

# The Impact of the Level of Development of Banking Infrastructure on the Indicators of Innovation in the Region

I Bakeeva<sup>1</sup>, A Nikolaeva<sup>2</sup>, J Nefedova<sup>3</sup>

<sup>1</sup>Kazan National Research Technical University n.a. A.N. Tupolev, Kazan, Russia

E-mail: jrbakeeva@gmail.com, annanikolaeva@bk.ru, niko\_julia@mail.ru

**Abstract.** Innovation is the driving force of economic growth and the welfare of the regions at the present stage of the development of society. It is innovation that promotes competitive advantages for companies. But the implementation of innovative activities is impossible without creating favorable conditions and opportunities for its implementation. In our study, we analyzed the degree of influence of various factors on the results of innovation activity using the method of correlation and regression analysis. The information base of the study was the data of the Federal State Statistics Service for 2017 in 85 regions of the Russian Federation on indicators of innovation activity and indicators of the development of banking infrastructure. Based on the regression model, it was concluded that the number of credit institutions and their branches in the region has a significant impact on the effectiveness of innovation. Thus, one of the directions of increasing the innovative activity of enterprises in the region is the development of banking infrastructure. But it should be borne in mind that this is due to large-scale investments, therefore it is necessary to pay attention to other factorial signs that contribute to the intensification of innovation activity. Sustainable innovative development of the region is achieved with the integrated management of the entire set of factor signs.

## 1. Introduction

The level of development of the regions and the country as a whole depends on the competitiveness of enterprises. In the modern world, innovation is the most important engine of economic growth. The introduction of innovations gives enterprises a competitive advantage of a high order, which is more sustainable in comparison with the advantages of a low order, such as cheap labor, low prices, etc. [1]. Due to the lack of innovation, companies in the Russian Federation are practically uncompetitive on the world market and attract few investors [2]. For the effective implementation of innovation, it is necessary to create the appropriate conditions or innovation infrastructure, which is a combination of institutions, organizations and individuals that provide favorable conditions and opportunities for the production and implementation of innovations. These include individuals and legal entities that provide direct financial, logistical, organizational, consulting, informational and other assistance to innovative production entities. These also include organizations that have separate units that perform the functions of the innovation infrastructure [3]. We should not ignore the role of staff motivation in the implementation of innovation [4]. It is important to create such conditions, that is, to form a powerful innovative potential in the country to increase the efficiency of innovation activities [5].

## 2. Literature review

There are different points of view on the factors contributing to increased innovation in the region. Davidson N., Mariev O., Pushkarev A. among the factors stimulating the innovation activity of Russian companies include government support for businesses and regions, increased competition, enterprise size, that is, larger organizations located in recipient regions tend to innovate. By the size of the companies located in the donor regions, this dependence was not identified by the authors. Also of great influence is the volume of foreign direct investment and the release of new products. Barriers to innovation are corruption, low quality education and limited access to finance [6]. To fight corruption, you need to understand what type of it is common in the region [7].

There are authors who hold a different point of view, for example, Cooke, P. believes that state support for innovative development loses in efficiency to private organizations, therefore the state should build innovative policies that stimulate the development of strong private investment companies [8]. Innovation policy should contribute to building partnerships of organizations in the field of R & D related to the growth rate of the knowledge base and the capacity of organizations to study and redistribute external knowledge [9]. According to the theory of growth poles, the driving industries in the regions are the catalyst for economic results in the regions. While mature industries are slowing growth, driving industries, on the contrary, increase momentum. Thus, innovation activity in the region depends on the development stage of the driving industry and its related industries [10], as well as on the macroeconomic conditions prevailing in the national innovation system [11]. Doloreux, D., & Parto, S. underscore the importance of the institutional characteristics of the region, its knowledge infrastructure and knowledge transfer system [12]. An important component of innovation activity is the staffing of innovation. Innovative development of the region is impossible without creating a system of training highly qualified personnel [13]. It is also necessary to consider a system of incentives for personnel, one of the tools of which is an effective social policy [14], and to carry out regular work to improve labor regulation [15].

In the opinion of R. Salimov and G. Mingaleev, the regulatory legal acts adopted by the region and within its jurisdiction should form a single, coherent and diverse system of references and legal management in the field of intellectual property [2]. In the current international situation, political consolidation in the region is becoming another factor in regional growth. The regional model of joint management involves the introduction of new actors in management (business organizations, employers' unions, research institutes, international organizations, non-profit organizations). The regional community should be included in global strategies, which will require transparency and openness of information and financial flows. At the same time, local cultural identity should be maintained and developed [16]. Kafouros, M, Wang, C, Piperopoulos, P are also talking about the implementation of international openness policies. In their opinion, the authorities should ensure links between their regions and the knowledge bases of developed countries and encourage foreign firms to transfer research and development to local universities [17]. The government must act quickly, as the pace of change is accelerating due to the driving force of new technologies. Governments need to be more flexible than ever before to make the most of new opportunities and adapt to change. The authorities should build mechanisms that determine whether there is a return on innovation [18].

## 3. Problem statement

In our study, we analyze the factors affecting the innovative activities of organizations. The data of the federal state statistics service for 2017 were used as an information base for the study in 85 regions of the Russian Federation. The following indicators of innovation activity were selected: domestic research and development costs, the number of patent applications filed for inventions and utility models, the number of patents issued for inventions and utility models, developed advanced production technologies, used advanced production technologies, innovation activity, number of personnel employed research, the number of graduate students, the number of doctoral students, the cost of technological innovation, the amount of innovation ion of goods and services.

Considered such indicators of development of banking infrastructure as the number of credit institutions in the region, the number of branches of credit institutions in the region, the number of internal structural units, which include additional offices, operating cash offices outside the cash hub, credit and cash offices, operating offices.

The hypothesis of the study is that the propensity to innovate affects the availability of credit and the development of banking infrastructure.

The study is conducted on the basis of the correlation-regression model.

#### **4. Theoretical part**

Innovative entrepreneurship and high-tech business require a high level of expenditure on research and development in the total investment. Achievement of competitive advantages is possible due to the reduction of the time needed to finance various innovative projects. For small innovative enterprises, barriers are the lack of investment resources and the lack of adequate financial mechanisms at the initial stage. In most cases, the creators of such enterprises do not have their own funds, and the following obstacles may arise in the way of obtaining commercial loans:

- too high risks due to the lack of formation and unpredictability of the market in question;
- relatively slow progress of the project under consideration to the level of profitability - the period can often exceed 2-3 years;
- lack of collateral for the organization, since the main type of ownership of small innovative enterprises are illiquid assets, namely, intellectual property, know-how, specialized types of equipment, resources, and a prototype [19].

Financing innovation from borrowed funds is, of course, more risky for industrial enterprises, since regardless of whether new profits are received or not received as a result of innovation, the loan will have to be returned (often, in parts, long before the loan agreement expires), paying interest as well. But with sufficient creditworthiness of the enterprise, as well as with the commercial viability of innovative projects for which credit is used, the mobilization of borrowed funds can be carried out much faster, for example, than placing new shares on the market or searching for co-founders[20]. According to studies of lending to high-tech organizations in the UK, the Big Four banks offer higher rates than their smaller counterparts. Combined with the ability of large banks to attract cheap capital on the international market, small firms are likely to lend to them significantly more profitably [21]. Better access to bank loans can help spread new products and production methods in emerging markets. Without access to credit, firms may remain in a model of low productivity and weak growth [22, 23].

#### **5. Results**

As initial data, the following parameters were used as of the end of 2017 in the context of the subjects of the federation:

1) internal costs of research and development, mln. Rub., 2) the number of patent applications for inventions, pcs., 3) the number of patent applications submitted for utility models, pcs., 4) the number of patents issued for inventions, pcs., 5) the number of issued patents for utility models, pcs., 6) the number of developed advanced manufacturing technologies, pcs., 7) the number of used advanced production technologies, pcs., 8) the specific of all organizations engaged in innovation, in the total number of organizations,%, 9) the number of personnel engaged in scientific research, people., 10) the number of graduate students, people., 11) the number of doctoral students, people., 12) the cost of technological innovation, mln. Rub., 13) the volume of sold innovative goods and services, mln. Rub., 14) the number of credit institutions in the region, pieces, 15) the number of branches of credit institutions in the region, pieces, 16) the number of internal structural divisions of credit institutions in the region, pcs.

Indicators from 1 to 13 characterize innovative activity in the region, and from 14 to 16 - provision of the region with banking infrastructure.

At the first stage of testing the hypothesis, we will calculate the paired correlation coefficients. According to the results of this analysis, the indicator X8 stands out strongly against the general back-

ground of suspiciously low coefficients. Apparently, the share of innovatively active enterprises is determined by other indicators not included in the sample. This fact is also an interesting result that deserves a separate study, but so far we exclude the parameter X8 from the model.

Of the remaining indicators, the parameter X4 most closely correlates with the rest of the totality - the number of patents granted, which is generally logical. Namely issued patents may well be recognized as a resultant characteristic characterizing the success of both applied and fundamental innovative developments.

At the second stage of testing the hypothesis, we construct a regression model, where the parameter X4 will be the resultant Y, and the rest (except the excluded X8) will be factor signs.

Following the analysis, the following model was obtained:

$$Y = -11,2155 + 0,0014*X1 + 0,5104*X2 - 0,7268*X3 + 0,5451*X5 + 0,9106*X6 + 0,0073*X7 - 0,0039*X9 + 0,0950*X10 - 0,2745*X11 - 0,0010*X12 + 0,0001*X13 + 5,1603*X14 + 1,1683*X15 + 0,0688*X16 \quad (1)$$

According to the Fisher criterion, the model turned out to be significant.

It can be seen that the number of credit institutions and their branches in the region has a very significant effect on the number of patents granted, the influence of the number of internal business units is less, but also significant.

Thus, the hypothesis that the security of a region with banking infrastructure has a positive effect on innovation activity has been confirmed.

## 6. Conclusion

Innovation activity is of great importance for enhancing the competitiveness of enterprises in the region. However, a lot depends on the support of innovative activities carried out in the region. Regional authorities should create an effective innovation infrastructure that provides favorable conditions and opportunities for the implementation of innovations. To assess the influence of various factors on the performance of innovation, we applied the method of correlation and regression analysis. According to the results of the calculation of paired correlation coefficients, one parameter was excluded — the specific total of organizations engaged in innovation, in the total number of organizations statistically weakly connected with others, and the parameter most suitable for the role of the resulting feature — the number of patents granted for inventions was chosen. After building a regression model, we can conclude that great attention should be paid to the development of banking infrastructure, which has a significant impact on the performance of innovation activities. However, it must be borne in mind that it is difficult to achieve changes in the factor characteristics associated with the banking infrastructure, since it requires substantial financial expenditures. The specific effect of other factor signs is less, but their change is achieved with less significant financial investments. Sustainable results are possible only with the integrated management of the entire set of factor signs.

## References

- [1] Porter M E 1998 *Competitive Advantage of Nations* 2nd. edn. *Free Press* (New York)
- [2] Salimov R I and Mingaleev G F 2011 *The Regional Policy of Industrial IPM Services for the Development of Knowledge Potential in Russia* *Implementing International Services Gabler Verlag* 425-435
- [3] Nefedyev A 2011 *Innovatsionnaya infrastruktura* *Creative Economy* **5(10)** 42-48
- [4] Nadreeva L, Gaynutdinova J and Rakhimova G 2016 *Productivity and motivation of employees in the services sector* *Proceedings of the 27th International Business Information Management Association Conference Innovation Management and Education* *Excellence Vision* vol 2020 1211-1219
- [5] Bakeeva I, Bakeev B, Trutnev V, Mingaleev G, & Babushkin V 2018 *Influence Of Level Of Development Of Innovative Potential Of Region On Results Of Innovative Activity In International conference" Economy in the modern world"(ICEMW 2018)* vol 61 28-32 *Atlantis Press*

- [6] Davidson N, Mariev O, & Pushkarev A 2018 The Impact of Externalities on the Innovation Activity of Russian Firms *Forsight* **12(3(eng))** 62-72
- [7] Bakeev M, Nikolaeva A, Safargaliev M, Garifullin R, & Nefedova J 2018 Factors of corruption on the firm level In International conference" Economy in the modern world"(ICEMW 2018) vol 61 17-22 *Atlantis Press*
- [8] Cooke P 2001 Regional innovation systems, clusters, and the knowledge economy *Industrial and corporate change* **10(4)** 945-974
- [9] Gkypali A, Filiou D and Tsekouras K 2017 R&D Collaborations: Is diversity enhancing innovation performance? *Technological Forecasting and Social Change* **118** 143-152
- [10] Quatraro F 2009 The diffusion of regional innovation capabilities: Evidence from Italian patent data *Regional Studies* **43** 1333-1348
- [11] Fritsch M, & Graf H 2011 How subnational conditions affect regional innovation systems: The case of the two Germanys *Papers in Regional Science* **90(2)** 331-353
- [12] Doloreux D, & Parto S 2005 Regional innovation systems: Current discourse and unresolved issues *Technology in Society Journal* **27** 133-153
- [13] Nadreeva L L, Melnichnov V V, Sivko M V 2016 Personnel support for innovation activity *Bulletin of Kazan State Technical University named A N Tupolev* **72(1)** 158-165
- [14] Nadreeva L, Abramov V 2018 Improving the Efficiency of Social Policy at Enterprises as an Instrument of Personnel Incentive System Proceedings of the 31th International Business Information Management Association Conference, IBIMA 2018- Vision 2020 (Milan)
- [15] Nadreeva L, Abramov V 2017 Problems and Directions for Improving Labor Rating Sustainable Economic development, Innovation Management, and Global Growth Proceedings of the 30th International Business Information Management Association Conference IBIMA 2017 - Vision 2020 1184-1190 (Madrid)
- [16] Dagbayev E D, Dagbayeva N Z, Badmatsyrenov T B, & Dashinimayeva P P 2018 New Global Reality And Challenges To Regional Growth In International conference" Economy in the modern world"(ICEMW 2018) vol 61 56-60 *Atlantis Press*
- [17] Kafouros M, Wang C, Piperopoulos P et al. 2015 (1 more author): Academic collaborations and firm innovation performance in China: The role of region-specific institutions *Research Policy* **44(3)** 803-817
- [18] Abou Hana, Mona 2017 Innovation in the UAE: From First Foundations to ‘Beyond Oil’ *Global Policy* **8(3)** 414-417
- [19] Goncharova E V, Starovoitov M K, Starovoitova Ya M 2017 Investment factors of development of the small innovative enterprises in the region *Economics: Yesterday, Today and Tomorrow* **7(12A)** 28-36
- [20] Zhaparov T T, Zhaparov K T 2017 Problems of lending innovation in the Kyrgyz Republic *Bulletin of the Academy of Public Administration under the President of the Kyrgyz Republic* vol 23 158-164
- [21] Cowling M, Ughetto E, & Lee N 2018 The innovation debt penalty: Cost of debt, loan default, and the effects of a public loan guarantee on high-tech firms *Technological Forecasting and Social Change* **127** 166-176
- [22] Bircan Çagatay de Haas, Ralph 2015 The Limits of Lending: Banks and Technology Adoption across Russia, CESifo Working Paper, 5461, Center for Economic Studies and Ifo Institute (CESifo) (Munich)
- [23] Skipin L N, Skipin D L, Petuhova V S, Solovev D B 2019 Improvement Possibilities of the Ways of the Bore Mud Desalinization *IOP Conference Series: Earth and Environmental Science* **272** paper № 032047. [Online]. Available: <https://doi.org/10.1088/1755-1315/272/3/032047>