Analysis of the structure of the regional labor market and its impact on the gross regional product

Mayya Valerianovna Dubovik[1][1], *Sergey Gennadievich* Dmitriev[2], and *Natalya Nikolaevna* Obidovskaya[3]

[1]Plekhanov Russian University of Economics, Department of Economic Theory, Moscow, Russia.
[2]Bryansk branch of Plekhanov Russian University of Economics, Department of Economics, Customs, Information Technology and Natural Sciences, Bryansk, Russia.
[3]Bryansk branch of Plekhanov Russian University of Economics, Department of Civil, Criminal Law and Procedure and Financial and Legal Disciplines, Bryansk, Russia.

Abstract. We have been conducting research to determine the impact of the structure of the regional labour market on regional development. We have studied the entities of the Central Federal District in general and the Bryansk region in particular. We have limited our labour market study to the research and development sector. We have used statistical analysis to test our hypothesis that there is no statistically significant correlation between regional enterprise expenditure and the movement of regional gross product. We have found that the structure of the regional labour market in the field of research and development is characterized by a steady downward trend of personnel engaged in research and development. The Pearson coefficient obtained for the analysis of the correlation between research and development expenditure and the gross regional product of companies in the Central Federal District does not suggest a significant correlation between the indicators. In general, we do not believe that it is possible to assert a stable trend in innovative development of the regions of the Central Federal District. What can be said with confidence is the inconsistency of the statistical information that served as the basis for the study, which in turn led to rather contradictory analyzes.
Keywords: labor market, gross regional product, innovation, R & D

1   Introduction

The purpose of our work is to study the structure of the Bryansk region's labour market as well as its impact on the dynamics of the gross regional product. Since one of the goals of Russia's socioeconomic development is innovative development, we have limited ourselves to analyzing the part of the Bryansk Region's labour market that is engaged in scientific research and innovation. Another limitation of our analysis is that we did not take into account organizational innovations focusing on technological innovation. Our opinion is

---

[1] Corresponding author: mvdubovik@gmail.com

Dela Press Conference Series: Economics, Business and Management Vol. 001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

that in Russian conditions, the creation of new enterprises in most cases serves as a tool for tax optimization, and is not the result of innovative activities of economic entities.

1.1   Literature review

The spatial distribution of the centers responsible for research and development has a significant impact both on their efficiency and on the economic growth of the region. Egger and Loumea [1] used databases on granted patents having identified "innovation clusters".

Chen, Wang, Li [2], using panel data on 30 provinces of China for the period 2005-2018 emphasize the existence of spatial influence on innovation activity: the level of urbanization promotes innovation, the rich natural resources of the region, on the contrary, negatively affect the innovation potential of the region.

The importance of spatial localization of innovations and the formation of regional innovation systems to stimulate economic development is proved in the work of J. Kim, K. Lee [3]. This study emphasizes the role of integration and interaction for the purposes of socioeconomic development; Yang, Che and Lai [4] have proved based on an econometric analysis of the Chinese patent database, that interregional industrial relations can contribute to interregional joint research and development (R&D). The need to form regional institutes of technological planning as one of the most important participants in regional innovation systems is analyzed (from a technological point of view, using patent databases) in the work of Park, Anderson, Seo [5]. Such elements of innovation infrastructure as high-speed railways and regional agglomeration of the financial industry, which have a positive impact on innovation activity, are analyzed in the work of Komikado, Morikawa et al. [6]. At the same time, Wang, Chandra et al. [7] show the way regional borders are changing through technological transformations leading to the creation of cross-border innovation systems. Min, Kim, Sawng [8] give convincing arguments that the efficiency of innovation is higher in those regions where "innovation networks" are created compared to conventional government funding of R&D. Stimulating research and development through foreign direct investment networks by the example of three megacities (Beijing, Shanghai-Suzhou, and Shenzhen-Dongguan) is analyzed in the work of Wei, Zhou et al. [9].

A critical approach to measuring innovation activity using patent databases is in the work of Smith and Funk [10]: only about 10% of inventions are registered, a certain part of the issued patents is useless. Fontana, Nuvolari et al. [11] confirm the conclusion that patents are granted only for a part of inventions, and that the granted patents are unevenly distributed between sectors of the economy and types of enterprises. S. Kim, H. Lee [12] trace the dynamics of innovation and patent activity after mergers and acquisitions of companies. Pfister, Koomen et al. [13] prove that the creation of higher educational institutions engaged in applied research leads to an increase in regional patent activity by 6.8%.

2   Materials and methods

The source of information for our study was the data of the Federal State Statistics Service – its territorial subdivision in the Bryansk region [14, 15]. We used data on the structure of employees involved in R&D and innovation, the innovative activity of enterprises and companies in the regions of the Central Federal District, patents granted and technologies developed as well as data on the dynamics of the gross regional product. We used these statistics taking into account the limitations described in the introduction to this study.

Dela Press Conference Series: Economics, Business and Management Vol.001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

We used the method of comparisons, the historical method, correlation analysis and other methods of econometrics and statistical analysis while carrying out this study.

3   Results

Figure 1 shows the dynamics of the structure of personnel employed in the field of research and development of enterprises and companies of the Bryansk region. There has been a steady decline in research activity in the region.

The data of the figure indicate that from 2005 to 2019 there was not only a quantitative but also a qualitative decrease in the personnel employed in the field of R&D in companies of the Bryansk region: the share of researchers decreased by more than 12%. The share of "other personnel" (economic services, accounting, personnel services, etc. [14]), on the contrary, has almost doubled.

Fig. 1. Structure of personnel employed in the field of R&D in the Bryansk region, %. Compiled by the authors on the basis of data [14, 15].

In general, the innovative activity of enterprises and companies in the Bryansk region does not have a steady upward trend during the entire observed period varying in a narrow range from 7 to 11%, the median value is 8.8% (Fig. 2).

The dynamics of goods shipped, works performed, services rendered by enterprises and companies of the Bryansk region, including innovative goods, works, services are shown in Fig. 3. The results of the analysis confirm our assumption that the innovative activity of enterprises in the Bryansk region has no tendency to increase.
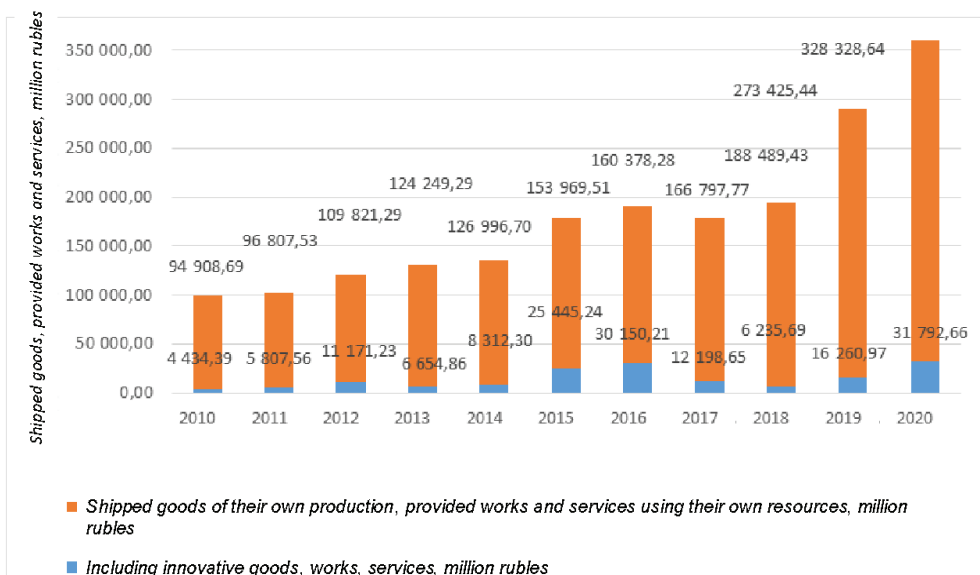
Figure 4 shows the results of correlation analysis (Pearson's coefficient) of gross regional product indicators and costs of innovation activities of enterprises and companies

Dela Press Conference Series: Economics, Business and Management Vol. 001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

of the Central Federal District. The resulting range of values is quite wide: from the lowest value -0.8 (Yaroslavl region) to the maximum 0.9 (Belgorod region).

The obtained results should be used with caution; therefore, we do not undertake to assert that the innovative activity of enterprises of the Central Federal District does not have a statistically significant impact on the dynamics of its gross regional product; the spread of values is quite high even within one region.
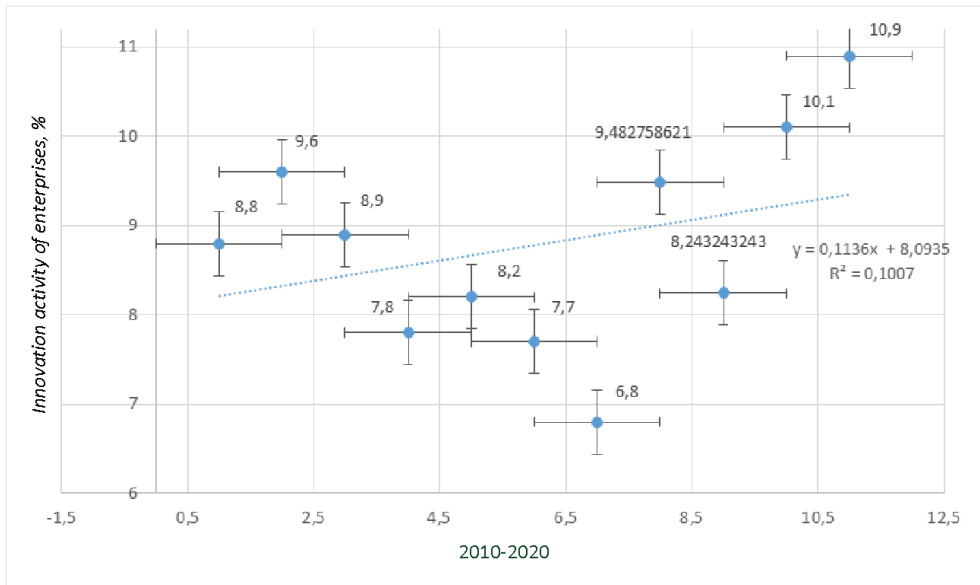

Fig. 2. The level of innovative activity of companies in the Bryansk region, %. Compiled by the authors based on data [14, 15].

Dela Press Conference Series: Economics, Business and Management Vol.001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

Fig. 3. Volumes of shipped goods, works, services by companies of the Bryansk region. Compiled by the authors based on data [14, 15].
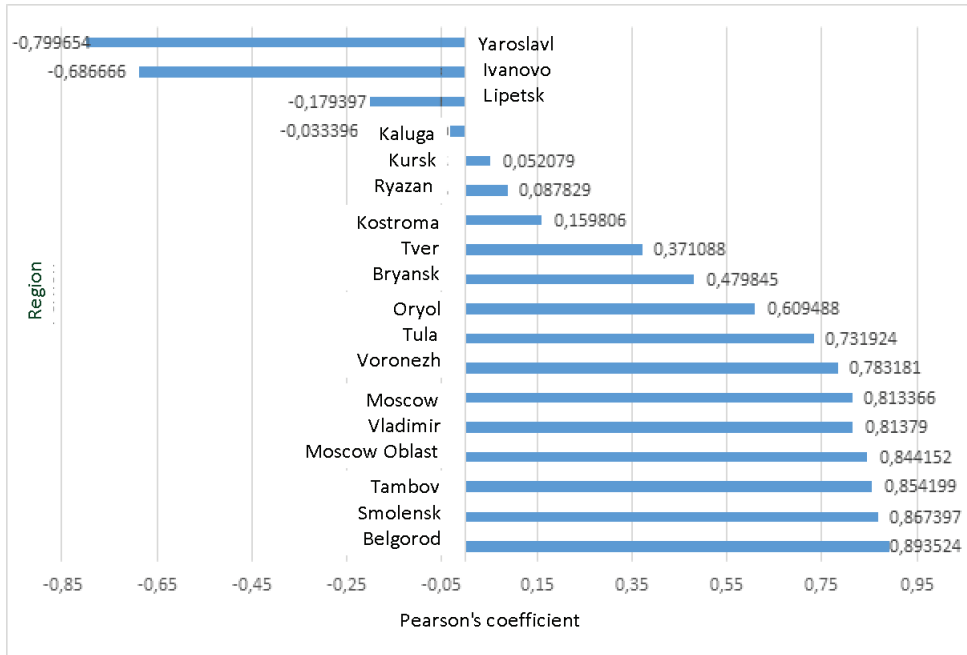

Fig. 4. Value of the Pearson's coefficient between the costs of innovation and the gross regional product of the Central Federal District regions. Compiled by the authors based on data [14, 15].
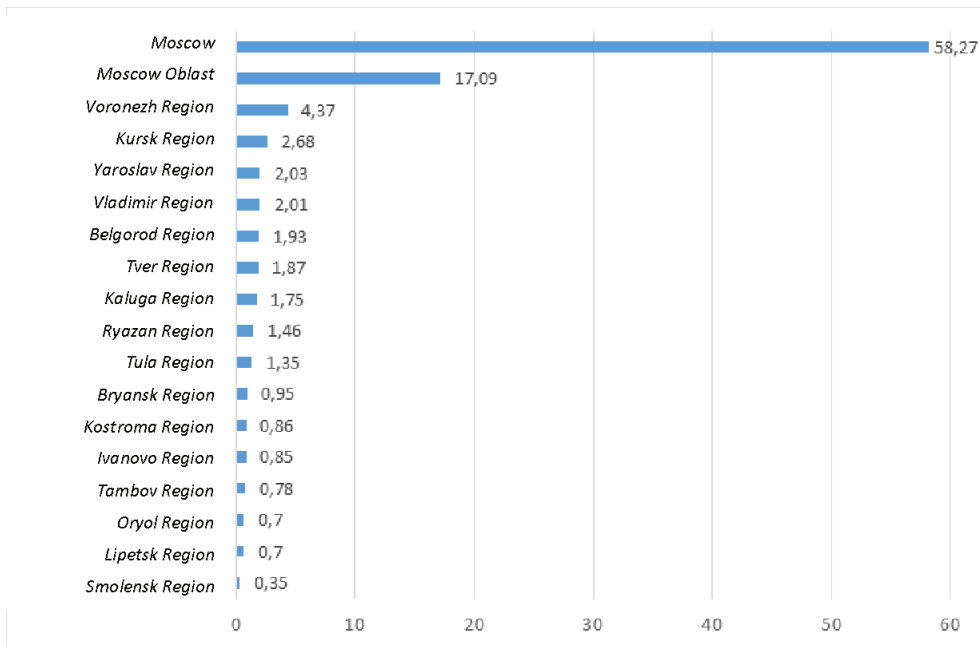
Fig. 5. Share of patents issued in the regions of the Central Federal District, %. Compiled by the authors based on data [14, 15].

Dela Press Conference Series: Economics, Business and Management Vol. 001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

Figure 5 shows the relative data on the patent activity of the enterprises of the Central Federal District. The share of the Bryansk Region is 0.95% of the total number of patents issued in the Central Federal District. We consider it necessary to pay attention to the fact that the Pearson's coefficient is -0.8 for the Yaroslavl region and +0.5 for the Bryansk region; however, the share of patents received by enterprises of the Yaroslavl region is almost twice as high as that of enterprises and companies of the Bryansk region.
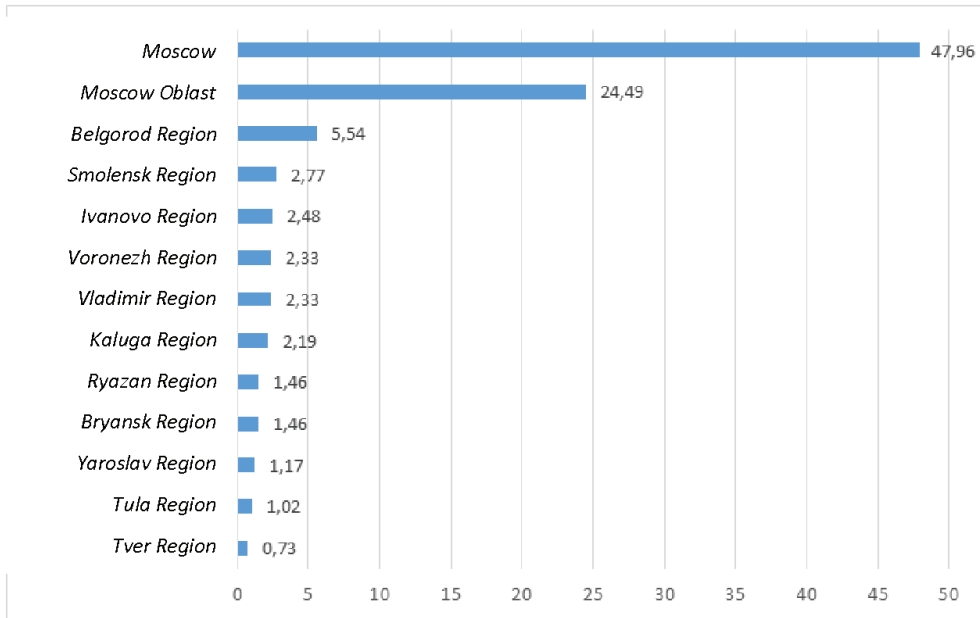
Fig. 6. Share of developed advanced technologies in the Central Federal District regions, %. Compiled by the authors based on data [14, 15].

At the same time, the share of Bryansk and Yaroslavl regions in the development of advanced technologies within the Central Federal District differs slightly (less than 1.5%), Fig. 6.

4   Discussion

This paper compares the indicators of innovation activity of enterprises and companies of the regions included in the Central Federal District. Having conducting a comparative analysis of the results of innovation activity in the regions of the Central Federal District, we obtained contradictory results: in a number of regions, with a negative correlation between R&D expenditures and gross regional product, more significant results (compared to other regions) were connected with a greater number of developed advanced technologies and patents for inventions, utility models, etc. The resulting phenomenon requires further research including the development of appropriate statistical tools for monitoring the innovation activity of economic agents, since the use of information on granted patents for these purposes is still debatable.

5   Conclusion

Dela Press Conference Series: Economics, Business and Management Vol.001, 007 (2022)   https://doi.org/10.56199/dpcsebm.lnzr7188

The III International applied research conference "Human resource management within the framework of realisation of national development goals and strategic objectives"

The results of our analysis confirm our hypothesis that there is no statistically significant impact of expenditures of enterprises and companies of the Central Federal District in the field of R&D on the gross regional product. That was not surprising given the dynamics of the last 10 years in the regional labour markets and in the Bryansk region in particular: the share of highly qualified researchers is decreasing, the share of workers not directly related to R&D has doubled. The Bryansk region belongs to the quartile with the lowest values of these indicators by its specific weight of patents obtained and developed technologies as well as by the use of advanced technologies and other intellectual property objects, The regional labour market has a structure that is more prominent in the stage of transition of the economy from the industrial to the post-industrial phase of development. Dynamic innovative development is unlikely under such circumstances.

References

1. P. Egger, N. Loumeau, The economic geography of innovation (2019). Accessed on: November 06, 2021. [Online]. Available: https://voxeu.org/article/economic-geography-innovation

2. J. Chen, L. Wang, Y. Li, Res. Pol., **66**, 101643, (2020). https://doi.org/10.1016/j.resourpol.2020.101643

3. J. Kim, R. Lee, Techn. Forecast. Soc. Change, **174**, 121271 (2022). https://doi.org/10.1016/j.techfore.2021.121271

4. R. Yang, T. Che, F. Lai, Techn. Forecast. Soc. Change, **170**, 120905 (2021). https://doi.org/10.1016/j.techfore.2021.120905

5. H. Park, T.R. Anderson, W. Seo. Comp. Industry, **129**, 103441 (2021). https://doi.org/10.1016/j.compind.2021.103441

6. H. Komikado, S. Morikawa, A. Bhatt, H. Kato, Techn. Forecast. Soc. Change, **167**, 120697 (2021). https://doi.org/10.1016/j.techfore.2021.120697

7. J. Wang, K. Chandra, C. Du, W. Ding, X. Wu, Techn. Soc., **65**, 101557 (2021). https://doi.org/10.1016/j.techsoc.2021.101557

8. S. Min, J. Kim, Y.-W. Sawng, Tech. Forecast. Soc. Change, **155**, 119998 (2020). https://doi.org/10.1016/j.techfore.2020.119998

9. Y.H.D. Wei, Y. Zhou, Y. Sun, G.C.S. Lin, Appl. Geogr., **32(1)**, 106-118 (2012). https://doi.org/10.1016/j.apgeog.2010.06.008

10. G. Smith, J. Funk, Why We Need to Stop Relying On Patents to Measure Innovation (2021). Accessed on: November 06, 2021. [Online]. Available: https://promarket.org/2021/03/19/patents-bad-measure-innovation-new-metric/

11. R. Fontana, A. Nuvolari, H. Shimizu, A. Vezzulli, Reassessing patent propensity: evidence from a data-set of R&D awards 1977-2004. Working Papers Department of Economics 2013/09 (ISEG – Lisbon School of Economics and Management, Department of Economics, Universidade de Lisboa, 2013)

12. S.Y. Kim, H.J. Lee, World Patent Inf., **59**, 101933 (2019). https://doi.org/10.1016/j.wpi.2019.101933

13. C. Pfister, M. Koomen, D. Harhoff, U. Backes-Gellner, Res. Policy, **50(4)**, 104197 (2021). https://doi.org/10.1016/j.respol.2021.104197

14. Bryanskaya oblast [Bryansk region] (Bryanskstat, Bryansk, 2020)

15. Territorialnyi organ Federalnoi sluzhby gosudarstvennoi statistiki po Bryanskoi oblasti [Territorial body of the Federal State Statistics Service for the Bryansk region]. Accessed on: November 06, 2021. [Online]. Available: https://bryansk.gks.ru