

ECONOMETRIC MODELING OF EXTERNAL FACTORS INFLUENCE ON INNOVATION ACTIVITY IN THE CASE OF REGIONAL HETEROGENEITY IN RUSSIA

Oleg Mariev,¹ Andrey Pushkarev²

Abstract: Innovations are essential for international competitiveness. In this research study, we analyze factors that affect the involvement of Russian firms in the innovation process. Our objective is to find out which factors on a regional level are the most important for innovative activity that would allow for improving the innovation policy. We overview the main groups of factors that were considered to be significantly affecting innovations. We then proceed to analyze the regional-level data, and classify the Russian regions into three groups based on set of their characteristics. Our results suggest that currently the most important external determinants of innovation propensity for the Russian regions are the share of organizations that carried out scientific research, FDI, appropriate infrastructure and the quality of human capital. It implies that the innovation policy should focus mainly on these indicators. We also found substantial differences between regional groups, both in significance of the considered indicators and in their power. Based on the results, we propose several policy recommendations that would facilitate innovation activities of the Russian regions.

JEL Classification Numbers: O31, H20; **DOI:** <http://dx.doi.org/10.12955/cbup.v5.943>

UDC Classification: 338.2

Keywords: innovations, human capital, external factors, regional heterogeneity, econometric modelling, self-organizing map

Introduction

Currently, both in Russia and in many other countries, more attention is paid to the issue of innovation activity and how this activity is related to various economic indicators, both at the micro and meso levels. Nevertheless, according to many studies and reports, innovation activity in the country remains at a low level (i.e. Schwab, 2016; Kuznetsov, 2015).

This paper aims to uncover how the range of external factors affect the innovation activities in Russia. It is done by analyzing different economic and social regional indicators that, according to previous research, may affect the innovative activities.

The rest of the paper is organized as follows. Section 2 provides a brief literature review. Section 3 provides a detailed description of the dataset and empirical methods used in this research. Section 4 discusses the empirical results based on the Russian region level data and their policy implications. Section 5 concludes the paper.

Literature review

To find the most relevant factors for the empirical analysis that affect regional innovation activity we analyzed a number of papers that discuss similar problems. In this section, we will give a short summary of them. Modern research identifies a large number of potential factors that can influence the innovative development of a region. In order to organize a large number of available indicators, we divide them into several groups.

1. Level of human capital in the region

The research of Junge et al. (2012) highlights that the presence of highly qualified specialists in the region is a prerequisite for the development of innovative technologies and products, and their production. To attract specialists to the region and prevent the outflow of highly qualified personnel, a decent standard of living is necessary. Therefore, this group of indicators, in addition to various indicators of the level of education, also may include public spending on medicine and education, the level of crime, GRP, the level of unemployment, the balanced financial result of organizations, etc.

2. Condition for competition development

Currently, among economists, the prevailing view is that the active perception, development and introduction of new technologies requires competition between enterprises. In particular, Dezhina

¹ Graduate School of Economics and Management, Ural Federal University, Yekaterinburg, Russian Federation; Institute of Economics, Ural Branch of the Russian Academy of Sciences, Yekaterinburg, Russian Federation, olegmariev@mail.ru

² Graduate School of Economics and Management, Ural Federal University, Yekaterinburg, Russian Federation, a.a.pushkarev@urfu.ru

However, there are also common factors for all regions that determine their innovative development, as evidenced by the high explanatory power of the general model of factors applied to the regions. Such indicators include the share of organizations that carried out scientific research and development in the total number of organizations; logarithm of the number of employees of organizations engaged in research and development; logarithm of direct foreign investments.

At the same time, the absolute values of the coefficients for the first two named variables show a difference in the power of their influence in regions of different groups. The third factor, foreign direct investment, influences positively and equally on the innovation activity of region groups, which necessitates its further detailed study with the aim of stimulating economic policy at various levels.

Conclusion

To sum up, in this research we have analyzed effects of different regional level factors on innovation activities. The results suggest that indicators, such as FDI, regional budget revenue, GRP, infrastructure development level and quality of human capital have a positive effect on the number of patents granted. Therefore, it may be beneficial for policies to target fields that these indicators represent, when aiming to increase innovation activity.

Additionally, we find that there are substantial differences between regional groups. For example, the group of Northern regions shows weaker correlation with most of the indicators however, significant ones have a stronger effect on innovation output than in all other regions. Thus, policy should be adjusted with these specialties in mind. We also find that there are several generally significant indicators, such as share of organizations that carried out scientific research and development in the total number of organizations; logarithm of the number of employees of organizations engaged in research and development; and logarithm of direct foreign investments. This means that federal policy should target these common traits first.

As prospects for further research, it would be beneficial to construct a model that would include not only factors on a regional level, but also at the level of separate firms. It would increase the overall quality of the model and provide better understanding, which firms the government should target as the main innovators and how exactly they could be supported.

Acknowledgements

This research was supported by the Russian Scientific Fund grant No. 15-18-10014 "Projection of optimal socio-economic systems in turbulence of external and internal environment".

References

- Dezhina I.G.(2008) "State, science and business in the innovation system of Russia", Dezhina IG, Kiseleva V.V. - Moscow: IET, 227 p.
- Fritsch M., Aamoucke R. (2013) "Regional public research, higher education, and innovative start-ups: an empirical investigation" *Small Business Economics*, Vol. 41, pp. 865-885.
- Gorodnikova N. et al. (2015) *Innovation activity indicators – 2015*, Moscow, High School Of Economics, 321.
- Junge, M., Severgnini, B., Srensen, A. (2012) "Evidence on the Impact of Education on Innovation and Productivity", Working Papers from Copenhagen Business School, 2, pp 1-31.
- Kimer E., Kinkel S., Jaeger A. (2009) "Innovation paths and the innovation performance of low-technology firms: An empirical analysis of German industry", *Research Policy*, Vol. 38, pp. 447-458.
- Kuznetsov E. (2015) *National Report on innovations in Russia 2015*. Moscow, Ministry of economic development , 146 (In Russian).
- L. Serven, C. Calderon. (2004) "The effects of infrastructure development on growth and income distribution", *World Bank Policy Research Working Paper*, № 3400, pp. 27-31.
- Schwab, K. (2016) *The Global Competitiveness Report 2015–2016*, Geneva, The World Economic Forum, 403.
- Shtertser T.A. (2005) "The empirical analysis of factors of innovative activity in the subjects of the Russian Federation" *NSU Herald*, Vol. 5. Issue 2, pp. 103-104.
- Srholec M. (2011). "A multilevel analysis of innovation in developing countries", *Industrial and Corporate Change*, Vol. 20, Issue 6, pp. 1539-1569.