

Microenterprises' Innovative Activities in Relations to Regions' Development in the Russian Federation

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Abstract

Currently, innovations are the main competitive advantage of small-sized enterprises in many developed countries. Innovative activities of microenterprises in Russia, making over 93% of small business, stay beyond reporting and specialised research. Given that, the objective of the research was a revealing interrelation of the results of microenterprises' activities and the innovative activities of enterprises in regions. Collections of statistical reports by the Russian Federal State Statistics Service as well as independent research materials, were used as information sources. Federal subjects were used as objects, correlation and regression analysis was the research methodology. The primary attention in the paper is paid to the possibility of indirect assessment of microenterprises' innovative activities in regions, looking for factors and forms of their interaction assisting the development of the potential of this small group of economic agents. As a result, it was found out that intensity of microenterprises' distribution, strengthened by intermediary's (mediator's) influence, is mostly interrelated with innovative activities, with the region's e-development index serving as mediator.

Key Words: *small business, microenterprises, innovations, innovative activities, regional development, regions' e-development index, regression analysis*

JEL Classification: *O11, O50, R11*

1. Introduction

Economy choosing an innovative way of development cannot do without small-sized enterprises that are becoming the critical sources of innovative activities and serve as the primary source of innovations and generators of new solutions. Their very presence creates prerequisites for the innovative development of the national economy. Characteristics of small business organisations such as flexibility, mobility and adaptability, enhanced creativity and resourcefulness and independence in taking decisions help the creation of new technologies and the introduction of improvements, their market adaptation and making profits in the shortest possible periods. Currently, innovations are the main competitive advantage of small-sized enterprises in many developed countries. Small and medium-sized enterprises are becoming the critical sources of innovative activities, assisting sustainable development of innovative national systems and the increase of competitive power of the high-tech sector of national economies [13, 17, 19].

If compared to developed countries, the share of a small and medium-sized business in the Russian economy is relatively small. According to the official data as of the end of 2016, about 2.8 mln small business entities were registered in Russia, which amounts to 58.4% of all enterprises and organisations in the Russian Federation. At the same time, 99.8% of enterprises and organisations that operated in 2016 in the EU countries [1] were referred to as small and medium-sized enterprises. Moreover, nearly all (93%) small-sized enterprises in the EU countries were microenterprises. Microenterprises make up the majority of small-sized enterprises in Russia as in the EU countries¹. Their share is over 93% of the total number of small business enterprises and more than 50% of receipts from sales of goods (work, services). The share of microenterprises increased by nearly 6%, and their receipts increased by 16% in 5 years.

In 2017, Russia was rated the 45th among the countries of the world (127 countries) in the innovations development level (improved by 4 points in comparison with 2014), with the innovation index amounting to 38.76, which is more than 40% less than the leader's – Switzerland has 67.69 [16]. The final innovation index is a ratio of expenses (available resources and environment for innovations, i.e. innovation potential of the country) and effect (achieved practical results of innovations). Mentioned above allows to objectively assess the efficiency of efforts for innovative development of the countries of the world, including Russia, being at various economic development levels. The share of the innovative

¹ Small business entities with less than 15 people employed and incomes from enterprising activities received for activities in the previous year not exceeding RUB120 mln are referred to microenterprises in the Russian Federation (Decree of the Government of the Russian Federation of April 04, 2016, No. 265 "On Maximum Incomes Received from Enterprising Activities for Each Category of Small and Medium-Sized Business Entities"). Before 2016 – with the income not exceeding RUB 60 mln.

Russian products (results of innovations) in GDP increased 1.9 times from 2010 to 2014, but still, the contribution of the innovation sector to GDP stays at a low level - 5%.

Enterprises' economic activities are one of the leading indicators of economic development in the Russian Federation and are defined in statistical accounting as "Share of organisations developing technological, organisational, marketing innovations in the accounting year". According to state statistics, the aggregate level of innovative activities of organisations in 2016 amounted to 8.4%. At the same time, the share of innovative enterprises in developed countries amounts to more than 50 % (Malaysia – 68.9%, Belgium – 52.9%, Switzerland – 52.7%, Germany – 52.6%) and keeps steadily growing.

The result of innovative activities is the volume of produced innovative products; work performed and services provided. In 2016, the share of innovative products of organisations developing technological, organisational and marketing innovations amounted to 8.5% of the total output of shipped products; work performed and services provided. In 2015, the share of small-sized enterprises developing technological innovations in the total number of researched small-sized enterprises amounted to 4.5%. In 2015, the share of innovative products (work, services) in the total output of shipped products, work performed, services provided by small-sized enterprises amounted to 1.6%.

The research and development sector (R&D) is the primary source of innovations. In 2016, enterprises from the R&D sector made 58% of all enterprises and organisations in the Russian Federation, at the same time, this share of small-sized enterprises amounted to 52%. As already said, microenterprises make up over 90% of small business enterprises, and there is only 0.8% of them specialising in R&D. At the same time, microenterprises make nearly 96% of small-sized enterprises from the R&D sector, i.e. 0.8%. The share of microenterprises is about 55% of the turnover of small-sized enterprises from the R&D sector.

The information about innovative activities of enterprises is accumulated in the form of statistical reporting No. 4 "Information about the organisation's innovative activities", filled in by all enterprises except small business entities. Besides this statement, there is form No. 2-MP called "Information about small-sized enterprise's technological innovations" presented by small-sized enterprises (except microenterprises) once every two years, in odd-numbered years. Thus, innovative activities of microenterprises, their contribution to the innovative development of the country go beyond reporting and specialised research. Research by Russian scholars is mostly dedicated to small business problems, and the state's measures to support small business are related to financial and legal issues.

At the same time, microenterprises are innovative by their nature. Microenterprises become the critical factor for transformative changes in an economy based on the implementation of new knowledge and advanced technologies. They help increase the speed

of scientific development, rapid commercialisation of results of research as well as adaptation for changing of the environment in all fields of activities, and that has a considerable impact on the rates of region's and ultimately the country's innovative development.

The main problem here is the lack of information on the innovative impact of microenterprises on the economy, their role and capabilities. Such information is needed both by the state and entrepreneurs in order to discover new business opportunities. Thus, this article focuses on creating a model for assessing the role of microenterprises based on indirect adjustments and the results of one-time monitoring. Therefore, we can add value to literature regarding innovations activities of micro-enterprises evaluating the role of microenterprises in Russian regional development using the existing system of indicators.

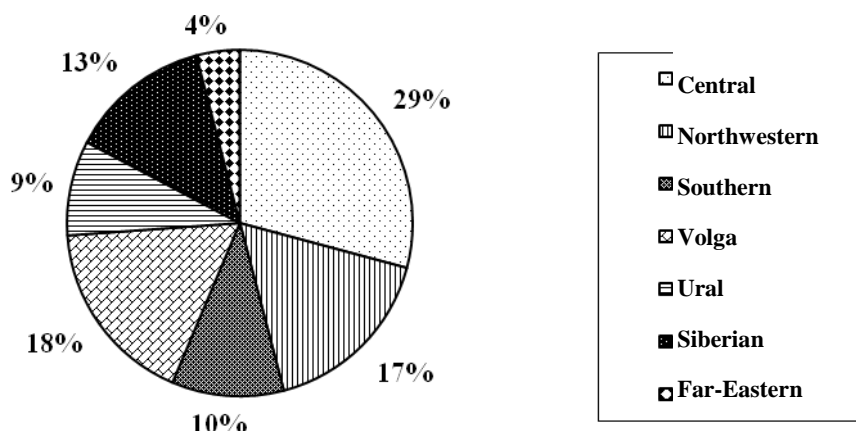
Regional environment for small business

The region is the central element in the formation of our country's innovative economy. Exactly the regional environment determines, to a large extent, the competitive power of national business on the contemporary global market. The regions of Russia are characterised by irregularity of aspects' of innovative processes development and factors having an impact on them, demonstrating considerable variety in this respect.

Small business and microenterprises are present practically in all regions of the country, in all fields and sectors of the economy. Today, the advantages of small business in comparison with other sectors of the economy are seen as much brighter than the disadvantages and shortcomings. Analysis of microenterprises' structural organisation allows assessing the level of creation of a favourable enterprising climate and assistance in every possible way for the development of entrepreneurship within a specific territory of the country and in a particular sector of its economic activities.

Microenterprises are distributed very irregularly in seven federal districts. The least number of microenterprises is registered in the Far-Eastern federal district (4%), the most significant number is registered in the Central federal district - 29%, North-western - 17% and the Volga – 18% (Figure 1). At the same time, nearly 46% of microenterprises from the Central federal district are located in the city of Moscow, and over 65% of microenterprises from the North-western federal district are in St. Petersburg.

Figure 1: Distribution of Microenterprises per Federal Districts, 2016



The state of affairs in the small business sector structure in the federal districts of Russia is similar to the situation in Russia as a whole. Thus, in 2016 from 40.0% (Southern federal district) to 47.3% (Ural federal district) of small-sized and micro enterprises were engaged in wholesale and retail trade, from 13.8% (Southern federal district) to 17.6% (Siberian federal district) were engaged in real estate operations and renting. At the same time, only from 8.0% (Far-Eastern federal district) to 11.8% (Volga federal district) small business entities operated in processing and treatment, from 11.1% (North-western and Central federal districts) to 14.8% (Southern federal district) were engaged in construction.

We can carry out primary data analysis and review the differences on average per capita GRP (gross regional product) in the regions of the Russian Federation, united in federal districts, to study specific regions in detail.

Table 1: GRP regional differences significance tests

Test name	Calculated value	p-value
ANOVA F-test	5.510	0.000
Welch	10.568	0.000
Brown-Forsythe	6.499	0.000

There is a statistically significant difference between groups based on the one-way ANOVA using alpha (the level of significance) equal to 0.05 and number of degrees of freedom equal to 7 and 62. Though, this test fails to show where the difference lies, means of which groups are different. The Welch and Brown-Forsythe statistics were used to describe potentially different regions (table 1). However, this result does not tell us which mean values are responsible for the difference, so we performed the post hoc test, which shows us that

North-Caucasian Federal Region and South Federal Region are significantly different from other regions: Central, Far-East, North-West, Siberian, Ural, and Volga.

It was precisely this irregularity of microenterprises' distribution at the level of specific regional associations which urged the authors to study local special features of enterprises. The authors would like to find one of the reasons that make some regions of the country more attractive for innovation than others. We believe that the role of microenterprises in the process of regional development is significant, as these entities are filling niches unoccupied by large corporations, providing employment to the population and enhancing economic growth through the production of innovative goods and services. As mentioned above, this class of companies does not submit reports and does not participate in regular business surveys. We can evaluate its role in economic development only with the help of indirect adjustments and econometric models.

2. Literature Analysis

Small business innovations are covered reasonably well in foreign published works and a few Russian papers. The focal areas of research in this field can be united in the following groups:

1. revealing factors enhancing performance (profitability) of small companies, based on a sampling investigation of certain enterprises [9]. These papers are focusing on financial and legal problems such as lack of financing, state tax policy, expensive rent, lack of a unified legal base, low innovative activity. Authors rely basically on official sources of information and do not provide additional methods for calculating indicators related to assessing the impact of micro-enterprises on the economy;
2. operations of innovative microenterprises in R&D fields [21];
3. cross-country comparisons of the environment for small business operation, including microenterprises, aiming to reveal factors are enhancing the adaptive possibilities of a company and its survival capability [3,4,10]. In this aspect, both individual companies and countries providing a fairly certain environment for the development of small business can be reporting units;
4. revealing the relative impact of various kinds of innovations on the results of microenterprises' activities, e.g. Liu & Andersson [11] found out that microenterprises demonstrate stronger striving for cooperation with other participants of the process and more significant profits when implementing open innovations than closed innovations.

Some well-known studies are confirming that microenterprises are a particular class of companies and entrepreneurs, whose possibilities are much stronger than the visual effect.

E.g., the OECD research [6] found out that small and medium-sized enterprises, including microenterprises, make various contributions to economic and social well-being, play a crucial role in national economies all over the world, creating jobs and added value. However, access to resources plays a crucial role in their survival capacity. The Association for Enterprise Opportunity (AEO) also known as “the voice of microbusiness” found that 92% of all enterprises in the United States are microenterprises which aggregate 31% of the economically active population of the country engaged in private business. The primary result driver here is the development of the Internet and networking communication technologies [7]. The authors hope to make a specific contribution by this research into the third group of works dedicated to small business and comparison of regional opportunities for innovations’ formation at the expense of micro-enterprises as well as enhancing the level of survival capacity of a particular enterprise. Armington and Zoltan [2] found already in 2002 that regional differences to a greater extent explained the speed of a new class of microenterprises’ formation in states of the USA rather than economic factors and time. If we speak about the significance of factors having an impact on the formation of new forms, this is human capital. We will mention that the authors used longitude data of 1991-1996 when the development of the Internet had not started yet. Regional differences in Russia are significant, because of that this hypothesis brought about the most influential authors’ response.

The objective of this research is finding interrelation of the results of microenterprises’ activities and innovative activities in regions. The authors did not aim in this research to provide specific recommendations to enhance the innovative activities of microenterprises in certain regions.

3. Hypotheses

Russian regions differ considerably by relation to innovations and the degree of their implementation. Researches from the Institute for Statistical Studies and Economics of Knowledge of the National Research University “Higher School of Economics” prepared new (for 2014) ranking of innovative development among Russian Federation subjects. They were ranked according to the value of the Russian regional innovation index. The composite innovation index was drawn up based on four private indices, one of which was the level of innovative activities. On the whole, 37 indicators were used for calculations [20]. We found this index informative to use as one of the variables in a particular study as it shows the contemporary trends in Russian regions development.

The amount of the composite innovative activities index fluctuates within the interval from 0.6796 – in case of the region characterised by high activities of organisations in implementing innovations, to 0.0417 (minimal non-zero value) – in the case of the most passive in this Russian Federation subject. On the whole, regions in the leading positions of

the ranking provide their leadership position thanks to widely engaging organisations in innovative activities and high efficiency of innovations. The Republic of Mordovia (0.6796), the Republic of Tatarstan (0.5747) and the Chuvash Republic (0.5533) occupy the top positions in a ranking by the innovative activities index.

The potential of innovative development of the economy in the number of regions is determined by the participation of small-sized enterprises in innovation's development and implementation. The share of small-sized enterprises in the Kursk Region and the Altai Region amounted to 12.1% and 13% respectively in 2013, and that is approximately 2.5 times higher than average in Russia. Because of that, we can suppose that the activities of microenterprises making the most of small business enterprises in regions affect regions' innovative activities. Thus, let us word the first hypothesis:

Hypothesis H1. Innovative activities of organisations in regions are directly or indirectly related to indicators of microenterprises' activities.

It should be mentioned that regions' development is inseparable from their e-development, from the use of state-of-the-art information and communication technologies in the economy, connecting objects located far from one another in the integrated information network. The 2013-2014 index of readiness for information society among Russian regions, calculated based on 94 indicators, characterising information society's development factors as well as the use of information and communication technologies, confirmed information inequality of the Russian Federation subjects [18]. The capital cities of Moscow and St. Petersburg, as well as the Yamal-Nenets autonomous district, are the three leading regions in the 2013-2014 index, with integral indices of 0.693, 0.643 and 0.569 respectively. The Republic of Dagestan is the outsider with the index amounting to 0.302.

Microenterprises are the elements of the information flow network, and the efficiency of their activities depends to a large extent on reliable communications and in the long run on the degree of use of information and technological resources of the country and its regions, the degree of regional informatisation. Hence we can conclude that indicators of microenterprises' activities in the region are related to its e-development index.

Besides that, it is common knowledge that Russian regions differ considerably in their economic and spatial characteristics such as the area, natural resources, density of settlements, number of agricultural and industrial enterprises and the level of economic development. It is natural to suppose that development of microenterprises in a region is related to the characteristic features of that region, and the more developed the region is, the higher the informatisation level in it is, the more significant the indicators of microenterprises' activities in this region are. Thus, basing on the above-mentioned another presumption is possible:

Hypothesis H2. Indicators of microenterprises' activities are most strongly related to the economic and spatial characteristics of territories.

4. Research Method and Model

Data. Not only official data from collections of statistical reports by the Russian Federal State Statistics Service (Rosstat) but also open access independent research were used to check the hypotheses as original information sources for the research. This research was conducted based on studies of quantitative indicators of microenterprises' activities in regions as well as factors characterising special features of each region. Federation subjects (regions) for which the Federal State Statistic Service bodies collect statistical reports serve as reporting units. Data for 80 federation subjects, included in the program for continuous federal statistical observation over activities of small and medium-sized enterprises, is used in the research². The indicators, obtained as a result of continuous observation, are unique as such data collection took place in our country in 2010 for the first time. The next examination took place in 2015, and its results have not been published yet. The list of sources and leading indicators used in this research is presented in Table 2.

Indicators. According to the suggested hypotheses, all indicators used in research (Table 2), can be divided into two groups:

1. indicators characterising microenterprises in the Russian Federation subjects,
2. economic and spatial characteristics of the Russian Federation subjects.

Table 2: List of indicators used in research and data sources for these indicators

Microenterprises development indicators		Characteristics of the Russian Federation subjects	
Indicator	Source	Indicator	Source
Number of enterprises at the end of the accounting year, units;	Rosstat collected works "The Main Results of Continuous Observation over Small and Medium-Sized Business Entities", "Small and Medium-Sized Business in Russia in 2010."	Gross regional product (gross added value in current basic prices) – total, rubles;	Rosstat collected works "Russian Regions. The Main Characteristics of the Russian Federation Subjects"
Investments by microenterprises in the fixed capital as to new and imported fixed assets – total, thousand rubles;		Innovative activities of organisations	
Microenterprises' turnover, thousand rubles;		Average annual number of economically active population, thousand people;	
Average number of microenterprises employees, people;			
Average monthly wages at microenterprises, rubles		Territories' e-development index	Special research by the Information Society Research Institute.
The intensity of microenterprises' distribution	Calculations by the authors		

² For the full list of federation subjects, where the research was carried out, see Section 10 "Number of small and medium-sized entrepreneurship subjects by subject of the Russian Federation" in the collection "Small and Medium-Sized Business in Russia in 2010", title from the screen, http://www.gks.ru/free_doc/new_site/business/prom/small_business/obsled_rus/tom1/itog-pdf/010.pdf, accessed on January 25, 2016.

Indicators were selected based on a generalisation of European experience in analysis of results of microenterprises' activities and analysis of results of continuous observation over microenterprises by Russian statistical bodies. There were the following requirements for the selection of indicators:

- indicators should reflect the essence of the carried out research;
- availability of official state statistics of the Russian Federation for indicators for at least five years;
- indicators are used in international research [1, 10].

The following indicators were included in the first group:

1. number of microenterprises at the end of the accounting year;
2. investments by microenterprises in the fixed capital as to new and imported fixed assets;
3. microenterprises' turnover;
4. the average number of microenterprises employees;
5. average monthly wages at microenterprises.

All listed indicators are referred to volume indicators, characterising the scales of microenterprises activities within the region, but they do not reflect economic and spatial features of regions, first of all, the involvement of region's economically active population (EAP) in small business. It is impossible to compare federation subjects as to the development level of this business segment (microenterprises) in them based on volume characteristics only as the scales of a regions' economic activities are considerably different depending on climate, administrative and territorial position, which is seen in Table 3. The most significant share of microenterprises is in the regions of the Central and Volga federal districts, these federal districts are also leading in investments and aggregate microenterprises' turnover. There are comparatively small numbers of microenterprises in the Ural federal district (7.7% of the federal level) and Southern federal district (8.9%). However the total amount of investments into the fixed capital in these regions differs by more than four times. What is the main reason for such differences? We can suppose that not volume characteristics but relevant indicators, characterising involvement of the economically active part of the population into mastering the provided for them opportunities, play a significant part in this business segment's development in regions.

Because of that, the authors offer the estimate indicator "*Intensity of microenterprises' distribution*" as the indicator reflecting the development degree of microenterprises in Russian regions. The indicator is calculated as the relation of the number of microenterprises in a region to the number of EAP in that region and eliminates the impact of the volume component, allowing to compare regions with various economic scales.

Table 3: The leading overall indicators of microenterprises activities in regions in 2010 as a result of continuous observation

Federation subjects	Number of subjects	Number of small-sized enterprises, thousands	Including microenterprises, thousands	The share of microenterprises, %	Number of employees at microenterprises, people	Microenterprises' turnover, billion rubles	Investments in fixed capital of microenterprises, billion rubles
Russian Federation - total	80	9,790.2	3,320.0	100.0	13,290.2	5,609.2	149.6
Central	18	2,855.0	1,002.9	30.2	3,906.1	1,961.5	51.3
Northwestern	10	1,161.7	425.3	12.8	1,609.8	769.2	6.2
Southern	6	853.5	294.2	8.9	1,162.6	391.5	20.2
North Caucasian	7	234.8	87.9	2.6	332.3	119.7	6.3
Volga	14	2,111.5	673.3	20.3	2,819.1	969.2	35.9
Ural	4	835.6	256.9	7.7	1,104.2	460.0	5.1
Siberian	12	1,298.6	430.0	13.0	1,753.6	676.2	21.4
Far-Eastern	9	439.2	149.4	4.5	602.1	261.9	3.2

The second group of indicators is represented by the following characteristics:

1. gross regional product (gross added value in current basic prices);
2. region's share in the all-Russian potential;
3. territories' e-development index.

The indicator used including in the EU countries for assessment of innovative activities of small and medium-sized enterprises is viewed in the research as the indicator of innovative activities of organisations in regions. The "*Innovative activities of organisations*" indicator is the share of organisations developing technological, organisational, marketing innovations in the accounting year, in the total number of investigated organisations.

Research model. The following simple linear regression model was used to check presumptions and research hypotheses

$$Y_i = a + bX_i, \text{ where}$$

Y_i – values of the dependent variable for each region, where i is the region's number;

X_i - values of independent variable for each region, where i is region's number;

a and b – parameters of the regression equation, calculated according to the analysed aggregate.

As for prerequisites for regression analysis, often not satisfied, when a region is a reporting unit as it is clear that any macroeconomic characteristic of regions will vary significantly, the authors undertook some measures for the models presented in the research to be significant and interpreted:

- a) selected characteristics for the research that can be transformed into a relative form (e.g. introduced the indicator of the intensity of microenterprises' distribution as a

- regressor), eliminating the impacts of the region's economy size;
- b) used indicators the value for which is set forth, as additional characteristics (e.g. from 0 to 1 in case of the region's e-development index), which also stabilises the model;
 - c) checked the aggregate for outliers, all models were built with and without outliers, making sure that their impact does not distort the direction and strength of connection;
 - d) assessed the quality of models by leftovers and made sure that there are no nonlinear configurations or accumulations of points.

The model's linear form was selected based on the primary data analysis. Besides, similar models are widely used by Russian and foreign authors when analysing macroeconomic dependencies [4, 9], and most often dependency of the independent variable on the resulting variable is strengthened by additional variable, introduced in the analysis as a mediator or moderator³. The "moderator" and "mediator" terms, as well as forms of regression models with specified variables, have been used in modelling for a reasonably long time, from 1986, you can read in detail about how precisely the regression model is built with the mediator's and moderator's participation in works by E. Hayes [3], Moeljadi [4] and many others.

The mediation effect presumes that the collective impact of independent variables and mediators on the result is more significant than direct impact by independent variables. In this case, the construction scheme for regression model comes down to the replacement of (A) type model by the (B) model, presented in Figure 2. Several regression models are constructed to assess the mediation effect:

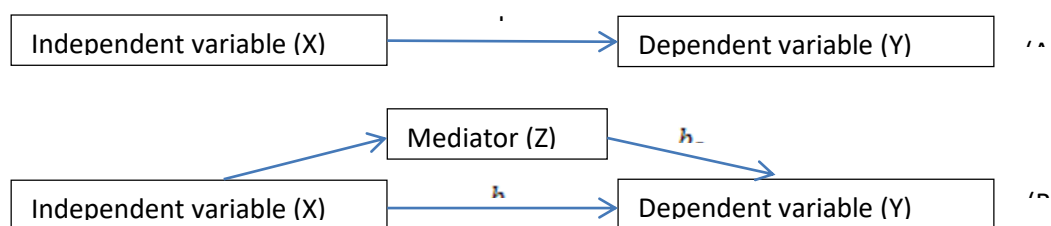
- a) dependent variable (result) from an independent one (regressor), the target of this equation is the assessment of regression coefficient b ;
- b) a mediator from the independent variable (regressor) for assessment of regression coefficient b_1 ;
- c) dependent variable from regressor and mediator simultaneously for assessment of regression coefficients b_3 and b_2 ;

If all three equations are statistically significant and direct regressor's impact on the result in the model (B) is less significant than in model (A), we are dealing with a mediator.

³ Mediation (from Latin *mediare* meaning to mediate, intervene, intercede) in multi-dimensional quantitative analysis is a variable mediating the connection between regressor and result, intensifying it.

Moderation (from English *moderator* meaning regulator, referee) in multi-dimensional quantitative analysis is a variable regulating the degree of regressor's affecting the result with the help of interaction effect (interaction).

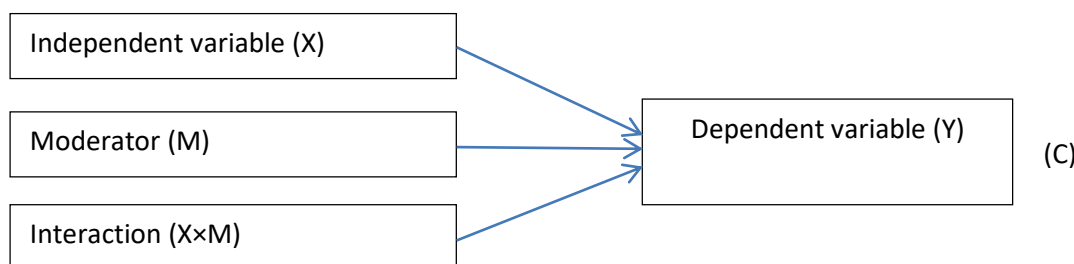
Figure 2: Mediation in regression modeling.



Moderation in the regression model is directed to the determination of the value of regressors' interaction, i.e. the significance of variable, being the effect of joint change by regressor and moderator (variable strengthening regressor's effect).

The construction scheme for the regression model with the moderator's participation is presented in Figure 3, as a result of applying modelled regression, we transfer from the model (A) to model (C), taking into account common impact by independent variable and moderator.

Figure 3: Moderation in regression modelling



5. Empirical Approval of Research Hypotheses

Hypothesis H1. Innovative activities of organisations in regions are directly or indirectly related to indicators of microenterprises' activities.

Parameters for three models, A, B and C, were determined to check-up this hypothesis, actual model's parameters are presented in Table 3 with index 1 (e.g. model A-1 means empirical check-up of theoretical model A).

Model A-1

Innovative activities of enterprises (except small-sized business) serve as dependent variable (Y_i) in basic model (A), the intensity of microenterprises' distribution, i.e. their number about the number of economically active people serves as the independent variable (X_i), with i being the region's number.

Thus, the general equation constructed on empirical data looks as follows (standard mistake values for each of the parameters in the correlation dependence equation are in brackets):

$$\hat{Y}_i = 7.25 + 0.1152X_i$$

(1.28) (0.06)

The model presumes that enterprises' innovations are concentrated in regions providing unique opportunities for innovative activities, and the higher the intensity of microenterprises' distribution, the higher this concentration will be (A-1, Table 5). Notwithstanding the low determination coefficient of model A-1 (only 3.78% of intensity's variety can be associated with innovative activity's variety), the model on the whole and its coefficient are significant (significance level is 10%). Consequently, a low determination may be related not to lack of connection but more complex configuration, e.g. such phenomenon as mediation or moderation. Let's review both possibilities one after the other, selecting the indicator that can serve as moderator or mediator.

Characteristics of regional potential may serve as such indicator, with its being rather closely associated with results of microenterprises' activities and assisting origination and development of investments and innovations in a region, but not being too closely associated with the other regressors. As it was said above, innovative development of regions is inseparably connected with its e-development. Because of that, the territories' e-development index [18] was selected as mediator and moderator for testing, the role of regions' e-development level is discussed in more detail when testing hypothesis H2.

Model B-1

The previously constructed model A-1 is a reflection of the set of variables presented in model A, assessment of regressor's (intensity of microenterprises' distribution) direct impact on the result (innovative activities of enterprises). We use the selected indicator for the region's e-development index as a mediator (Z) to construct a model (B) presented in Figure 2 and transform the model, the result is presented as model B-1 (Table 4). This model is a system of linear equations, the significance of mediator or regressor is modeled in the first one, and the second of the system equations reflects regressor's (intensity of microenterprises' distribution) impact on mediator (region's e-development index) and via it on the result (innovative activities of organizations).

Equations constructed on actual data to assess the mediation effect are as follows (standard mistake values for each of the parameters in the correlation dependence equation are in brackets):

- 1) the equation for the dependent variable:

$$\hat{Y}_i = 1.71 + 22.5712 \times Z_i - 0.0481 \times X_i$$

(2.41) (8.43) (0.088)

- 2) equation for mediator:

$$\hat{Z}_i = 0.24 + 0.0072 \times X_i$$

(0.01) (0.000)

The mediation effect presumes that joint impact by independent variable and mediator on the result is more significant than direct impact by the independent variable. Regressor's

direct impact on the result is measured by regression coefficient by it, and we see that it amounts to -0.0481, and that means the negative impact of distribution's intensity variant on the changeability of innovative activities of enterprises in regions. The indirect effect is revealed as the mediate impact of distribution's intensity via the region's e-development index on the result. Statistically, this effect is presented by regression coefficients product $b_1 \times b_3 = 0.163$. The indirect effect is positive and demonstrates that joint increase of intensity of microenterprises' distribution in the region and growth of the same region's e-development index bring about in the crease of innovative activities of organisations.

It is seen in Table 5 that regression coefficient and the model as a whole are statistically significant at the 1% level and determination coefficient equals 9.8%, and that is 5.9% higher than in model A-1. The model with simultaneous inclusion of regressor and mediator is statistically significant and the significance of the coefficient $b_3 < b$ (b_3 - regression coefficient from model B, b - regression coefficient from model A) in this model is considerably lower than in direct regression.

Model C

Let's come back to model A and introduce additional corrections using the regions' e-development index as moderator — the result presented in Table 4 (model C-1).

The equation constructed on actual data to assess the moderation effect is as follows (standard mistake values for each of the parameters in the correlation dependence equation are in brackets):

$$\hat{Y}_i = -0.13 + 26.918 \times M_i - 0.023 \times X_i - 0.538 \times X_i M_i$$

(2.79) (9.05) (0.09) (0.42)

Though the model, on the whole, is significant, and its explanatory force is close to model B-1 (with mediation), the variables interaction effect is insignificant, i.e. the territories' development index cannot serve as moderator, there is no joint impact of this indicator (M) and intensity of microenterprises' distribution (X) on the result (Y).

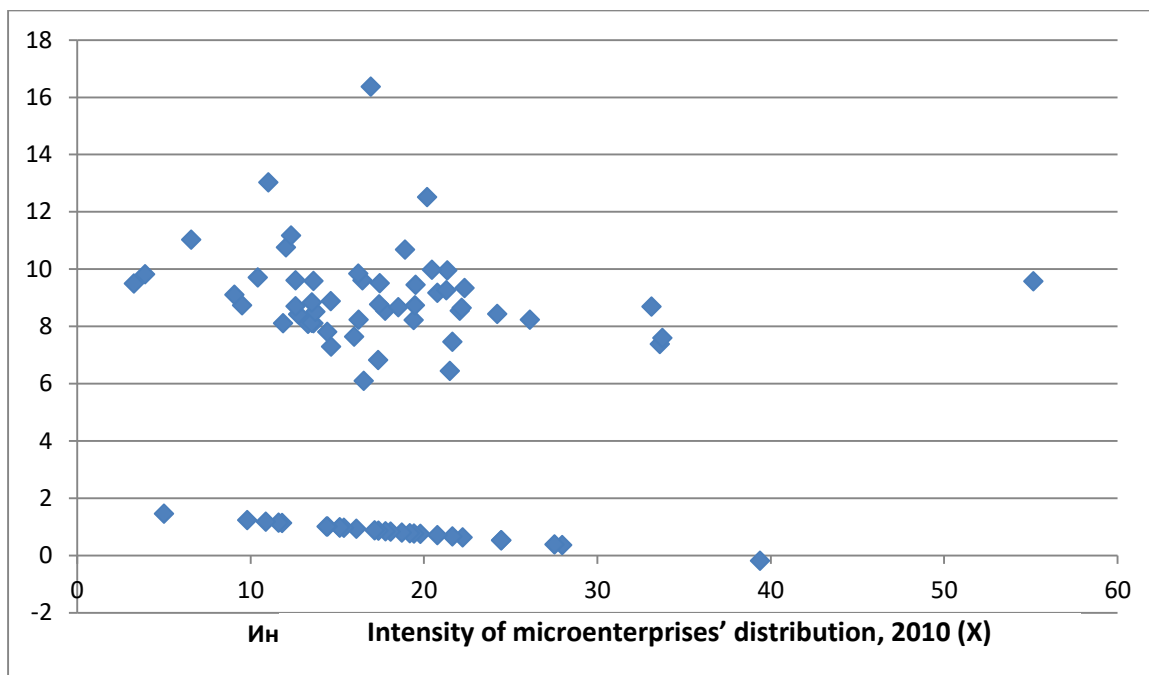
Table 4: Regression models parameters and their quality indicators for assessment of contribution of indicators characterizing microenterprises' activities into variation of Russian regions' innovative activities in 2010

Model	Dependent variable	Independent variable	Model's constant	Regression coefficient from model (b)	Model's standard mistake (SE)	Model's significance level according to F criterion (Sig.F)	Model's determination coefficient (R-sq), %
A-1	Innovative activities of organizations, %, 2010 (Y)	Intensity of microenterprises' distribution, 2010, (X)	7.25	0.1152 * ⁴	0.066	0.0840	3.78
B-1	Territories' e-development index, 2010 (Z)	Intensity of microenterprises' distribution, 2010 (X)	0.24	0.0072 ***	0.001	0.0000	48.07
	Innovative activities of organizations, %, 2010 (Y)	Territories' e-development index, 2010 (Z) Intensity of microenterprises' distribution, 2010 (X)	1.71	22.5712*** -0.0480	8.431 0.088	0.0070	9.68
C-1	Innovative activities of organizations, %, 2010 (Y)	Territories' e-development index, 2010 (M) Intensity of microenterprises' distribution, 2010 (X) Interaction (X×M)	-0.13	26.917*** -0.023 -0.538	9.053 0.089 0.419	0.0097	10.44

Thus, the checks carried out on the significance of models with various configurations demonstrated that the intensity of microenterprises' distribution (indicator characterising microenterprises' development in regions) affect innovative activities of enterprises in regions, on the whole, this impact is positive, statistically significant but not prominent. Therefore, there is a more complex, mediate the connection between innovations in regions and indicators of microenterprises' activities. Consequently, the first presented research hypothesis that innovations in regions are related to indicators of microenterprises' activities is confirmed. Theoretical values of enterprises' innovative activities (Y) were calculated according to the model that had demonstrated the biggest regressor's impact on the result with a statistical significance of coefficients (C-1), the results are presented in Figure 4.

⁴ The significance level, with which these results can be considered statistically reliable, is marked by asterisks. Traditionally, when testing the hypothesis of coefficient's significance, the following significance levels are used: *p<0.1 (coefficient is significant with 10% probability of I type mistake), **p<0.05, ***p<0.01.

Figure 4: Modelling of organisations' innovative activities and intensity of microenterprises' distribution in regions.



We can see two clusters of regions and outliers in the drawn-up regions' distribution diagram according to the theoretical value of innovative activities of organisations (Figure 3). To outliers (abnormal for aggregate values) we refer to the value of the intensity of St. Petersburg microenterprises' distribution in case of the common value of innovative activities, which may mean the insufficient use of region's significant opportunities by it. On the other hand, the Magadan Region demonstrates high innovative activities with an average intensity of microenterprises' distribution.

Two clusters of regions demonstrate a clear division of theoretical values (obtained according to the model with mediation) of innovative activities of organisations with the same values of intensity of microenterprises' distribution. Thus, we can say that although innovative activities of microenterprises stay beyond statistical observation, they are strictly related to the intensity of microenterprises' distribution, enhanced by the impact of the region's potential information development.

The framework of this research does not allow wide-scale and detailed analysis of differences in the environment for innovations' origination in microbusiness of regions referred to various clusters, but this may be the topic for further research.

Hypothesis H2. Indicators of microenterprises' activities are most strongly related to economic and spatial characteristics of territories.

The research on the interrelation of indicators of microenterprises activities results and the regions' e-development index demonstrated that the regions' e-development index is closely correlated with the most critical indicators of microenterprises activities results, to wit, their

numbers, intensity and density of distribution and the number of microenterprises employees. The association is weak in the case of the index and indicators characterising economic results of the region's activities such as gross regional product and microenterprises' investments into fixed capital (Table 5). The previous statement agrees well with low survival capacity of microenterprises in Russia as well as the poor competence of entrepreneurs in economics – they see no sense in investments that have no time for recoupment.

Table 5: Pair correlation coefficients for regions' e-development index and the most critical regional indicators

Indicator	Association closeness assessment	Coefficient
Investments in the fixed capital as to new and imported fixed assets – total, thousand rubles	practically lacking	0.2278
Innovative activities of enterprises, %	weak	0.3410
Gross regional product per Russian Federation subjects (gross added value in current basic prices) – total, rubles		0.4073
Average monthly wages at microenterprises, rubles		0.4523
Economically active population (EAP), thousand people	average	0.6016
Microenterprises' turnover, thousand rubles		0.6539
Region's share in the all-Russian potential, (%)		0.6956
The intensity of microenterprises' distribution (enterprises per one thousand people from the economically active population)	strong	0.7205
The average number of microenterprises employees, people		0.7333
Number of microenterprises at the end of the accounting year, units.		0.7676

The region's e-development index is the most correlated with intensity from the aggregate of the potential's characteristics (Table 5). The higher value of the coefficient is seen only in the case of the number of microenterprises and an average number of microenterprises employees, but the intensity indicator already includes these values in calculations, because of that modelling of these relations has no sense.

The analysis demonstrated that the e-development index is correlated with the most critical indicators of microenterprises activities results; at the same time there is a weak association with economic and spatial characteristics of territories. Consequently, the second research hypothesis is not confirmed.

6. Conclusions and Limitations

The main limitation of this research is the use of secondary information sources based on official reports by the Russian Federal State Statistics Service. These sources accumulate combined indicators for regions and are not aimed to check up research hypotheses. The following reasons prevent the collection of adequate primary information:

1. unavailability of company registers for researchers to organise representative sampling because of closed personal data of entrepreneurs;
2. continuous statistical observation takes place once in 5-10 years, and the programs for these observations are unstable in the composition of indicators, which makes their comparison more difficult;
3. microenterprises do not present the form No. 4 (innovations) and do not keep a respective accounting. Given that, it is impossible to divide innovative activities brought about precisely by factors related to microenterprises' distribution and other factors in models.

Even with the mentioned limitations, the research data allows us to come to some conclusions that could be useful when forming regional politics for support of small-sized businesses.

The objective of this research was to reveal the interrelation of the results of microenterprises' activities and innovative activities of enterprises in regions. The research demonstrated that the intensity of microenterprises' distribution as a characteristic of territorial potential affects innovative activities of organisations, on the whole, this impact is positive, but the explanatory regression force is not strong. However, directing its impact via a mediator being a resource indicator for a territory's potential, the interaction enhances the explanatory regression force as well as its statistical significance increases. It turns out that the more significant the intensity of microenterprises' distribution in a region is, the higher innovative activities of organisations in that region are, and at the same time the value of the e-development index is higher. If we take the theoretical values of the model based on modelled regression, it is possible to single out abnormal values and divide regions in two clusters, different in the average level of innovative activities but at the same time having similar potential (intensity of microenterprises' distribution). These clusters are divided according to the values of some hidden variable, the search for which may be the topic of the next research.

The analysis demonstrated that without the development of a territory's information potential, the interaction of innovations and intensity is insignificant. The experience of developed countries shows that if small-sized and microenterprises were set up in the past as a result of striving by many people to start their own business, nowadays setting up of such

enterprises is often initiated by big companies ordering them to engage in certain kinds of products or establish close ties with the market. Big business in its turn provides active development of territories, including from communications and information technologies development.

Thus, we should not speak about the simultaneous joint impact of intensity of microenterprises' distribution and the level of regions' e-development on innovative activities of organisations in regions. This impact is successive: developed infrastructure boosts strengthening of the intensity of microenterprises' distribution, and that means an increase in the share of the economically active population that transfers to the entrepreneurs class, seeing significant social and economic prospects here. Moreover, this process is not so much connected with GDP or average wages growth in the region, and not only with that, exactly correlation coefficients show that this association is insignificant. The share of entrepreneurs "out of necessity" is still predominant in Russia, which is typical for resource-focused countries. However, 65% of women and 70% of men see the source of new opportunities in entrepreneurship and assess the entrepreneur's status rather high – 77% of people launching their business think that this line of work is more successful than working for a salary. Setting up microenterprises, including in the form of self-employed entrepreneurs (one-person business) can be characterised as a unique creative kind of economic behaviour, for which enterprising spirit, initiative and creative activities connected at the same time with particular risk for a limited number of interested people are typical [14].

The carried out research demonstrated that the presumption of the simultaneous impact of intensity of microenterprises' distribution and the level of regions' e-development on innovative activities of enterprises in regions is partially confirmed. Interaction of innovations and intensity of microenterprises' distribution is insignificant without the development of a territory's information potential. However, the impact is successive: the level of Russian regions' readiness for an information society boosts the strengthening of the intensity of microenterprises' distribution, and that in its turn affects innovative activities of enterprises in the region. Thus, it turns out that the more significant the intensity of microenterprises' distribution in a region is, the higher innovative activities of enterprises in that region are, and at the same time the value of the e-development index is higher.

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