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ECONOMIC DETERMINANTS OF SMALL BUSINESS DEVELOPMENT IN THE LVIV REGION: INSIGHTS FROM REGRESSION ANALYSIS

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Abstract. *Purpose.* This research aims to investigate the factors influencing small business development in the Lviv region of Ukraine. Specifically, we seek to identify the impact of economic indicators such as Gross Regional Product (GRP), Foreign Direct Investment (FDI), and foreign trade participation on the number of small enterprises. *Methodology.* A quantitative research approach was employed to analyze the relationship between the aforementioned variables. A multiple linear regression model was constructed using data from the State Statistics Service of Ukraine and the Main Department of Statistics in the Lviv region. The model was estimated using statistical software to determine the significance and magnitude of the coefficients. *Results.* The empirical analysis revealed several key findings. Firstly, GRP and FDI were found to have a positive and statistically significant impact on the number of small enterprises in the Lviv region. This suggests that economic growth and foreign investment can stimulate entrepreneurship and business creation. Secondly, foreign trade participation exhibited a negative relationship with small business development. This finding may be attributed to factors such as increased competition from imported goods or the dominance of large-scale enterprises in the region's export sector. *Practical implications.* The results of this study have important implications for policymakers, business owners, and other stakeholders in the Lviv region. Policymakers can utilize these findings to develop targeted interventions aimed at fostering a conducive environment for small business growth. For instance, policies that promote economic growth, attract foreign investment, and support local entrepreneurs can contribute to the region's economic prosperity. Small business owners and entrepreneurs can benefit from the insights gained through this research by understanding the factors that drive growth and the challenges that may hinder it. By making informed decisions about their business strategies and operations, they can increase their chances of success. *Value / Originality.* This research contributes to the existing literature on small business development by providing empirical evidence on the factors influencing small business growth in a specific regional context. The use of a quantitative approach and the application of a multiple linear regression model enhance the rigor and reliability of the findings. Additionally, the study highlights the complex interplay of economic factors and their impact on small business development, offering valuable insights for policymakers and practitioners.

Keywords: small business, economic growth, regional economics, innovations, gross regional product, foreign direct investment, foreign trade, regional development.

JEL Classification: L26, R11, C21

1. Introduction

In the context of Ukraine's economic landscape, small businesses are pivotal for ensuring economic stability, fostering job creation, and promoting innovation. Particularly in the Lviv region, small enterprises play a crucial role in bolstering the local economy, fulfilling consumer needs, and enhancing budget revenues. This paper examines the current state and future prospects of small business development in Lviv, analyzing the influence of external factors

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on business operations and proposing models for optimizing management and planning processes in this sector. This study develops a multiple linear correlation-regression model to analyze the factors influencing small business development in the Lviv region of Ukraine. By identifying key variables, we aim to understand the dynamics affecting the number of small enterprises in the area.

Small businesses are vital to the economic framework of Ukraine, contributing significantly to job creation, economic stability, and innovation. Their inherent flexibility and adaptability enable rapid responses to market fluctuations and changing consumer preferences. In the Lviv region, small businesses are instrumental in local economic development, providing essential goods and services and enhancing local government revenues.

Despite their importance, small businesses face numerous challenges, including the adverse effects of the COVID-19 pandemic, the ongoing military conflict in eastern Ukraine, and general economic instability. This study aims to evaluate the current state of small businesses in the Lviv region, assess the impact of external factors on their operations, and develop strategies to optimize their management and growth.

2. Literature Review

The study of small and medium enterprises (SMEs) has evolved significantly, with researchers employing diverse methodological approaches to gain insights into various aspects of SME performance, innovation, and internationalization. This literature review synthesizes key contributions from studies that emphasize methodological rigor and the importance of systematic analysis in SME research. The author (Delmar, 2019) provides a comprehensive examination of growth measurement methodologies in the context of entrepreneurship and SMEs and highlights the complexities involved in defining and quantifying growth, advocating for a multi-dimensional approach that considers both quantitative metrics (such as revenue and employee count) and qualitative factors (like market impact and innovation). Paper (Cao, Shi, 2021) contribute to the field through a systematic literature review that explores entrepreneurial ecosystems in both advanced and emerging economies. Recent research suggests that interpretive qualitative case studies are a valuable methodological tool for exploratory research in SMEs, particularly in the field of information systems (Ponelis, 2015). Furthermore, significant methodological differences exist between multinational corporations and smaller firms when examining the driving forces and barriers of Industry 4.0 adoption among SMEs (Horváth, Szabó, 2019). Additionally, a robust methodological framework that combines quantitative and qualitative analyses is necessary to investigate the drivers of innovation among SMEs in the European Union (Hervás-Oliver, Parrilli, Rodríguez-Pose, Sempere-Ripoll, 2021). Finally, a rigorous methodological approach is crucial to understanding how SMEs navigate the complexities of internationalization (Gankema, Snu, van Dijken, 2019).

The COVID-19 pandemic has significantly affected small and medium enterprises (SMEs) across the globe. Small businesses were adjusting to the COVID-19 crisis (Bartik, Bertrand, Cullen, Glaeser, Luca, Stanton, 2020), many SMEs faced immediate challenges, including reduced customer demand, supply chain disruptions, and the need to rapidly adapt to new health guidelines (Bartik, Bertrand, Cullen, Glaeser, Luca, Stanton, 2020). SMEs faced unique challenges, including access to finance and navigating complex regulations related to health and safety (Juergensen, Guimón, Narula, 2020) and SMEs responded to public crises, specifically analyzing their digitalization efforts during COVID-19 (Guo, Yang, Huang, Guo, 2020). COVID-19 acted as a crucial catalyst for digital transformation among micro and small enterprises, their study highlights that the pandemic compelled many SMEs to rapidly adopt digital tools to sustain operations and connect with customers (Culasso, Giacosa, Giordino, Crocco, 2022). Digital tools enabled SMEs to adapt quickly to changing market conditions and consumer behaviors (Papadopoulos, Baltas, Balta, 2020). Access to finance remains a significant barrier for many SMEs, particularly in developing economies (Rao, Kumar, Chavan, Lim, 2023). The innovative SMEs often face unique financing challenges due to the perceived risks associated with their activities (Wellalage, Fernandez, 2019).

Recent studies examine the factors influencing the development of SMEs in Ukraine, for example economic conditions, regulatory frameworks, and access to financial resources significantly impact job creation within SMEs (Zhurakovska, Sydorenko, Shmatkovska, Brodska, 2020). Additionally, existing fiscal policies often fail to meet the specific needs of SMEs, highlighting the need for a reassessment of these policies (Yaroshevych, Cherkasova, Kalaitan, 2019). Moreover, improving access to finance and simplifying bureaucratic processes are crucial for facilitating smoother operations for small businesses (Zahorskyi, Lipentsev, Yurystovska, Mazii, Akimov, 2019). Microcredit programs have been shown to empower SMEs, particularly in rural areas, by providing crucial funding for business growth (Yemelyanov, Petrushka, Symak, Trevoho, Turylo, Kurylo, Lesyk, 2020). The digital transformation of small businesses is essential for enhancing competitiveness and ensuring their sustainability, and government support is vital in accelerating this process (Shevtsova, Shvets, Panychok, Sokolova, 2020). Furthermore, tailored

support for SMEs can enhance competitiveness and drive innovation, particularly through regional innovation policies and the concept of smart specialization (Nehrey, Zomchak, Havryliuk, 2024).

In addition, the relationship between economic growth and environmental degradation underscores the need for data intelligence to foster a sustainable environment (Zomchak, Nehrey, Oliskevych, Voronenko, Rogoza, 2023). Machine learning methods can be used to forecast the creditworthiness of individual borrowers, improving access to finance for SMEs (Zomchak, Melnychuk, 2022). Moreover, a conceptual approach to modeling financial support for innovative processes in small businesses is essential for their development (Komar, 2014; Zaichko, Riznyk, Biloshkurskyi, 2024). Authors also explore the institutional factors influencing public goods reproduction, by focusing on the economic indicators that drive small business growth (Kichurchak, 2016) and evaluate working life quality in Ukraine in terms of business responsibility (Sadova, Hrynkevych, Pasyeka, 2015). The broader context of entrepreneurship in the knowledge economy, particularly its development and support in Ukraine, needs to be considered (Sitnicki, Horbas, Derkach, Flowers, Wielewska, Tucki, Pimenov, 2024).

Furthermore, sustainable development components of territorial communities and regions, in light of socio-political challenges, significantly impact the effectiveness of support strategies for SMEs (Panchyshyn, Vdovyn, 2023). Local economic conditions, infrastructure, and policy frameworks are critical for fostering a conducive environment for small businesses (Sych, 2019).

The literature on small and medium enterprises (SMEs) highlights their critical role in economic development, innovation, and sustainability, particularly in challenging contexts such as post-war recovery.

3. Multiple Linear Correlation-Regression Model of Small Business Development in the Lviv Region: Results and Discussion

In the context of economic development, small businesses play a crucial role in job creation, innovation, and regional stability. To effectively analyze the factors contributing to small business growth in the Lviv region, we propose a multiple linear regression model that incorporates various economic indicators.

To construct a multiple linear correlation-regression model, we first identify the dependent variable Y and the independent variables X that directly affect it.

In this model, the dependent variable is defined as the number of small enterprises in the Lviv region. The following independent variables were selected:

– Gross Regional Product (million UAH);
– Direct Foreign Investments in Lviv Region Enterprises (million USD);
– Population Income in the Lviv Region (million UAH);
– Average Salary (USD);
– Number of Participants in Foreign Trade in the Lviv Region;
– Population of the Lviv Region;
– Number of Houses in the Lviv Region;
– Consumer Price Index.

To build the econometric model of small business development in the Lviv region, we utilized data from the State Statistics Service (State Statistics Service of Ukraine, 2024) and the Main Department of Statistics in the Lviv region (Main Department of Statistics in Lviv Region, 2024) for the period from 1999 to 2023.

Before commencing modeling, it is crucial to check the independent variables for multicollinearity and to discard any variables that exhibit high correlation with each other (Table 1).

Table 1
Correlation Matrix of the Input Indicators of small business development in the Lviv region

	Number of small enterprises	GRP, million UAH	Foreign direct investment, million US dollars	Incomes of the population, million UAH	Average salary, USD	Number of participants in foreign trade in goods	Number of Births	Number of houses, units	Number of cultural institutions, units
Number of small enterprises	1,00								
GRP, million UAH	0,75	1,00							
Foreign direct investment, million US dollars	0,47	0,21	1,00						
Incomes of the population, million UAH	0,77	0,98	0,22	1,00					
Average salary, USD	0,82	0,76	0,50	0,75	1,00				
Number of participants in foreign trade in goods	0,50	0,88	0,06	0,90	0,45	1,00			
Number of Births	-0,34	-0,68	0,02	-0,71	-0,20	-0,86	1,00		
Number of houses, units	0,79	0,93	0,22	0,93	0,83	0,75	-0,43	1,00	
Number of cultural institutions, units	-0,66	-0,44	-0,50	-0,42	-0,54	-0,27	0,28	-0,41	1,00

Source: calculated by authors

A threshold value of 0.85 was selected for correlations among the factors. We compared each factor's correlation with the dependent variable to determine which variables should remain in the model. Consequently, the following factors were discarded due to multicollinearity:
– population income in the Lviv Region (million UAH);
– average salary;
– population of the Lviv Region;
– number of houses in the Lviv Region;
– Consumer Price Index (CPI).

Thus, the multiple linear correlation-regression model will include three independent variables:
– Gross Regional Product (x_1).
– Direct Foreign Investment (x_2).
– number of foreign trade participants (x_3).

When building the linear correlation-regression model, we derived the following P-values (Table 2).

Table 2
P-values of the model of small business development in the Lviv region

Variable	P-value
Intercept	1.25E-11
GRP, million UAH	9.53E-05
Foreign direct investment, million US dollars	0.044
The number of participants in foreign trade in goods	0.028

Source: calculated by authors

Since the P-values for all independent variables are less than 0.05, the results are considered statistically significant. This indicates that, with 95% confidence, the relationships between the variables are not due to chance, and these independent variables significantly influence the dependent variable, making them important for inclusion in the model.

So, we can calculate parameters of the model of small business development in the Lviv region parameters (Table 3).

Table 3
Model of small business development in the Lviv region parameters

Variable	Coefficients
Intercept	17811.79
GRP, million UAH	0.028
Foreign direct investment, million US dollars	6.291
The number of participants in foreign trade in goods	-3.704

Source: calculated by authors

The multiple linear correlation-regression model for small business development in the Lviv region is expressed as:

$$\tilde{y} = 17811,7863 + 0,0277x_1 + 6,2912x_2 - 3,7042x_3$$

where $\tilde{y}$ is the number of small enterprises in the Lviv region;

x_1 – Gross regional product;

x_2 – direct foreign investment;

x_3 – the number of foreign trade participants.

The coefficients of the multiple regression indicate the expected change in the number of small enterprises for a one-unit increase in each independent variable:
– The average value of the model when all independent variables are zero is 17,811 enterprises.
– A one-million UAH increase in GRP results in an increase of 0.0277 small enterprises.
– A one-million USD increase in direct foreign investment results in an increase of 6.2912 small enterprises.
– An increase of one foreign trade participant corresponds to a decrease of 3.7042 small enterprises.

Next, we construct confidence intervals for the regression coefficients. With 95% probability, all actual model values will fall within the following limits:

Let's construct confidence intervals for the true values of the regression coefficients (Table 4):

Table 4
Confidence intervals of regression coefficients

Variable	Lower 95%	Upper 95%
Intercept	15002.44	20621.13
GRP, million UAH	0.016	0.04
Foreign direct investment, million US dollars	0.19	12.39
The number of participants in foreign trade in goods	-6.97	-0.44

Source: calculated by authors

Based on the obtained data, it can be concluded that with probability 95% all factual value of the model will be to be in limits:

$$y_{нижс} = 15002,44 + 0,0157x_1 + 0,1909x_2 - 6,967x_3 (2.2)$$

$$y_{верх} = 20621,128 + 0,0397x_1 + 12,3914x_2 - 0,4412x_3 (2.3)$$

Also was received the results of basic evaluations plural correlation-regression models, and exactly: coefficient plural correlations, coefficient of the multiple determination and standard errors models (Table 5):

Table 5
Regression statistics of the model equation

Indicator	Regression statistics
Multiple R	0.86
R-squared	0.020.748
Standart Erroe	1147.68

Source: calculated by authors

	df	SS	MS	F
Regression	3	77699816,67	25899938,89	19,6635006
Residual	21	27660319,89	1317158,09	
Total	24	105360136,6		

Figure 1. Empirical value of Fisher's test
Source: calculated by authors

We also obtained key statistics for the regression model:

– The multiple correlation coefficient of 0.86 indicates a strong positive correlation between the number of small enterprises, the gross regional product, direct foreign investments, and the number of foreign trade participants.

– The coefficient of determination indicates that changes in GRP, direct foreign investment, and the number of foreign trade participants explain 73.75% of the variation in the number of small enterprises.

– The standard error of the model is approximately 1147, suggesting that the actual values fluctuate around the theoretical values by approximately 1147 enterprises.

To assess the adequacy of the multiple correlation-regression model, we applied Fisher's F-test (Figure 1).

The empirical value of Fisher's test was 19.663. Using the table of Fisher's test at a given level of significance α=0.05 and at given degrees freedom v1=3 and v2=25-3-1=21 found critical Fisher's test value, which is 3.072. F emp > F cr, and therefore with probability 95% zero hypothesis reject What testifies about adequacy models

The next step involves testing the model for autocorrelation and heteroskedasticity.

Using the Durbin-Watson table for the given degree of freedom α = 0.05, k =3 for the sample size of 25, the value was found d_l = 1,123 and d_u = 1,654 With the help of these data, autocorrelation zones were determined. the value of the d – statistic was found to be 1.791. This value is in the range of 1.654-2.346, which indicates the absence of autocorrelation. So, with a probability of 95%, it can be stated that there is no autocorrelation in the sample population.

4. Conclusions

The development of small businesses in the Lviv region is crucial for the overall economic growth of the area. Our research indicates that small businesses encounter numerous challenges, including economic instability, limited access to finance, and regulatory and infrastructure barriers. Despite these obstacles, small businesses exhibit significant potential for adaptation and innovation.

The impact of external shocks, such as war and the COVID-19 pandemic, underscores the importance of small businesses. These events have considerably affected the economic landscape in Ukraine, particularly the operations of small enterprises. The pandemic resulted in substantial income losses and temporary closures, especially in the service sector, while the ongoing conflict has led to decreased production, loss of markets, and infrastructure destruction. Many entrepreneurs have had to relocate their businesses to safer areas or adjust their business models to cope with new conditions.

This study employed correlation-regression analysis methods to identify key factors influencing the number of small enterprises. A multiple linear regression model was constructed, demonstrating the relationship between selected independent variables and the dependent variable – the number of small enterprises.

Overall, the findings affirm the value of correlation-regression analysis in identifying the primary factors affecting small business performance in the Lviv region.

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