Artículo de investigación

Estimation of fixed capital investment in Russian small enterprises and microenterprises in 2018

Оценка инвестиций в основной капитал российских малых предприятий и микропредприятий в 2018 году

Estimación de la inversión de capital fijo en pequeñas empresas y microempresas rusas en 2018

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Written by:
I.S. Pinkovetskaia[15]
Y.V. Nuretdinova[16]
T.V. Treskova[17]
N.M. Neif[18]

Abstract

The purpose of this work is the assessment of the investments into fixed capital of small enterprises and microenterprises and influence on investment such factors as size categories, types of economic activity and territorial placement. The comparative analysis of small enterprises and microenterprises investments is based on relative indicators, which are calculated per enterprise and per worker. The research was conducted with the usage of the official statistical information obtained in the course of observation activity of the enterprises in 2018. Modeling of empirical data was based on functions of normal distribution. We defined the values investments in small enterprises and microenterprises which are located in 82 regions and related to two categories and sixteen types of activity. We revealed regularities of distribution of investments calculated per enterprise and per worker, and identified the regions with the lowest investments in small enterprises and microenterprises. New knowledge of the investment in the fixed capital in the Russian small enterprises and microenterprises was achieved. Proposed information and tools are applicable for justification of the investments can be used for the small enterprises and microenterprises development.

Аннотация

Целью данной работы является оценка инвестиций в основной капитал малых предприятий и микропредприятий, а также влияния на инвестиции таких факторов, как размерные категории, виды экономической деятельности и территориальное размещение. Сравнительный анализ инвестиций малых предприятий и микропредприятий основан на относительных показателях, которые рассчитываются на одно предприятие и на одного работника. Исследование проводилось с использованием официальной статистической информации, полученной в ходе наблюдения за деятельностью предприятий в 2018 году. Моделирование эмпирических данных проводилось с использованием функций нормального распределения. Определены величины инвестиций в малые предприятия и микропредприятия, расположенные в 82 регионах и относящиеся к двум категориям и шестнадцати видам деятельности. Выявлены закономерности распределения инвестиций в расчете на предприятие и на одного работника, выявлены регионы с наименьшими инвестициями в малые предприятия и микропредприятия. Получены новые знания об инвестициях в основной

[15] PhD, Associate Professor, Ulyanovsk State University, Russia
pinkovetskaia@gmail.com
[16] PhD, Associate Professor, Ulyanovsk State University, Russia
[17] PhD, Associate Professor, Ulyanovsk state agrarian University P.A. Stolypin, Russia
[18] PhD, Associate Professor, Ulyanovsk state agrarian University P.A. Stolypin, Russia

Keywords: Small enterprises, microenterprises, size categories, investment into fixed capital, types of economic activity, regions

капитал российских малых предприятий и микропредприятий. Предлагаемая информация и инструментарий применимы для обоснования инвестиций, могут быть использованы для развития малых предприятий и микропредприятий.

Ключевые слова: малые предприятия, микропредприятия, размерные категории, инвестиции в основной капитал, виды экономической деятельности, регионы.

Resumen

El propósito de este trabajo es evaluar las inversiones en capital fijo de pequeñas empresas y microempresas e influir en la inversión, tales como categorías de tamaño, tipos de actividad económica y colocación territorial. El análisis comparativo de las inversiones de pequeñas empresas y microempresas se basa en indicadores relativos, que se calculan por empresa y por trabajador. La investigación se realizó con el uso de la información estadística oficial obtenida en el curso de la actividad de observación de las empresas en 2018. El modelado de datos empíricos se basó en funciones de distribución normal. Definimos las inversiones en valores en pequeñas empresas y microempresas que se ubican en 82 regiones y están relacionadas con dos categorías y dieciséis tipos de actividad. Revelamos las regularidades de la distribución de las inversiones calculadas por empresa y por trabajador, e identificamos las regiones con las inversiones más bajas en pequeñas empresas y microempresas. Se logró un nuevo conocimiento de la inversión en capital fijo en las pequeñas empresas y microempresas rusas. La información y las herramientas propuestas son aplicables para la justificación de las inversiones que se pueden utilizar para el desarrollo de pequeñas empresas y microempresas.

Palabras clave: Pequeñas empresas, microempresas, categorías de tamaño, inversión en capital fijo, tipos de actividad económica, regiones

Introduction

Small enterprises and microenterprises, as the accumulated experience shows, are the most important factor of economic development for many countries, including those in the conditions of economic crisis (Acs et al., 2008; Baumol, 2004; Decker et al., 2014; Simon-Moya et al., 2016). To date in Russia there are 2659 thousand small enterprises and microenterprises, which employ 11349 thousand employees. The share of Russian small enterprises and microenterprises in the GDP and the number of employees is more than two times lower than the corresponding figures for the countries of the European Union (SME Bank, 2015).

In order to enhance the role and growth of small enterprises and microenterprises, the state strategy for development of Small enterprises and microenterprises till 2030 was accepted (Russian Federation, 2016). The Strategy plans the growth of small enterprises and microenterprises in GDP twice (up to 40%) and growth of a share of workers in such enterprises up to 35% of the total number of the working population. The specified purposes, as shows foreign experience (Sollner, 2014), are real. Implementation of the strategy involves growth of investment in small enterprises and microenterprises in the medium and long term.
Such work should be based on the justification of investments into fixed capital in enterprises. Therefore, an important scientific problem is to assess consumption of investment, including namely investment per enterprise and per employee. Such relative indicators can provide the federal and regional authorities with the information needed to development of plans. This plans will be based on the anticipated increase in the number of enterprises and their workforce. The investment potential of small enterprises and microenterprises should expand through the various forms and methods of investments attraction including such institutes as the state guarantees.

Government should provide information, marketing, financial and legal support to small enterprises and microenterprises. To motivate the authorities on support of small enterprises and microenterprises should be drawn up the official

national rating of authorities' efficiency, based on the data of investment climate observations in the Russian regions. This rating must base on the comparative analysis mentioned above relative indicators through the regions. In Russia the system of incentives for development of small enterprises and microenterprises in such regions should be created, where the role of entrepreneurship is low. The Korean experience of this activity is described in the article (Choi et al., 2015).

The purpose of the present paper is the assessment of the investments into fixed capital of small enterprises and microenterprises in 2018 and influence of such factors as size categories, types of economy activity and territorial placement of enterprises. In order to ensure a comparison of investments in small enterprises and microenterprises located in different Russian regions, the calculations are based on the relative indicators. Fixed capital investments are determined in counting per one enterprise and per one employee. In our paper the modeling of differentiation of relative indicators of investment in small enterprises and microenterprises is made on the bases for the application of functions of normal distribution. The possibility of applying such functions to describe relative indicators follows the pilot work (Pinkovetskaia, 2015).

his paper comprises of six sections. The literature review section synthesizes foreign and Russian studies on investment into fixed capital enterprises. In the third section, the paper describes methodology and design of this studies. This section also explains the data sources that were used in this paper. In section four and five present the results of the analyses on level investment into fixed capital enterprises situated in various regions and specializing in various types of economic activity. The conclusion section summarizes the results, highlights implications of the results and proposes future research relating to the study.

Literature review

Foreign and Russian authors researched the concepts and the principles of investment into fixed capital of Small enterprises and microenterprises. In our opinion, the following findings of researches are of the greatest interest. Pichler et al. (2000) gave the analysis of the main aspects of investment policy and factors, exerting impact on the amount of investment in the Small enterprises and microenterprises. Poire et al. (1984) proved on the case of Northern Italy, that in the circumstances of crisis small enterprises are more effective. That is why basic investment should be made into the Small enterprises and microenterprises, but not into the big enterprises with the standardized mass production. Skuras et al. (2008) discussed issues of justification of decisions on investments into fixed capital of Small enterprises and microenterprises of six countries of the European Union. The conclusion that the size of firm exerts direct impact on the volume of investment was drawn. Similar results are demonstrated by Lewandowska et al. (2015), who found out the significant differences in investments into small enterprises and microenterprises in various regions of Poland. The China experience (Wu et al., 2008) demonstrates that the amount of investments depend on the types of activity in small enterprises and microenterprises. In this article authors showed that to get the credit in the financial markets the enterprises must have specialists of this sphere. Microenterprises rarely employ such specialist, which creates a problem in investment in fixed capital.

Some works are devoted to the study of investment in the small enterprises and microenterprises of specific Russian regions. Regional aspects of investments into fixed capital of small enterprises in Russia are considered in the monograph (Gnevko, 2010), as the proof of essential distinctions of the volumes of investment in small enterprises and microenterprises from territorial placement of these enterprises. Bogomolova et al. (2016) analyzed investments into fixed capital of small business of the northern region and proved that they much depend on a type of economic activity. In the article (Noreen, 2014) examined how the investments differ in East regions of Russia. Some questions of investment in enterprises situated in Russian regions present in works (Kiseleva et al., 2019; Korneyko et al., 2018; Novikov and Prosvirina, 2019).

In general, the analysis of researches allowed us to draw a conclusion that problems of investment are relevant. Such factors as size categories and specialization of small enterprises and microenterprises, also regions in which they are located, have significant effect on the amount of investments into fixed capital.

Methodology

The source of the data, used in this research, is official information of the Federal State Statistics Service of the Russian Federation gathered from observation of activity small enterprises and

microenterprises for 2018 (Federal State Statistics Service, 2019). This observation included all small enterprises and microenterprises, conducting activities in the territory of Russia. The division in size categories is made in accordance with Russian Federation state Law № 209 "On development of medium and small entrepreneurship in the Russian Federation". Information of observation includes indicators of activities of small enterprises (from 16 to 100 workers inclusive) and microenterprises (not exceed 15 workers). Statistical observation of small enterprises and microenterprises in Russia was carried out on 16 types of economic activities: agriculture, hunting and forestry, fishing; mining; manufacturing; production and distribution of electricity, gas; production and distribution of water; construction; wholesale and retail trade; transport and storage; hospitality (hotels and restaurants); IT activity; real estate operations, rent; professional activity, science; public administration; education; healthcare and social services; culture and sport. Small enterprises and microenterprises are located in all regions of Russia without exception. Therefore, these observations describe indicators of Small enterprises and microenterprises operating in 82 regions of Russia.

In the course of the research, two groups of small enterprises and microenterprises had been defined. The first group included enterprises allocated on size and territorial features, and the second group - on size and type of economic activity.

In the course of the studies the following three hypotheses were tested. First hypothesis is relative investments on one enterprise and per one employee depend on the size category of the small enterprises and microenterprises. Second hypothesis is relative investments per enterprise and per worker depend on the region. Third hypothesis is relative investments per enterprise and per worker depend on the type of economic activity.
Distribution of values of the investments in small enterprises and microenterprises calculated per enterprise and per worker across all regions can be described with application of the normal distribution. The following conceptual provisions define this. Each small enterprise and microenterprise act as the independent actor, defining the purposes and tasks, proceeding from a concrete situation, and conducts risk economic activity. Respectively, the group of the enterprises, formed on the criteria stated above, includes a significant amount of the enterprises. Economic, historical, climatic, demographic, educational and other features of development of the specific region in Russia have significant effect over small enterprises and microenterprises indicators. This features act independently from each other, so we can assume probabilistic (stochastic) distribution of indicators values, including indicators of investments into fixed capital calculated per Small enterprises and microenterprises and per worker. Average investments per enterprise and per worker describe average arithmetic values for all Small enterprises and microenterprises in each region on two size categories.

Discussed in the paper investment in the fixed capital of small enterprises and microenterprises formed by the influence of two kinds of drivers, the first of them determined the similarity of the investment values of regional groups of small enterprises and microenterprises and the second their differences (Pinkovetskaia, 2015). The first type of drivers leaded to the investments grouping in the vicinity of some average value for all regions. The second type of drivers determined the degree of differentiation of investment values. The deviation of investments in specific regions from the average value could be both in the direction of reduction and in the direction of increase.

From the Chebyshev theorem (Kramer, 1962) follows that individual random values can have significant distinctions, in so doing, their arithmetic mean is relatively stable. A similar conclusion follows from the central limit theorem (Jenish et al., 2009), which establishes that the arithmetic mean of quite a large number of independent random values loses the character of a random value. Thus, the relative values of each small enterprises and microenterprises investment in the region are random values that may have a significant spread, but we can foresee the significance of their arithmetic mean.

Note that in accordance with the Lyapunov theorem, the distribution of the average values of independent random values approaches the normal distribution, if the following conditions are met: all values have finite mathematical expectations and dispersion, none of the values is not sharply different from the rest. The mentioned above conditions correspond the values of relative investments in small enterprises and microenterprises by regions. As Gmurman (2003) pointed out, the distribution of random values is fast enough (more than ten observations) approaching the normal distribution. In our paper, we used the methodical

approach, which was based on the spatial data. Similar approach was considered in the work (Schroder et al., 2014).

Thus, there are theoretical prerequisites for using the functions of normal distribution to describe the differentiation of relative investments in the fixed capital of small enterprises and microenterprises by regions of Russia. Empirical information for 2015, which we used in the course of the research, included the volume of investments in fixed capital by small enterprises and microenterprises, number of enterprises and number of employees. Values of investments we calculated, respectively per enterprise and per worker. We generated information for each region of Russia on two size categories and 16 types of economic activity. These databases included average values of fixed capital investments of small enterprises and microenterprises located in each of 82 regions. The determination of the number of empirical data is important in the development of normal distribution functions. The relevant justifications are presented in the works of various authors (Heinhold et al., 1964, Hodasevich, 2017), which indicated that the number of observations must be at least 40.

Relative investment in small enterprises and microenterprises in regions

We tested the formulated hypotheses using the data of relative investments of two groups of small enterprises and microenterprises. The first group included small enterprises and microenterprises, i.e. two size categories in all Russian regions. The second group included small enterprises and microenterprises of 16 types of economic activity, which were upper pointed. For small enterprises and microenterprises that belong to each region were developed functions of normal distribution. These functions describe the distribution of values of investments in fixed capital counting per enterprise and per worker, for all small enterprises and microenterprises. We developed four functions. Processing of statistical data and evaluation of functions of normal distribution were carried out with application of the Microsoft Excel 2010 and Statistica 10.

The first function describes the distribution of investments per small enterprise, excluding the microenterprises:

$$y_1(x_1) = \frac{87125}{1473{,}64 \times \sqrt{2\pi}} \cdot e^{\frac{-(x_1 - 2346{,}85)^2}{2 \times 1473{,}64 \times 1473{,}64}}. \quad (1)$$

The second function describes the distribution of investments counting per microenterprise:

$$y_2(x_2) = \frac{8655{,}56}{160{,}14 \times \sqrt{2\pi}} \cdot e^{\frac{-(x_2 - 259{,}50)^2}{2 \times 160{,}14 \times 160{,}14}}. \quad (2)$$

The third function describes the distribution of investments counting per one employee in small enterprises, excluding the microenterprise:

$$y_3(x_3) = \frac{3045{,}71}{46{,}44 \times \sqrt{2\pi}} \cdot e^{\frac{-(x_3 - 78{,}36)^2}{2 \times 46{,}44 \times 46{,}44}}. \quad (3)$$

The forth function describes the distribution of investments counting per one employee in microenterprise:

$$. \; y_4(x_4) = \frac{2665{,}00}{52{,}16 \times \sqrt{2\pi}} \cdot e^{\frac{-(x_4 - 97{,}84)^2}{2 \times 52{,}16 \times 52{,}16}} \quad (4)$$

The indicators of the obtained functions of normal distribution are the average values of investments in fixed capital of small enterprises and microenterprises for 2018, standard deviations, the intervals of change values of investment. These intervals correspond to the values of investments that are typical for small enterprises and microenterprises located in the majority (68%) regions of Russia. The boundaries of these intervals were determined on the basis of the average values of investments and standard deviations. The minimum value of the interval corresponds to the difference between the average investment value and standard deviation. The maximum value of the interval corresponds to the sum of the average investment value and standard deviation.

Table 1 shows the indicators that correspond to all developed functions of normal distribution on two size categories enterprises. Data present in the table 1 in rubles. The exchange rate for 2018 in Russia was 1 ruble=0,017 Dollars.

Table 1. Indicators of investment in fixed capital enterprises, thousand rubles

Number of function	Size categories	Average value	Standard deviations	Interval
1	2	3	4	5
		Counting per enterprise		
(1)	Small enterprise	2348	1474	874-3822
(2)	Microenterprise	260	160	100-420
		Counting per employee		
(3)	Small enterprise	78	46	32-124
(4)	Microenterprise	98	52	46-150

Source: Authors' work

Feature of functions of normal distribution (Venttsel, 2001) is that intervals of change of investments, characterize Small enterprises and microenterprises in most (68%) regions. The boundaries of these intervals are calculated on the basis of the average values and standard deviations.

The data in table 1 show that the current level of investment in small enterprises are in average 2348 thousand rubles, i.e. about 40 thousand dollars per enterprise. For most regions these values are in the interval from 874 to 3822 thousand rubles per enterprise. Investment in fixed capital per worker are in average 78 thousand rubles or 1300 dollars. The data in table 1 show that the current level of investment in microenterprises ranges from 100 to 420 thousand rubles (from 1700 to 7140 dollars) per year in most regions. These investments are not very large. That is why entrepreneurs can invest their money and the funds of their relatives. Therefore, microenterprises rarely use bank loans. In addition, microenterprises have no credit history and system of accounting, which banks need.

Values of investments, which were counted per worker in small enterprises and the microenterprises showed interesting phenomenon. Investments counting per worker in small enterprises lower than in microenterprises. Such provision sounds may be connected with financial difficulties of small enterprises in Russia. As show data in table 1, first and second hypotheses received confirmation. Relative investments per enterprise and per worker in small enterprises differ from microenterprises. There is significant differentiation investment in fixed capital per enterprise and per worker in regions.
The characteristics of investments provided in table 1 are of interest as directly to the businessmen (especially start-ups) and to the departments of federal, regional and municipal government responsible for supporting business development. Besides, the credit and financial institutions, leasing and insurance companies, funds of guaranteeing and angel investors, could use this information.

The volumes of investment calculated per enterprise and per worker, significantly differ from region to region, that is visible from intervals of change given in column 5 of table 1. Values of investments could be used for monitoring of these values in regions, ratings analysis, marking regions with highest and lowest investments in Small enterprises and microenterprises. In addition, the results are capable to play an important role in addressing support to business by federal and regional authorities.

Regions of Russia with the least investments into fixed capital in small enterprises and microenterprises were defined from the minimum values corresponding to the lower bounds of intervals. In small enterprises this group of regions represented by Murmansk, Arkhangelsk, Orel, Ivanovo region, Zabaikalsky, Krasnoyarsk territory, republic of Buryatia, cities of Moscow and Saint-Petersburg. For microenterprises low values of investments feature such regions as Ryazan, Novgorod, Samara, Irkutsk, Tomsk, Sverdlovsk region, republic of Buryatia, Zabaikalsky, Altai, Khabarovsk territory, city of Saint-Petersburg. Regions of Russia with the high investments into fixed capital in small enterprises: Kemerovo, Smolensk, Orenburg, Penza, Lipetsk, Ulyanovsk, Tambov, Voronezh region, republic of Karelia, Kamchatka territory. Regions of Russia with the high investments into fixed capital in microenterprises: Pskov, Kursk, Rostov, Kemerovo, Tambov, Voronezh, Lipetsk,

Orenburg region, republics of Komi and Altai, Stavropol territory.

The relevant data could be used in course of developing ratings of investment climate in regions of Russia. Moreover, results of monitoring can be used in proving projects and programs of business development, especially in regions where the level of investments into fixed capital is low.

Relative investment in small enterprises and microenterprises in sectors

Tables 2 and 3 show values of average investment in fixed capital small enterprises and microenterprises on types of economic activity in rubles on data of 2018. The exchange rate for 2018 in Russia was 1 ruble=0,017 Dollars.

Table 2. Indicators of investment in fixed capital small enterprises, thousand rubles

Type of economic activity	Per one enterprise	Per one employee
agriculture, hunting and forestry, fishing	12143	292
mining	7021	180
manufacturing	1895	55
production and distribution of electricity, gas	2119	60
production and distribution of water	1994	63
construction	4447	178
wholesale and retail trade	710	36
transport and storage	2625	88
hospitality (hotels and restaurants)	221	8
IT activity	828	27
real estate operations, rent	2990	104
professional activity, science	3118	138
public administration	388	14
education	133	5
healthcare and social services	862	27
culture and sport	1133	47

Source: Authors' work

Table 3. Indicators of investment in fixed capital microenterprises, thousand rubles

Type of economic activity	Per one enterprise	Per one employee
agriculture, hunting and forestry, fishing	1460	496
mining	843	360
manufacturing	246	77
production and distribution of electricity, gas	454	107
production and distribution of water	395	124
construction	349	157
wholesale and retail trade	112	56
transport and storage	224	116
hospitality (hotels and restaurants)	127	39
IT activity	51	21
real estate operations, rent	471	180
professional activity, science	147	72
public administration	175	83
education	24	16
healthcare and social services	98	23
culture and sport	62	37

Source: Authors' work

Average values of investment into fixed capital small enterprises per different type of activity on the basis of data for 2018, are presented in table 2. The data shown in table 2, present that the highest current level of investment in agriculture, hunting and forestry, fishing small enterprises is

in average 12 million rubles in year per enterprise. Significantly less investment in mining (7 million rubles). Small volume of investment into fixed capital is in education, hotels and restaurants. Average values of investment into fixed capital microenterprises per different type of activity on the basis of data for 2018, are presented in table 3. The data present that the highest current level of investment in agriculture, hunting and forestry, fishing microenterprises is in average 1.46 million rubles in year per enterprise. Significantly less investment in mining (800 thousand rubles). Small volume of investment into fixed capital is in education and IT activity. The volumes of investments per enterprise and per worker much differ by types of economic activity that follows from the data provided in tables 2 and 3. The highest level of investments into fixed capital of the enterprises is in the agricultural production. It is caused by great amounts of fixed assets of such enterprises. Besides, financial support of the agricultural enterprises through the state program of import substitution has considerably increased over recent years (Khulkhachieva, 2017).

Thus, basing on data tables 2 and 3 we can make conclusion that hypothesis one and three are confirmed. That is, studies had shown that investments in fixed capital depend on size of enterprises and type of economic activity.

The data provided in tables 2 and 3 could be used for solving the problems of monitoring, planning and forecasting the volume of investment. Most relevant preparation of justifications on development of small enterprises and microenterprises specialized on the types of activity, which have not gained enough development in Russia.

Conclusion

In our research new knowledge of the amount of the investment in the fixed capital for the Russian small enterprises and microenterprises in 2018 was achieved. The research proves that the investments into fixed capital of small enterprises and microenterprises depend on such factors as size categories of the enterprises, types of economic activity, and territorial placement of the enterprises. The most important result of research is that all three hypotheses confirmed. We showed that there is significant differentiation investment on sectors. We defined regions, where the volumes of investment into fixed capital by each of size categories of the enterprises and primary types of economic activity, are characterized by values smaller, than the lower level and higher than upper level appropriate intervals given in table 1. We proved that investment per worker is higher in microenterprises than in small enterprises. The acquired new knowledge can be used for further research, as well as in the training of students and entrepreneurs. The methodology and tools, which were used in the research process can be applied in the similar studies in the countries with a significant number of territorial (administrative) units.

We proposed the methodical approach and assessment tools for investment in small enterprises and microenterprises, which can be useful in the research on entrepreneurship problems. The results received in this research, namely specific values of investments counting per enterprise and per worker, serve as a good reference points for the businessmen (especially for the start-up stage) and divisions of the state bodies responsible for the support of small enterprises and microenterprises. Aspiring entrepreneurs can use the facts about investments per enterprise and per employee when they choose the type of activity. Working entrepreneurs, basing on the information provided in our paper, can plan further investments depending on the number of employees and the type of their economic activity. Financial institutions may use information to substantiate the granting of loans to small enterprises and microenterprises, financing, leasing, factoring, consignment and other methods of investment. The authorities can apply the results of the study to substantiate plans of small enterprises and microenterprises development.

The results of the simulation, namely minimum and maximum values of investments, can be used for monitoring and compiling the investment climate ratings in the regions of Russia. In addition, research results are needed to assess investment requirements for different groups of small enterprises and microenterprises. They can be used to develop assistance programs for them, by providing small enterprises and microenterprises with grants, subsidies, and reducing interest on loans. Government and regional authorities can use the research results to ensure the implementation of the Federal strategy for small enterprises and microenterprises development for the period up to 2030 (Russian Federation, 2016). The future investigations are advised to be based on the information of investment in fixed capital of

small enterprises and microenterprises of various cities and municipalities.

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