

FACTORS OF ENTREPRENEURIAL ACTIVITY IN LARGE CITIES OF RUSSIA

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Abstract

Purpose: In this article, a correlation and regression analysis are carried out aimed at identifying the interrelation between the indicators of socio-economic development of cities and the number of business entities in them.

Methodology: This is analytical-logical research that has been done through content analysis and documentary and library research.

Result: The entrepreneurial activity in these cities depends on such factors as the retail sales per capita, the proportion of unemployed who applied to the employment service in total population, budget revenues per capita and the volume of paid services per capita. The equations compiled for the other cities did not pass the test according to Student and Fisher criteria. Therefore, it can be concluded that other factors not considered in this analysis influence the entrepreneurial activity in those cities. The revealed dependencies will help determine the directions for a further increase of entrepreneurial activity in the large cities of Russia.

Applications: This research can be used for universities, teachers, and students.

Novelty/Originality: In this research, the model of factors of entrepreneurial activity in large cities of Russia is presented in a comprehensive and complete manner.

Keywords: correlation and regression analysis, economic development, entrepreneurship, city, Russia.

INTRODUCTION

Entrepreneurship in cities with over one million people in the Russian Federation develops differently. The difference between the numbers of enterprises in different cities is explained by a set of factors affecting the development of the city. An important task is to identify a factor that is crucial for the number of enterprises in the cities. A source for the determination of the interrelation between indicators is a correlation-regression analysis.

Teixeira et al. (2018) argue that entrepreneurship and entrepreneurial intentions have gained increasing attention from academics, governments, and politicians around the world. It is seen as a critical factor for economic growth and development of a country, as it contributes to the solution of fundamental macroeconomic issues such as increased employment, development of competitiveness, innovation and the creation of economic and social values. Therefore, academics and researchers, governments and politicians are interested in identifying the differences and causes that influence the level of entrepreneurship as a phenomenon associated with business activity in a country or region. (Teixeira, Casteleiro, Rodrigues & Guerra, 2018)

The aim of another study was to determine the factors affecting the decision of the entrepreneurship of agricultural enterprises. In the study, entrepreneurial coefficients were taken as model-dependent variables, and the amount of land, active capital, gross production value, MLU, producer age, agricultural insurance, net profit, and formal education variables were included as independent variables. Based on the results obtained, the amount of active capital and age variables falling negative, land quantity, gross production value, EIB, insurance, net profit, and education parameters were determined as positive according to the theory. (Agizan, Bayramoglu, 2019)

Within another approach, the author tries to explore the concept of cities as custodians for entrepreneurial opportunity (EO). While EO is normally applied at the individual level, the aim of this paper is to show its importance at a collective, urban level and present a conceptual model of pull factors. The three key pull factors identified are (1) city configuration, (2) city connectivity, and (3) city culture. (Stephens, 2019)

Also, the impact of small entrepreneurship on the main indicators of the Federal district region's development in Russia is studied. As a result of regression analysis, a statistically significant association between indicators of small entrepreneurship performance and development of the Volga Federal District regions is revealed. (Sadyrtidinov, Korablev, & Vladimirova, 2015)

METHODS

The following thirteen Russian cities with a population of more than one million people were selected in order to analyze the entrepreneurial activity: Novosibirsk, Yekaterinburg, Nizhny Novgorod, Kazan, Chelyabinsk, Omsk, Samara, Rostov-

on-Don, Ufa, Krasnoyarsk, Perm, Voronezh, and Volgograd. The cities Moscow and Saint-Petersburg were excluded from the research because they are endowed with the status of a state (region). So, it is incorrect to use them for comparison with other cities which are municipalities. [Kolossova, V., & O'Loughlin, J. \(2004\)](#)

Correlation analysis is used for determining the tightness and direction of the relationship between sampled variables. And regression analysis helps in determining the type of mathematical function in a causal relationship between variables.

The following explanatory variables (X) are chosen for analysis: [Puffer, S. M., & McCarthy, D. J. \(2001\)](#)

- The proportion of the working-age population in the total population (X1);
- Investments in fixed assets per capita (X2);
- Budget revenues per capita (X3);
- Average monthly accrued wages (X4);
- The proportion of unemployed citizens who applied for assistance in finding suitable work to state organizations of employment services in the total population (X5);
- Commissioning of fixed assets (X6);
- Retail turnover per capita (X7);
- The volume of paid services per capita (X8). [Kolossova, V., & O'Loughlin, J. \(2004\)](#).

The number of enterprises that indicates the entrepreneurial activity is used as the dependent variable (Y). After identifying all the dependencies, the factors of entrepreneurial activity are determined.

The source of information for conducting correlation and regression analysis is the statistical collection "Regions of Russia. The main socio-economic indicators of cities for the 2013-2017 years. ([Glebova, Sadyrtidinov, Khamidulina, Masgutov, Sadykov, 2015](#)) The publication provides information on the socio-economic situation in the capitals of the Russian regions, as well as cities with a population of over 100 thousand people. Also, the source of information is a database of indicators of the municipalities in the selected cities.

RESULTS AND ITS DISCUSSION

The analysis of data for city Novosibirsk showed that the number of enterprises has a strong correlation with the commissioning of fixed assets (correlation coefficient - 0.86). The regression model (1) was built.

$$Y = 120270.3 + 0.4955x \quad (1)$$

As can be seen, with an increase in the commissioning of fixed assets by 1%, the number of enterprises will increase by 495.5 units. The determination coefficient is 0.74, which means that of the number enterprises in Novosibirsk depends on the commissioning of fixed assets on 74%, and another 26% fall on other factors.

According to Student statistics, the differences between the compared values are not statistically significant. Fisher statistics shows that the model has a low level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 1.5%. The quality of the model is rated as good since the error does not exceed 8-10%.

For the city Yekaterinburg, the retail turnover per capita showed the highest correlation with the number of enterprises. So, it was chosen to build a regression model (2).

$$Y = 174427.6 - 0.3976x \quad (2)$$

With an increase in retail sales per capita by 1000 rubles, the number of enterprises will decrease by 397.6 units. The increase in retail turnover can be partly explained by the annual increase in prices for goods sold. With a rise in price, consumers also expect a rise in quality, which is often inaccessible to newly opened enterprises that cannot compete with others. The number of such enterprises decreases. [Puffer, S. M., & McCarthy, D. J. \(2001\)](#)

The determination coefficient is 0.82, which means that the number of enterprises in Yekaterinburg depends on retail sales per capita on 82%, and another 18% is accounted for by other factors.

According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 2%. The quality of the model is rated as good since the error does not exceed 8-10%.

To build a regression model (3) for Nizhny Novgorod, the indicator X5 was chosen - the proportion of the unemployed who applied to the employment service in the total population. [Kolossova, V., & O'Loughlin, J. \(2004\)](#)

$$Y = 74,558.5 + 67,509.7x \quad (3)$$

With an increase in the share of the unemployed who applied to the employment service in the total population by 1%, the number of enterprises will increase by 67,509.7 units. Those who apply to the employment service are a potential workforce, usually not pretending on high wages. Their increase will positively affect the number of enterprises and organizations in the city. [Shakhovskaya, L. S., & Akimova, O. E. \(2013\)](#)

The determination coefficient is 0.85. According to the Student statistics, the coefficient is significant, the explanatory variable is chosen correctly. Fisher statistics show high level of quality of the model. According to the Darbin-Watson table, there is autocorrelation of residues. The average approximation error is 1.29%. The quality of the model is rated as good since the error does not exceed 8-10%. [Puffer, S. M., & McCarthy, D. J. \(2001\)](#)

Regression model (4) for the city Kazan was built, using the indicator x5 - the proportion of the unemployed who applied to the employment service in the total population.

$$Y = 30536.75 + 105193.2x \quad (4)$$

The determination coefficient is 0.69. Student statistics shows that the coefficient is not significant. According to Fisher statistics the model has a low level of quality. Autocorrelation of residues is presented. The average approximation error is 3.57%. The quality of the model is rated as good since the error does not exceed 8-10%.

Regression model (5) for the city Chelyabinsk was also estimated using the indicator X5

$$Y = 51239.1 + 33479.5x \quad (5)$$

The determination coefficient is 0.79. According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table there is autocorrelation of residues. The average approximation error is 2.01%. The quality of the model is rated as good.

After correlation analysis for the city Omsk the indicator x8 - the volume of paid services per capita was chosen to construct a regression model (6).

$$Y = 55750.39 - 492.71x \quad (6)$$

The determination coefficient is 0.47, so the accuracy of the regression equation is average. According to the Student statistics, the differences in the compared values are not statistically significant. Fisher statistics shows that the model has a low level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 1.88%. The quality of the model is rated as good.

To build a regression model for the city Samara, the indicator x5 was chosen - the proportion of the unemployed who applied to the employment service in the total population.

$$Y = 52908.33 + 19677.4x \quad (7)$$

The determination coefficient is 0.9. According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 0.61%. The quality of the model is rated as good. [Shakhovskaya, L. S., & Akimova, O. E. \(2013\)](#)

To build a regression model (8) for the city Rostov-on-Don, the indicator x3 (budget revenues per capita) was chosen.

$$Y = 34004.65 + 0.4087x \quad (8)$$

The determination coefficient is 0.77. According to Student statistics, the coefficient is not significant. Differences in the compared values are not statistically significant. Fisher statistics shows that the model has a low level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 0.88%. The quality of the model is rated as good.

The proportion of the unemployed who applied to the employment service in the total population was also chosen to construct a regression model (9) for the city Ufa. [Puffer, S. M., & McCarthy, D. J. \(2001\)](#)

$$Y = 32512.67 + 32988.9x \quad (9)$$

The determination coefficient is 0.83. According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table, there is autocorrelation of residues. The average approximation error is 1.43%. The quality of the model is rated as good.

The regression model (10) for the city Krasnoyarsk was constructed using the indicator X3 - Per capita income.

$$Y = 74231.51 - 0.8332x \quad (10)$$

The determination coefficient is 0.95. According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 0.52%. The quality of the model is rated as good. [Kolossoy, V., & O'Loughlin, J. \(2004\)](#)

Next, the correlation and regression analysis for the city Perm was made. In the regression model (11) the indicator X5 - the proportion of the unemployed who applied to the employment service in the total population was used.

$$Y = 48173.56 + 15222.9x \quad (11)$$

The determination coefficient is 0.41. The accuracy of the selection of the regression equation is average. According to Student statistics, the coefficient is not significant. Differences in the compared values are not statistically significant. Fisher statistics shows that the model has a low level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 2.99%. The quality of the model is rated as good.

To build a regression model for the city Voronezh, the indicator X7 - retail turnover per capita was chosen.

$$Y = 25807.49 + 182.4x \quad (12)$$

The determination coefficient is 0.66. According to Student statistics, the coefficient is not significant. Differences in the compared values are not statistically significant. Fisher statistics shows that the model has a low level of quality. According to the Darbin-Watson table, autocorrelation of residues is presented. The average approximation error is 1.57%. The quality of the model is rated as good.

The last million-plus city analyzed in this work is Volgograd. To build a regression model, we chose the indicator x8 - The volume of paid services per capita. [Shakhovskaya, L. S., & Akimova, O. E. \(2013\)](#)

$$Y = 41060.88 - 270.55x \quad (13)$$

The determination coefficient is 0.91. According to the Student statistics, the coefficient is significant and the explanatory variable is chosen correctly. Fisher statistics shows that the model has a high level of quality. According to the Darbin-Watson table, there is no autocorrelation of residues. The average approximation error is 1.99%. The quality of the model is rated as good since the error does not exceed 8-10%.

CONCLUSION

The equations for such cities as Yekaterinburg, Nizhny Novgorod, Chelyabinsk, Samara, Ufa, Krasnoyarsk, Volgograd can be considered reliable. The entrepreneurial activity in these cities depends on such factors as the retail sales per capita, the proportion of unemployed who applied to the employment service in total population, budget revenues per capita and the volume of paid services per capita. The equations compiled for other cities did not pass the test according to Student and Fisher criteria, therefore it can be concluded that other factors not considered in this analysis influence the entrepreneurial activity in those cities.

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