**ASSESSMENT OF THE INFLUENCE OF AGGLOMERATION FACTORS ON THE ECONOMIC ACTIVITY OF THE NOVOSIBIRSK REGION (MICROECONOMIC ANALYSIS)**

In the eastern Russia the settlement system has a focal character, transport development and population density are low, and there are doubts that agglomeration effects have a significant impact on economic results.

The Novosibirsk region has a special development condition. Unlike many other regions of Siberia and the Far East, it does not have rich natural resources, is not the base of large corporations, has a diversified economic structure and a competitive domestic market. The combination of these features may be favorable for the work of agglomeration forces.

The tested hypotheses of the analysis are as follows:

1. On the territory of the Novosibirsk region, agglomeration effects are significant and affect the economic and financial performance of enterprises.

2. Proximity to Novosibirsk – a large labor and goods market - creates advantages for enterprises.

3. Location in the city creates advantages for businesses due to spatial concentration.

4. Economic agents located on the territory of the Novosibirsk agglomeration have higher productivity indicators due to institutional support.

The SPARK-Interfax database was a source of information about enterprises. Hypothesis testing requires the specification of regression equations that include, along with the factors of interest, those variables that control for important characteristics and conditions of the development of enterprises. The models used the approach of an extended production function, where, along with assets and the number of employees, variable of distances to Novosibirsk, belonging to the city and to the urban agglomeration were introduced, while the form of ownership, the duration of work in the market and the industry of the company were controlled.

To make sure that the estimates of agglomeration effects are stable, their impact on two indicators was studied: revenue and profit of the enterprise, and both absolute and relative (per employee) values were considered; the following equations were estimated:

(1)

Where *Yi* is the revenue of the enterprise *i*; *Ki* is the assets of the enterprise *i; Li*is the number of employees at the enterprise *i*; *Ai* is the age of the enterprise *i* ; *Bi* is a dummy variable that takes the value 0 if the type of activity of the enterprise *i* relates to agriculture and 1 to all other types of activity; *Si* is a dummy variable that takes the value 1 if enterprise *i* is private and 0 in all other cases; *Di*is the distance from enterprise *i* to the city of Novosibirsk; *Ci* is a fictitious variable that takes the value 1 if the enterprise *i* is located in the city and 0 if it is not in the city; *Ui*  is a fictitious variable that takes the value 1 if the enterprise *i* is located on the territory of the Novosibirsk urban agglomeration and 0 if it is outside the boundaries of the agglomeration; *εi* is an error.

 (2)

 (3)

Where *Pi* – profit of firm *i*.

 (4)

In accordance with the properties of the production function, there should be a positive impact of labor and capital on total production volumes and on the size of the value-added, respectively, it is expected that *β1>0* and *β2>0*. The expected results are higher efficiency of private business (*β5>0*), reduced incentives for development with an increase in the company's age (*β3<0*) and higher productivity in industry compared to agriculture (*β4>0*). The tested hypotheses suggest a statistically significant positive effect from the concentration of business activity and the proximity of producers to a large market, i.e. *β6>0, β7>0* and *β8>0*.

The information on the sample of enterprises refers to one year (2019), and the problems of autocorrelation, accounting for inflation and time trend are not an issue in the regressions. However, the tests showed the heterogeneity of the error variance, so the estimations were carried out using the generalized least squares method.

The estimation results for revenue (1) and labor productivity (2) are shown in Table 1, estimates for profit (3) and profit per employee (4) are presented in Table 2.

The elasticity coefficients for assets and employment in the regression for total revenue correspond to the properties of the Cobb-Douglas function. The expected is the positive impact on the output and productivity of private ownership compared to the state. The higher productivity and profitability of business in the field of industry and services in comparison with agriculture turned out to be predictable. Younger enterprises demonstrate higher rates of both output and profit, which may be explained by incentives to gain a foothold in the market.

*Table 1*

**Regression estimates for revenue**

|  |  |  |
| --- | --- | --- |
|  | Revenue (*Yi*) | Revenue per employee  |
|  | Initial regression | Regression with excluded insignificant variables | Initial regression | Regression with excluded insignificant variables |
| Constant () | 8,201\*\*\*(0,126) | 8,211\*\*\*(0,127) | 8,268\*\*\*(0,122) | 8,273\*\*\*(0,122) |
| Employment (*Li*) | 0,571\*\*\*(0,006) | 0,571\*\*\*(0,006) | - | - |
| Assets (*Ki*) | 0,480\*\*\*(0,004) | 0,480\*\*\*(0,004) | 0,480\*\*\*(0,004) | 0,480\*\*\*(0,004) |
| Age of firm (*Ai*) | -0,577\*\*\*(0,011) | -0,577\*\*\*(0,011) | -0,549\*\*\*(0,011) | -0,549\*\*\*(0,011) |
| Branch (*Bi*) | 0,583\*\*\*(0,100) | 0,586\*\*\*(0,099) | 0,555\*\*\*(0,094) | 0,556\*\*\*(0,093) |
| Type of property (*Si*) | 0,217\*\*\*(0,039) | 0,219\*\*\*(0,039) | 0,190\*\*\*(0,039) | 0,191\*\*\*(0,039) |
| Distance to Novosibirsk (*Di*) | -0,034\*\*\*(0,007) | -0,036\*\*\*(0,006) | -0,033\*\*\*(0,007) | -0,034\*\*\*(0,006) |
| City (*Ci*) | 0,084\*\*(0,035) | 0,085\*\*(0,035) | 0,080\*\*(0,035) | 0,081\*\*(0,035) |
| Agglomeration (*Ui*) | 0,016(0,043) | - | 0,008(0,043) | - |
| R2 | 0,574 | 0,574 | 0,361 | 0,361 |
| Number of observations | 44366 | 44366 |

All econometric estimates have confirmed the statistical significance of positive agglomeration effects in the regional economy. Reducing the distance to the regional center by 2 times increases the output and efficiency of enterprises by about 3.5%, which corresponds to the estimates obtained for Russia as a whole. The phenomenon of "protection of the city" was discovered, belonging to the city is a significant positive factor for revenue, however this variable is statistically insignificant for profit. Obviously, the wider and more diversified market of the city supports demand, keeping enterprises of varying degrees of efficiency.

*Table 2*

**Regression estimates for profit**

|  |  |  |
| --- | --- | --- |
|  | Общая прибыль (*Pi*) | Прибыль на одного занятого  |
|  | Регрессия полная | Регрессия с исключёнными незначимыми факторами | Регрессия полная | Регрессия с исключёнными незначимыми факторами |
| Constant () | 4,331\*\*\*(0,199) | 4,413\*\*\*(0,216) | 4,406\*\*\*(0,191) | 4,553\*\*\*(0,202) |
| Employment (*Li*) | 0,529\*\*\*(0,008) | 0,529\*\*\*(0,008) | - | - |
| Assets (*Ki*) | 0,531\*\*\*(0,005) | 0,531\*\*\*(0,005) | 0,531\*\*\*(0,005) | 0,531\*\*\*(0,005) |
| Age of firm (*Ai*) | -0,166\*\*\*(0,013) | -0,166\*\*\*(0,013) | -0,130\*\*\*(0,013) | -0,131\*\*\*(0,013) |
| Branch (*Bi*) | 0,747\*\*\*(0,192) | 0,773\*\*\*(0,188) | 0,731\*\*\*(0,182) | 0,731\*\*\*(0,179) |
| Type of property (*Si*) | 0,097\*(0,052) | 0,103\*\*(0,052) | 0,066(0,052) | - |
| Distance to Novosibirsk (*Di*) | -0,023\*\*\*(0,009) | -0,035\*\*\*(0,007) | -0,022\*\*(0,009) | -0,032\*\*\*(0,007) |
| City (*Ci*) | 0,040(0,046) | - | 0,034(0,046) | - |
| Agglomeration (*Ui*) | 0,072(0,056) | - | 0,062(0,057) | - |
| R2 | 0,569 | 0,569 | 0,333 | 0,333 |
| Number of observations | 44366 | 44366 |

The variable of belonging to the Novosibirsk agglomeration turned out to be statistically insignificant. The phenomenon of the "shadow of the city" rather than the "agglomeration shadow" takes place in the region, a significant drop in productivity and efficiency of firms is observed in the immediate environment of the regional capital, which also covers part of the territories within the boundaries of the agglomeration.

Despite the fact that the Novosibirsk region is located in the Asian part of the country, the results of microeconomic analysis confirmed that agglomeration effects work in there.