1.786	.083
	Based on Median	.681	.749
2017	Based on Median and with adjusted df	.681	.736
	Based on trimmed mean	1.501	.162

Note: Grouping Variable: Month.

The results obtained through a one-way ANOVA analysis of variance ($p < 0.05$) do not support the hypothesis of equality of mean values in the subgroups studied (Table 3). Thus, the results of the test support the claim that there is a statistically significant difference between monthly averages for at least one pair in both the 2013-2021 and 2013-2017 series. However, the failure to meet the conditions of normality of distributions and homogeneity of variance in the case of the 2013-2021 time series also does not give grounds to consider the above result as statistically significant. Verification of the hypothesis of ascending seasonal variations requires further testing.

Table 3. ANOVA (Analysis of Variance)

Series		df	Mean Square	F	p
2013	Between Groups	11	72,308,477.552	13.361	.000
	Within Groups	96	5,412,093.581		
2017	Between Groups	11	25,081,556.230	7.096	.000
	Within Groups	48	3,534,524.842		

Note: Grouping Variable: month.

The results of the Welch and Brown-Forsythe tests, which by design do not require the criterion of homogeneity of variance to be met, indicate that there are significant differences between group mean values ($p < 0.05$) for at least two characteristics for the 2013-2017 and 2013-2021 monthly data time series (Table 4). The results indicate a fairly clear and distinct correlation between empirical and theoretical values determined by the additive and multiplicative models. In turn, the mutual dependence of theoretical models is very large.

Table 4. Robust Tests of Equality of Mean

Test	Statistic ^a	df1	df2	p
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Welch (2013-2021)	5.680	11	37.294	.000
Brown-Forsythe (2013-2021)	13.361	11	41.778	.000
Welch (2013-2017)	6.141	11	18.546	.000
Brown-Forsythe (2013-2017)	7.096	11	18.267	.000

Note: An asymptotically F distributed; Grouping Variable: Month.

As the criterion for normality of distributions was not met, the Kruskal-Wallis Test was also applied in the analysis (Table 5). The results obtained ($p < 0.05$) confirm the existence of statistically significant differences between at least two group averages.

Table 5. Kruskal-Wallis Test

Time series	Statistic ^a	df	p
2013-2021	54.816	11	.000
2013-2017	33.510	11	.000

Note: a. Grouping Variable: Month.

The number of liquidated enterprises by month significantly increased in January and December each year compared to the other months (Fig. 2). The post hoc analysis of the 2013-2021 and 2013-2017 time series, using all the tests available in the SPSS package, confirms the existence of significant differences between the results recorded in January and December and the other months, respectively ($p < 0.05$ individual; $p \rightarrow 1$ for tests). Due to the lack of fulfillment of the criterion of normality of distributions and homogeneity of variance, formally not all post hoc tests meet the criterion of usefulness for the 2013-2021 series, although in practice all the results obtained confirmed the existence of statistically significant intergroup differences for January and December.

Taking into account the formal and financial conditions of running micro-enterprises in Poland in a legal form: for a sole owner running a business, an increase in obligatory costs may be a problem that appears at the turn of the years. For instance, contributions paid to the Social Insurance Institution (ZUS), are conditioned by the amount of the average monthly salary in the national economy. In the years 2013-2021, this remuneration systematically increased by an average of 5.66% y/y.

4.2 Seasonal Decomposition

Seasonal decomposition is used to extract a seasonal component, a combined trend and cycle component, and an "error" component from a time series. In practice, this method enables the construction of forecasts taking into account seasonal variations of additive and multiplicative nature. A comparison of the theoretical series with the original one meets the requirements of ex-ante evaluation.

The analysis based on seasonality indicators provides further confirmation of the hypothesis on the seasonal nature of micro-enterprise liquidations. The model based on the 5-period centered moving average deviates from the series determined by the data subject to the study. Consideration of both additive and multiplicative seasonal variations in the forecast significantly increases the precision of fitting the theoretical model to the empirical data (Fig. 3).

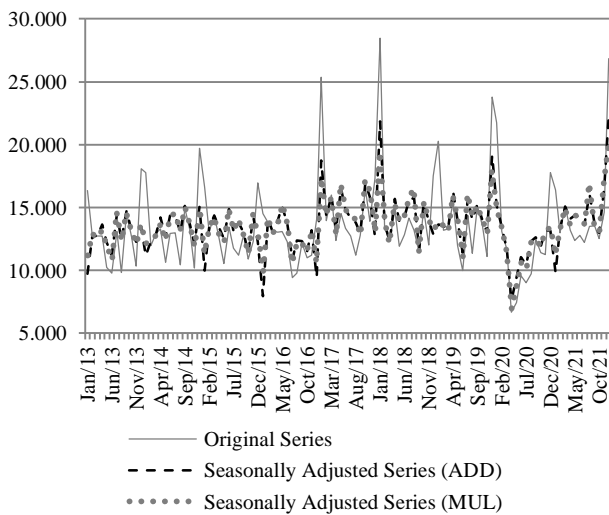


Fig. 3: The course of the original time series and the forecasts taking into account seasonal fluctuations of an additive and multiplicative nature

The values of the seasonal indicators coincide with the results obtained from the post hoc analysis (Fig. 4).

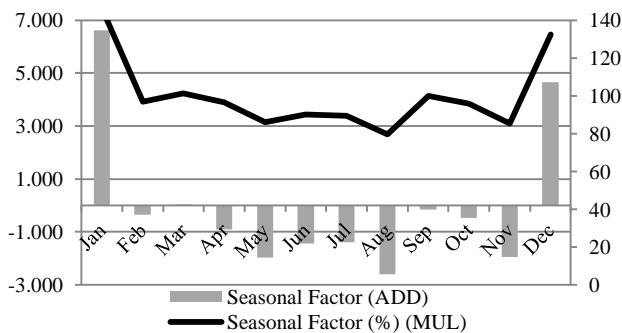


Fig. 4: Seasonal Factor

The correlation analysis confirms the outlined convergence of the original series based on average values for 2013-2021 with the forecast taking into account seasonal variations of additive and multiplicative nature (Table 6).

Table 6. Estimated correlation coefficients among variables

Variables	Termination		
	a.	b.	c.
CC			
Seasonal Adjusted Series (MUL)	.655** (.000)	.468** (.000)	.585** (.000)
Seasonal Adjusted Series (ADD)	.646** (.000)	.454** (.000)	.546** (.000)
Seasonal Adjusted Series (ADD)			
Seasonal Adjusted Series (MUL)	.971** (.000)	.923** (.000)	.989** (.000)

Note: CC - Correlation Coefficient, a. Pearson Correlation, b. Kendall's tau_b, c. Spearman's rho; **, Correlation is significant at the 0.01 level (2-tailed).

The results of seasonal decomposition confirm that most enterprises are liquidated in the winter period, which covers the months December-January. The values of the seasonal fluctuation indices recorded for the remaining months indicate slight differences as compared to the mean values determined for empirical data.

4.3 Enterprise Liquidation vs. the COVID-19 Pandemic

Relating the monthly results of the number of enterprise closures in the consecutive years 2018-2021 to the model built on the averages covering the years 2013-2017 (Fig. 5), it is clear that the values are significantly lower in the year 2020, which should be directly linked to the period of the outbreak of the COVID-19 pandemic. In that year, compared to the model, an 11.1% decrease was recorded, in contrast to the year 2021, in which a 10.4% increase was recorded. Therefore, it appears that, relative to the model, 2020-2021 did not significantly change the total number of deregistered enterprises y/y. In contrast, the number of enterprises liquidated in 2020 concerning 2019 decreased by more than 18.1%.

Thus, it turns out that the years 2018-2019, the period of introducing new rules on one-man business, brought an increase in the number of enterprise liquidations by 10.9% and 8.6% y/y, respectively. At the same time, it should be noted that during this period, compared to previous years, more enterprises were registered due to financial preferences (Jegorow et al., 2021).

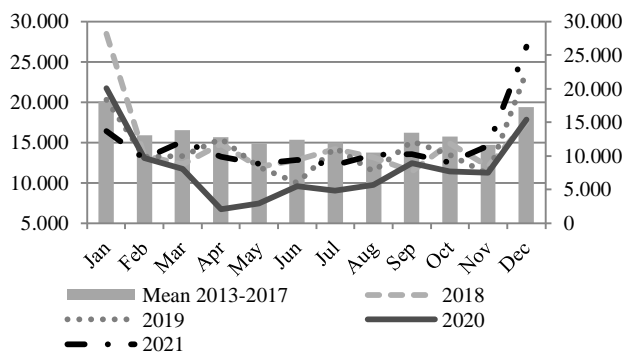


Fig. 5: Deregistration of enterprises, the average for 2013-2017, absolute data for 2018-2021

The distinctly lower numbers of liquidated enterprises in March and April 2020 can be associated with the temporary suspension of the operation of these entities. In March 2020, as many as 48,624 entities were closed. It was the highest result for liquidated enterprises from 2013-2021. The second lowest result in the category of suspensions is seen in December 2021, i.e., 42,237. Business closures or suspensions may be related to rising inflation, rising interest rates, and macroeconomic outlooks because of the long-term downturn in economic activity during the pandemic period. These results are significantly higher than the total recorded between 2013 and 2021, for which the average was 13,574.

5 Conclusion

The analysis shows that the liquidation of enterprises, similarly to their establishment [14], has a cyclical nature and is part of the seasonality determined by the monthly system. Most enterprises are liquidated in December or January. However, no month can be indicated as the month in which the fewest enterprises are closed. The identified quantitative aspect of the study is the contribution to further qualitative research on the question of why enterprises are going out. An important direction of future research is also to conduct a comparative analysis broken down into sectors or industries. An important direction of future research is also to conduct a comparative analysis broken down into sectors or industries. With the resources of public registers, such an analysis is currently not possible to be carried out based on a comprehensive study.

The analysis showed that the pandemic scare was of short duration and that the intensity of enterprise liquidations immediately after the COVID-19 outbreak did not occur. On the contrary, the number of liquidated enterprises decreased compared to earlier years. Entrepreneurs opted for the institution

of business suspension, the significant scale of which must be attributed precisely to the effects of the pandemic. Perhaps government or local government support helped entrepreneurs, and the answer to this question requires further studies. Given the differences from the outlined model, further empirical research should take into account the far-reaching effects of the COVID-19 pandemic, rising inflation, and the context of the war in Ukraine.

To conclude, the Polish government and local institutions undertake various activities to support entrepreneurship and entrepreneurs. Regardless of numerous doubts about the effectiveness of these instruments, it is worth considering the implementation of systemic support programs for entrepreneurs in the period of increased intensification of their liquidation in conditions of a relatively stable external environment. In this case, the focus should be on the increase in contributions paid by entrepreneurs to the Social Insurance Institution (ZUS), the amount of which has been systematically growing in recent years, becoming an increasing financial burden.

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