

Spatial Specifics of Investment Utilization in a Regional Economy

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Abstract. Innovation that takes place in global and national economy has specific regional manifestations. Therefore, when evaluating the efficiency of utilizing investment resources, it's necessary to consider the specifics of territorial development, which is what this research is about. The methodology is based on correlation and regression analysis. The effectiveness of the current resourcing for all the processes, including innovation, could seemingly be assessed by comparing spending and outcomes. This study uses the domestic R&D costs as the resourcing indicator. The resulting indicators are gross regional products and the monetary value of innovative goods, products, and services. The research further applies correlation and regression analysis to identify a strong correlation between the values above, which enables modeling the development of the national economy. That allows grouping the CFD regions in terms of their potential response to domestic R&D spending, which manifests itself as a change in GRP and in the value of innovative goods.

1. Introduction

The today's economic system features an innovative development paradigm distinguished by technological retrofitting; for better performance, it has to optimize the use of all the resources it has at hand [1].

The most frequently mentioned challenges of innovation are "... higher R&D costs compared to competitors..." [2], which emphasizes the importance of efficient funding for technological advancement; this is confirmed by a number of international studies that note that innovation is what drives competitiveness [3, 4].

2. State of the art

Any socioeconomic processes and relations that may emerge as part of local innovation will have considerable local specifics. Assessment of innovation is important for a market actor's positioning; it's also an important guidelines for strategizing upon innovation in companies [5-7] and countries alike [8-10].

Thus, A.N. Shvetsov notes that he clarifies that innovation and economic growth in Russia also have a no less important territorial aspect to them [11].

Innovation is a strategic tool for the enhancement, creation, and improvement the economic systems to give rise to competitive advantage [4]. The need to bolster innovation exists in nearly any region of the Federation. Notably, while nearly every region is in need of innovation, only some of them

have access to the federal innovation toolkit. This is a rather negative aspect, because any allocation of funds from the federal budgets for innovation projects requires co-funding from the region. However, this requirement is difficult to meet since regions often lack sufficient funding. It is therefore only logical that regional and intra-regional discrepancy is increasing [11].

O.S. Sukharev recognizes the truth behind this statement and identifies another challenge of innovation, which is that the country's financial and banking systems lack focus on the needs of the real economy, on providing it with a greater opportunity for innovation and commercialization [12].

This leads to a conclusion that the market demand for new technologies and products will boost the transition to innovative reproduction. V. Zemlichkene believes local innovative development largely depends on the extent, to which companies use innovation and associated resources to gain competitive advantage and to amplify the region's potential [13]. These statements have been fundamental to furthering the innovation paradigm in the context of 'open innovation' [14-17]

Bresnahan and Trajtenberg believed 'broad-use technologies' opened up great opportunities in this respect [18]. If such technologies see regular updates, they can be used in combination with other technologies to improve the latter.

H. Godoe believes that technological innovation largely depends on the resources available to R&D as well as on the market demand [19], an argument supported by a number of other studies [20, 21].

Therefore, one of the signs that an economy is innovating is that socioeconomic systems have their performance increased thanks to efficient use of the available resources, including finance and investment, in the context of regional specifics.

In his analysis of the latter, A.G. Isayev concludes that when studying territorial factors of influence, it is necessary to consider their dynamic properties that can be used in the feedback assessments to model the regional economy [22].

Thus, when assessing the efficiency of using this or that resource (including finance and investment), regional specifics of innovation should be borne in mind.

3. Research methodology

It seems appropriate to begin the analysis into regional innovation specifics with identifying and assessing the efficiency of utilizing the available finance and investment. It is logical to define these aspects as a correlation between spending a specific resource and the effect it generates.

This research seeks to analyze such regional specifics for the Central Federal District. The analysis is to be based on the domestic R&D costs and on the performance of the socioeconomic system. The performance is to be measured by two indicators:

- gross regional product, as it is extremely important for assessing the economic efficiency and growth [23];
- the value of innovative goods, works, and services as a product of regional innovation.

Notably, the resource and indicators specified are in direct correlation. The commonly accepted scale for interpreting the obtained correlation coefficients leads to a conclusion the resources are strongly linked to the performance [24]. Thus, the selected indicators can be used to construct two equations to describe domestic R&D costs and the resulting output in terms of regression analysis [25].

Model data are shown in Table 1. Note that regression methods are rather popular tool for assessment of economic processes in a variety of fields [26-28].

Table 1. Regression dependence equations, Russia.

Region	Value of innovative goods, works, and services (Y1)	GRP (Y2)
Belgorod Oblast	-10217.3+24.7x	223455.74+248.7x
Bryansk Oblast	-8986.00+55.55x	113068.67+271.5x
Vladimir Oblast	-7243.27+7.94x	46142.47+12.94x
Voronezh Oblast	-40833.99+10.6x	-847125.6+244.5x
Ivanovo Oblast	5015.94-6.50x	4102.14+246.82x
Kaluga Oblast	-11115.4+2.7x	-106194.47+42.6x
Kostroma Oblast	970.30/27.15x	80622.73+578.13x
Kursk Oblast	-8171.48+6.48x	147486.05+45x
Lipetsk Oblast	27227.05+106.5x	203591.6+646.9x
Moscow Oblast	-293183.928+5.6x	-407856.798+32.9x
Oryol Oblast	7909.43348-13.16x	40991.1033+ 286.47325x
Ryazan Oblast	-3152.94669+7.25x	98646.3603+112.55x
Smolensk Oblast	1023.05969+3.58x	62195.3117+148.72x
Tambov Oblast	412.466416+3.00x	90731.7687+100.94x
Tver Oblast	22663.1978+2.07x	45693.5723+62.74x
Tula Oblast	12891.8629+10.39x	168142.832+68.1x
Yaroslavl Oblast	11345.8445+3.09x	133760.854+41.9x
Moscow	-1044430.53+5.88x	856181.213+40.2x

4. Results

The results produces a number of important findings:

- most regions are above the national average in terms how efficiently they use their resources as indicated by the value of innovative goods, works, and services. It's vice-a-versa, however, in Ivanovo and Oryol Oblasts. A region that stands out is Ryazan Oblast, which showcases a negative correlation. However, this is rather an anomaly.

- speaking of how efficiently regions use their resources in terms of GRP, most of them are above national average, which indirect proves their R&D spending is optimal. However, some regions perform worse. Vladimir Oblast, Kaluga Oblast, Moscow Oblast, Yaroslavl Oblast, and the City of Moscow all gain less from funding innovation.

Summing up, it's worth noting Lipetsk Oblast, which, following this paper's logic, is the most optimal region in terms of both parameters. Thus, it is possible to diagnose efficient domestic R&D costs, where every ruble has to maximize its output in terms of both GRP and value of innovative goods, works, and services.

Bryansk Oblast, Kostroma Oblast, and Belgorod Oblast take lead in terms of both coefficients.

On the other hand, Tula Oblast, Vladimir Oblast, and Moscow lag behind.

Notably, efficiency in terms of value of innovative goods, works, and services is lower than that in terms of GRP. This is primarily due to the fact that aside from producing innovative goods, domestic costs have other formalized manifestations: know-hows, patent and license applications, other real economic effects that apply to GPR calculations while not necessarily constituting innovation.

5. Conclusions

Summing up the study, it is worth noting that despite the observable global economic processes of innovation in all processes, resourcing remains crucial. The effectiveness of the current resourcing for all the processes, including innovation, could seemingly be assessed by comparing spending and outcomes. This study uses the domestic R&D costs as the resourcing indicator. The resulting indicators are gross regional products and the monetary value of innovative goods, products, and services. The research further applies correlation and regression analysis to identify a strong correlation between the values above, which enables modeling the development of the national economy. Given that the na-

tional values can be considered baseline, regional indicators of CFD regions have compared against the adopted benchmark. The finding is that Lipetsk Oblast takes the lead in both criteria. Other leaders are Bryansk Oblast, Kostroma Oblast, and Belgorod Oblast. On the other hand, Tula Oblast, Vladimir Oblast, and Moscow lag behind. It is therefore safe to say that regions differ not only in quantity, but also in quality.

6. Discussion of results

Note that the proposed approach does not guarantee unambiguous interpretation. However, this toolkit does describe the existing trends and uses data from official sources, meaning any interested party could use it for research purposes or in the interests of actors in real economy to project the efficiency of potential R&D costs, with promotion of innovation in mind.

7. References

- [1] Chen J et al 2018 Holistic Innovation: An Emerging Innovation Paradigm *International Journal of Innovation Studies* **2(1)** 1-13 <https://doi.org/10.1016/j.ijis.2018.02.001>
- [2] Brassier T-M, Mladenov A, Strauss K 2017 Open innovations in the field of business models: literature review and further research directions *Business Informatics* **4(42)** pp 7–16 DOI: 10.17323 / 1998-0663.2017.4.7.16
- [3] Simao L B et al 2016 External relationships in the organizational innovation RAI *Revista de Administração e Inovação* **13(3)** 156-165 <https://doi.org/10.1016/j.rai.2016.06.002>
- [4] Distanont A 2018 The role of innovation in creating a competitive advantage *Kasetsart Journal of Social Sciences* **1-7** <https://doi.org/10.1016/j.kjss.2018.07.009>
- [5] Zhang X 2017 Measurement Model and its Application of Enterprise Innovation Capability Based on Matter Element Extension Theory *Procedia Engineering* 174 275-280 <https://doi.org/10.1016/j.proeng.2017.01.136>
- [6] Sulisty H et al 2016 Innovation capability of SMEs through entrepreneurship, marketing capability, relational capital and empowerment *Asia Pacific Management Review* **21(4)** 196-203 <https://doi.org/10.1016/j.apmr.2016.02.002>
- [7] Hsiao et al Y Ch 2018 Firm-specific advantages-product innovation capability complementarities and innovation success: A core competency approach *Technology in Society* **55** 78-84 <https://doi.org/10.1016/j.techsoc.2018.06.009>
- [8] Khedhaouria A et al 2017 Configurational conditions of national innovation capability: A fuzzy set analysis approach *Technological Forecasting and Social Change* **120** 48-58 <https://doi.org/10.1016/j.techfore.2017.04.005>
- [9] Švarc J et al 2019 Regional innovation culture in innovation laggard: A case of Croatia *Technology in Society* <https://doi.org/10.1016/j.techsoc.2019.03.03.006>
- [10] Yang J 2012 Innovation capability and corporate growth: An empirical investigation in China *Journal of Engineering and Technology Management* **29(1)** 34-46 <https://doi.org/10.1016/j.jengtecman.2011.09.004>
- [11] Shvetsov A N 2016 "Growth points" or "black holes"? (On the issue of the effectiveness of the use of "zonal" tools to post-stimulate the revitalization of the economic dynamics of territories) *Russian Economic Journal* **3** pp 40–61
- [12] Sukharev O S 2016 Questions of the development strategy of Russia Federalism **1** pp 133–154
- [13] Zemlickiene V 2011 Analysis of high-technology product development models *Intellectual Economics* vol 5 **2** pp 283–297
- [14] Chiaroni et al D 2011 The Open Innovation Journey: How firms dynamically implement the emerging innovation management paradigm *Technovation* **31(1)** 34-43 <https://doi.org/10.1016/j.technovation.2009.08.08.007>
- [15] Vilas A P, Boas ViveirosLopes et al 2018 Evolution of the open innovation paradigm: Towards a contingent conceptual model *Technological Forecasting and Social Change* **132** pp 284-298 <https://doi.org/10.1016/j.techfore.2018.02.014>

- [16] Žemaitis E 2014 Knowledge Management in Open Innovation Paradigm Context: High Tech Sector Perspective *Procedia - Social and Behavioral Sciences* **110** pp 164-173 <https://doi.org/10.1016/j.sbspro.2013.12.859>
- [17] Chen J et al 2018 Holistic Innovation: An Emerging Innovation Paradigm *International Journal of Innovation Studies* **2(1)** pp 1-13 <https://doi.org/10.1016/j.ijis.2018.02.001>
- [18] Bresnahan T F, Trajtenberg M 1995 General Purpose Technologies: “Engines of Growth”? *Journal of Econometrics* vol 65 **1** pp 83–108
- [19] Godoe H 2000 Innovation regimes, R&D and radical innovations in telecommunications *Research Policy* vol 29 Issue 9 pp 1033-1046
- [20] Cancino ChA et al 2018 Technological innovation for sustainable growth: An ontological perspective *Journal of Cleaner Production* 179 31-41 <https://doi.org/10.1016/j.jclepro.2018.01.059>
- [21] Höflinger P J 2018 Reputation for technological innovation: Does it actually cohere with innovative activity? *Journal of Innovation & Knowledge* **3(1)** 26-39 <https://doi.org/10.1016/j.jik.2017.08.002>
- [22] Isaev A G 2018 Regional aspects of investment processes: an empirical analysis of the distribution of capital resources in the Far Eastern Federal District *Economic and social changes: facts, trends, forecast* vol 11 **4** pp 63–76 DOI: 10.15838 / esc.2018.4.58.4
- [23] Sukharev O S 2015 Economic growth of a rapidly changing economy: theoretical setting *Regional Economy* T 12 **2** pp 359-370 doi 10.17059 / 2016–2–3
- [24] Repova M L 2010 Arkhangelsk: Arkhang. state tech. Univ 32 p
- [25] Draper N, Smith G 2007 Applied regression analysis. Multiple Regression = Applied Regression Analysis 3rd ed. (M.: "Dialectics") p 912
- [26] Jørgensen M et al 2012 Interpretation problems related to the use of regression models to decide on economy of scale in software development *Journal of Systems and Software* **85(11)** pp 2494-2503 <https://doi.org/10.1016/j.jss.2012.05.05.068>
- [27] Cohen J P et al 2014 Semi-parametric regression models and economies of scale in the presence of an endogenous variable *Regional Science and Urban Economics* **49** pp 252-261 <https://doi.org/10.1016/j.regsciurbeco.2014.10.002>
- [28] Yi S et al 2018 Application of threshold regression analysis to study the impact of regional technological innovation level on sustainable development *Renewable and Sustainable Energy Reviews* **89** 27-32 <https://doi.org/10.1016/j.rser.2018.03.005>