Analysis on Investment of Small and Medium Entrepreneurship

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ABSTRACT

The article presents the results of the author’s analysis and evaluation of investments in small and medium entrepreneurship, the empirical testing of hypotheses about the presence of the differentiation value of investment and the possibility of describing the existing regularities with the use of economic and mathematical models. During models' constructing we used official statistical indicators characterizing the set of small enterprises, medium enterprises and individual entrepreneurs in all regions of the Russian Federation. There are two classes of models describing the volumes of investments accounted, respectively, to one entrepreneurial structure and one employee. Logical and statistical analysis showed that all developed models are approximate well the original data over the entire range of their changes. It is proved that the volume of investment, both in terms of entrepreneurial structure and one of its employees differs significantly depending on the number of employees of entrepreneurial structures, regions, and economic activities, which specialize in entrepreneurial structures. The developed model and the resulting patterns can be used to solve a wide range of tasks while monitoring business activities, development design and forecasting in this sector of the economy at the federal, regional and municipal levels of management.

Keywords: Small and Medium Enterprises, Individual Entrepreneurs, Investment, Economic and Mathematical Models, Regions of the Country

JEL Classifications: L26, O16

1. INTRODUCTION

Small and medium entrepreneurship started to form in the Russian Federation since the nineties of the twentieth century. At this time there was a transformation of the economy, which was largely ineffective. There was an imbalance with a predominance of large enterprises, associations and industrial complexes in the economy. Recently entrepreneurship has experienced significant growth. To date, the role of entrepreneurial structures (small and medium enterprises, individual entrepreneurs) in our country has significantly increased. More than 23 million people worked in this sector of economy in 2010. The total number of entrepreneurial structures was about 4.5 million. The volume of production and services has reached 30.8 trillion rubles (Federal Service of State Statistics, 2016).

One of the significant trends of contemporary development of world economy is the increasing role of small and medium businesses as more mobile and flexible forms of organization of business life. This is evidenced by the increase in the share of small business in the gross domestic product (GDP) of the country, growth in the number of employed in small business and entrepreneurship. Over the past 15 years the share of small and medium business in Russia’s GDP has nearly doubled, however it is still not comparable to the indicator in developed countries. Thus, the share of small and medium business in the GDP of European countries reached 58% and in the USA – 50%. However, small and medium entrepreneurship in our country has not yet reached the level characteristic for the developed countries as shown, in particular, in recently published research results (National Report “Global Entrepreneurship Monitor”, 2011). In Russia it is only 21%. The dynamics of employment in the sphere of individual entrepreneurship over the last 15 years is unstable. Its share in the total employment in Russia does not exceed 10%.

The need for a substantial increase in the turnover of entrepreneurial structures was repeatedly observed in the messages of the President to the Federal Assembly and government decisions.
At present, therefore, it is important to develop evidence-based recommendations for further development of entrepreneurship in the country, increase of its role in the national economy. The increase flow of investments in the sphere of small business is an effective way of work. However, public financing and realization of target programs are not always able to provide a sufficient volume of investment resources, aided by the banking sector.

The analysis of lending practices of individual entrepreneurs shows a strong tendency to the reduction of the size of loans granted to them and the increasing value of overdue debt on them (Figure 1).

Despite the fact that the dynamics of investment of small enterprises in fixed capital is positive, so the investment growth of small enterprises in fixed assets in 2012 compared to the previous year increased by 20.8%, in 2013 by 10.2%, in 2014 year by 15.6%, one of the major problems of entrepreneurship development are the lack of own funds, high interest rates on loans, and difficulties in obtaining loans (Kiseleva et al., 2015).

In this regard, among urgent scientific problems is defining the regularities characterizing the investment needs for the development of entrepreneurship at the present stage. Common problems of investments into the fixed capital of enterprises and organizations are considered in the works of many authors (Bystrov et al., 2008; Usowicz, 2011; Nurmukhametov, 2009; Erden and Holcombe, 2005; Voss, 2002). Some aspects of the investment policy of small and medium entrepreneurship are represented in a number of monographs and papers (Pichler et al., 2002; Domar, 1957; Van Horn, 2003; Gittman and Jonk, 1997; Skuras et al., 2008; Anson, 2003). These problems are not fully reflected in researches of Russian economists except several works (Livshic et al., 2000; Regional Aspects of Functioning and Development of Small Entrepreneurship in Russia, 2010; Vilenskiy, 2011; Zlobin and Plakhova, 2008); modeling of investment was considered in the monograph of Micek (2011).

The criteria defining small and medium enterprises were established in the Federal Law "On the Development of Small and Medium Entrepreneurship in the Russian Federation" dated 24.07.07 year No. 209-FZ (2007). The main criterion is the number of employees that for small enterprises should not exceed 100 persons, and for the average enterprise it ranges from 101 to 250 people. Small and medium entrepreneurship in accordance with paragraph 1 of article 3 also includes individual entrepreneurs. Further, in this paper three types of business entities – Small enterprises, medium enterprises and individual entrepreneurs are called the entrepreneurial structure.

Thus, entrepreneurship is seen quite widely, which is consistent with the concept presented in the work of Reynolds et al. (2005). It should be noted that entrepreneurial structures are characterized by the same types of economic activities, they compete on the same markets, have largely the same production technology, work as risky businesses. Individual entrepreneurs differ from small and medium enterprises on their organizational-legal form.

The paper discusses the results of research that the authors devoted to the analysis and evaluation of the current investment volumes of small and medium entrepreneurship, empirical testing of hypotheses about the presence of differentiation values of investment and the possibility of describing the existing regularities with the use of economic and mathematical models. The volume of investments in the calculation for one such structure and for one its worker are considered as indicators of investment in fixed capital of entrepreneurial structures.

2. METHODOLOGICAL APPROACH AND ALGORITHM

In the present study, the authors have put forward the following hypotheses.

Hypothesis 1: The volume of investments, both in terms of one entrepreneurial structure and one of its employees differs significantly depending on the number of employees (size) of the entrepreneurial structure, regions of the country, and types of economic activities that entrepreneurial structures specialize.

Hypothesis 2: Mathematical models can be used to estimate the volumes of investment in entrepreneurial structures as well as the functions of density of normal distribution.

The aim of the study was to develop methodologies and tools for the analysis of investment volumes in entrepreneurial structures. Thus, the following tasks were solved: Methodical approach and algorithm of the study was proved, economic and mathematical models describing the volume of investments in 2010 were developed, the analysis of the obtained models was offered and the regularities that characterize the achieved level of investments were formulated.

The research methodology is based on the consideration of aggregates of entrepreneurial structures in all regions (republics, territories, areas) of the country. The need for this approach is due to the following objective prerequisites. Entrepreneurial structure, acting as an independent economic entity, defines its goals and objectives, based on the specific situation, and leads to a risky economic activity. In each of the regions of the Russian Federation the number of these entrepreneurial structures is very large. Description of individual enterprises (entrepreneurs) and their subsequent aggregation is a very complex and time-consuming process. Therefore it would be logical to build models for a set of entrepreneurial structures, combined by territorial and industrial characteristics.

The author’s algorithm for estimating the levels of investment in entrepreneurial structures included the following steps:

Figure 1: The amount of loans granted to the individual entrepreneurs and the size of overdue debt on them (compiled by the authors according to the Bank of Russia data)
• Formation of the information base, describing the type of economic activity, the number of small enterprises, medium enterprises and individual entrepreneurs, the number of its employees and volume of investments in fixed capital for each region of the country;
• Determination of the volume of investments on the aggregations, respectively, small enterprises, medium enterprises, individual entrepreneurs in every region depending on the types of activity;
• Calculation of the amount of investment attributable to one entrepreneurial structure and one of its employees for each region of the country depending on the types of activity;
• Constructing density functions of normal distribution, approximating the values of investment volumes accounted, respectively, for one small enterprise, medium enterprise and one individual entrepreneur, and the functions that describe the amount of investment per one of its employees (first class models);
• Constructing density functions of normal distribution, approximating the values of investment volumes attributable to one entrepreneurial structure by major types of economic activity (second class model);
• Assessment of the quality constructed functions on the accepted criteria;
• Definition of laws for the development of entrepreneurial structures based on the developed functions.

3. RESEARCH DATA AND INSTRUMENTS

While constructing models the indicators characterizing the sets of small enterprises, medium enterprises and individual entrepreneurs in all regions of the Russian Federation were used as input data. Data for 21 republics, 9 territories and 46 provinces of the country was considered. To exclude double-counting data on Autonomous districts and Autonomous region was not considered. When modeling the authors used statistical data for 2010 presented in the report on continuous monitoring activities of small and medium entrepreneurship made by the Federal Service of State Statistics (2010).

Entrepreneurial structures currently specialize on five main types of activities (The System of “Tax Help”, 2016). The first type is manufacturing - Specialization on the manufacture of food products, textile and garment products as well as other similar production. The construction includes entrepreneurial structures, leading new construction, reconstruction, major and current repairs of buildings and constructions, including individual construction. The third type of activities - Wholesale and retail trade, repair of motor vehicles, motorcycles, household goods and personal items. Further on this activity will be called trade, in short. Entrepreneurial structures of transport and communications include enterprises in land, water, air types of transport and all types of enterprises of telecommunications and postal activity. The fifth type of activity involves not only a variety of real estate transactions, rent and provision of related services, and also scientific activities, as well as a range of support services.

Table 1 shows data reflecting the total number of entrepreneurial structures included in the general population in conducting researches, investment volumes and volumes of their products.

Table 2 presents indicators that describe the distribution of entrepreneurial structures and volumes of investment by the types of economic activity.

The methods of logical, economic and mathematical analysis, statistics were used during the research. For the solution of tasks and information processing were used computer programs “Statistics,” “Microsoft Excel,” “Mathcad.” Verification of the obtained functions was conducted according to the methodologies of Pearson (Kremer and Putko, 2002), Kolmogorov–Smirnov and Shapiro–Wilk (Vukolov, 2004).

4. RESULTS AND DISCUSSION

4.1. First Class of the Developed Models

The developed models, describing the values of investment volumes in 2010 for all regions of the country equivalent for one small enterprise, medium enterprise and one individual entrepreneur, respectively, will be discussed further (all the following formulas and tables given in the paper were obtained by the author):
• Investments in fixed capital per one small enterprise ($x_1$, billion rubles),

$$y_1(x_1) = \frac{7.6}{0.16 \cdot \sqrt{2\pi}} e^{-\frac{(x_1-0.45)^2}{2 \cdot 0.03}}; \quad (1)$$

• Investments in fixed capital per one medium enterprise ($x_2$, billion rubles),

$$y_2(x_2) = \frac{331.5}{5.91 \cdot \sqrt{2\pi}} e^{-\frac{(x_2-1.74)^2}{2 \cdot 0.03}}; \quad (2)$$

• Investments in fixed capital per one individual entrepreneur ($x_3$, billion rubles),

$$y_3(x_3) = \frac{1.69}{0.022 \cdot \sqrt{2\pi}} e^{-\frac{(x_3-0.058)^2}{2 \cdot 4.810^{-4}}}. \quad (3)$$

Models, reflecting the value of investments (in thousands rubles) for 2010 in all regions of the country per one worker employed, respectively, in small enterprises, medium enterprises and for individual entrepreneurs are provided below:
• Investments in fixed capital per one employee of small enterprise ($x_1$),

Table 1: Characteristic of entrepreneurial structures

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Small enterprises</th>
<th>Medium enterprises</th>
<th>Individual entrepreneurs</th>
<th>Entrepreneurial structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity, thousand units</td>
<td>1644</td>
<td>26</td>
<td>2927</td>
<td>4597</td>
</tr>
<tr>
<td>Volume of investment, billion rubles</td>
<td>520.3</td>
<td>254.3</td>
<td>136.8</td>
<td>911.4</td>
</tr>
<tr>
<td>Turnover, trillion rubles</td>
<td>18.94</td>
<td>7.42</td>
<td>4.49</td>
<td>30.85</td>
</tr>
</tbody>
</table>
The developed models allow to estimate the average value of investment in the regions of the country accounted respectively for one small enterprise, medium enterprise and individual entrepreneur and its one worker. In addition, the range of values of these indicators can be determined with the use of these models.

4.2. Second Class of the Developed Models

The developed models, describing the value of investments (in thousands rubles) for 2010 in all regions of the country, attributable to one entrepreneurial structure by the main economic activity are represented below:

• For trade entrepreneurial structures,
  \[ y_1(x_t) = \frac{1657.5}{27.66 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_t-63.62)^2}{2 \cdot 785.08^2}}; \]  
  \[ (7) \]

• For manufacturing entrepreneurial structures,
  \[ y_2(x_m) = \frac{12257.14}{183.54 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_m-365.99)^2}{2 \cdot 336.710^2}}; \]  
  \[ (8) \]

• For construction entrepreneurial structures,
  \[ y_3(x_c) = \frac{10725}{182.07 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_c-345.23)^2}{2 \cdot 333.150^2}}; \]  
  \[ (9) \]

• For transport and communications entrepreneurial structures,
  \[ y_4(x_t) = \frac{4420}{58.19 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_t-140.47)^2}{2 \cdot 339.410^2}}; \]  
  \[ (10) \]

• For entrepreneurial structures, specializing on the operations with real estate,
  \[ y_5(x_r) = \frac{8666.67}{183.65 \cdot \sqrt{2\pi}} \cdot e^{-\frac{(x_r-307.53)^2}{2 \cdot 333.730^2}}. \]  
  \[ (11) \]

Models (7-11) allow to estimate the average value of investments on the main types of economic activity attributable to one entrepreneurial structure in the regions of the country. In addition, the ranges of investment values for each of the activity types can be defined due to the use of the models.

4.3. Model Validation in Terms of Quality

Logical and statistical analysis showed that all developed models are well approximate to the original data over the entire range of their changes. Table 3 shows the estimated values of the main statistical data for three quality criteria. A comparison of these calculated values showed that the statistics for the Pearson criterion is less than the table value of the criterion equal to 4.61. Similarly, the values calculated from Kolmogorov–Smirnov test are less than table value of 0.15. Statistics of Shapiro–Wilk is close to one. Thus, for all considered criteria, the developed models are of high quality and can be used to describe the studied regularities.

Since all the developed economic and mathematical models approximate well the original data and have a high quality of the accepted criteria, we can conclude that hypothesis 2 about the feasibility of using the functions of density of normal distribution to estimate the volume of investment in entrepreneurial structures found in the process of research was confirmed.

4.4. Analysis of the Developed Models

The fact is that the functions of density of normal distribution (Ventsel, 2001) can help to define average values and ranges of variation of considered parameters without complex calculations. These intervals for the most (68%) regions of the country were calculated from the average squared deviations of the indicators. When calculating the bounds of the interval for the average value of the indicator it is necessary to add and subtract the indicated deviation respectively.

Average values and ranges of variation of investment in fixed capital, attributable to one entrepreneurial structure and one employee based on the data for 2010 are represented in Table 4. They are based on the developed models.

The figures shown in Table 4, can be used in the solving of tasks for monitoring the volume of investments at all levels of management.
and regulation of entrepreneurship (federal, regional, municipal), identifying the needs for financial resources when planning activities in credit organizations and funds, specializing on the help and support of entrepreneurship. The value of the investments per one employee with the growth of size of enterprises is growing.

It is necessary to know that the average number of workers employed by individual entrepreneurs, as shown by earlier studies (Pinkovetskaia, 2012) is significantly below the average number of employees of small enterprises. Accordingly, the volumes of investment per worker with individual entrepreneurs have the least value for small enterprises; this value is twice as big and for medium enterprises is more than four times. This trend is confirmed by the analysis of investment in large enterprises of our country. The average value of investment per employee for large enterprises (as shown by the calculations of the authors), is 160 thousand rubles per year, which is almost twice higher the corresponding indicators for medium enterprises.

The amount of investment accounted per one entrepreneurial structure and per one employee vary greatly in specific regions of the country, which is evident from the intervals of changes in these indicators. The relevant data may be used in the formation of projects and programs of entrepreneurship development, especially in the regions where its level is not sufficient.

Average values and intervals of investment variation in fixed capital per entrepreneurial structure in different industries according to the data for 2010 are presented in Table 5. They are based on the developed models, describing the investment in entrepreneurial structures, specializing on five main types of economic activity.

The investment volumes as shown by the data given in Table 5 differ significantly according to the types of economic activity. The smallest investment is typical for trade enterprises, because, in our opinion, the specifics of these are, as a rule, small shops. In addition, trade enterprises have received the greatest development in previous years and, to date, their formation has basically ended. A small investment in entrepreneurial structures of transport and communications can be explained by the weak development of this type of activity in most regions of the country and a small size of the concerned enterprises. Entrepreneurial structures dedicated to three other types of economic activity are characterized by similar levels of investment.

The data in Table 5, can be used to solve the problems of monitoring, planning and forecasting the volumes of investment. The most current studies provided sources for the development of entrepreneurial structures, specializing on the types of activities that have not received sufficient development in specific regions and municipalities.

The indicators shown in Tables 4 and 5 characterizing the intervals of change in the investment volume allow to conclude that the volume of investments per one entrepreneurial structure and one of its employees differs significantly depending on the number of employees (size) of entrepreneurial structure, regions on the country and types of economic activity that the entrepreneurial structure is specializing. Thus, hypothesis 1 was confirmed within the research process.

5. CONCLUSION

The conducted research allowed to draw the following conclusions:

- The ability to use density functions of the normal distribution as the models for describing the volume of investments in fixed capital entrepreneurial structures in the regions of the country and on the main types of economic activity was proved;
- High quality models of approximate good using original data were developed according to the accepted criteria;
- The presence of differentiation of the investment volumes attributable to one entrepreneurial structure and one employee, in different regions of the country and by the types of activity was shown;
- The average investment values attributable to one entrepreneurial structure and one worker in the regions of the country were defined and the intervals of changes in these indicators characterize the majority (68%) of regions;
- Entrepreneurial structures directly characterizing proportional relationship between their size and the amount of investment were established: The larger the enterprise, the more investment is accounted per one enterprise and also per one employee;
- Mean values and intervals of variation volumes of investment in entrepreneurial structures on the main types of economic activity were defined;
- It was shown that relatively lower volume of investment characterizes entrepreneurial structures, specializing on trade, transport and communications, and relatively greater one characterizes the structures in manufacturing, construction and carrying out operations with real estate.

The hypotheses were confirmed during the research. Proposed methodical approach and algorithm of modeling can be used to estimate the volume of investment in entrepreneurial structures in the regions of the Russian Federation and their municipalities.

The obtained results are of certain theoretical and practical significance, in particular, in further scientific research of small and medium entrepreneurship, as well as for justifying the proposals for its functioning. They are of interest for credit, financial institutions and those specializing on supporting the entrepreneurial structures’
funds. The developed models and the resulting patterns can be used to solve a wide range of tasks connected with the monitoring of entrepreneurial activities, design of development and forecasting in this sector of economy at the federal, regional and municipal levels of management.

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