ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8

International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies

http://TuEngr.com

Regional Features of the Spatial Distribution of Educational Capitals in Russia

Arina V. Suvorova[1*]

[1] *Institute of Economics of the Ural Branch of the Russian Academy of Sciences, Ekaterinburg, RUSSIA.*
**Corresponding Author (Tel: +73433714536, suvorova.av@uiec.ru)*

Paper ID: 12A6M

Volume 12 Issue 6

Received 15 February 2021
Received in revised form 01 April 2021
Accepted 08 April 2021
Available online 14 April 2021

Keywords:
Educational investment; Spatial heterogeneity; Socioeconomic differentiation; GRP; Territorial capital; Russia region; Moran's index; Hall-Tydeman index (HT); Geographic-based educational capital; Gini coefficient.

Abstract

Educational capital is an important factor in the socio-economic development of countries and regions. This study focuses on identifying the features of placement of its components by the case of Russia; the emphasis is on determining the scale of inter-territorial differentiation and the specifics of educational capital concentration. The study is based on statistical data from Rosstat. The methodological tools are based on indicators for assessing the degree of inequality, methods of spatial autocorrelation, and cartographic analysis. It has been revealed that the degree of uneven distribution of educational capital elements in space at the stage of accumulating resources for its development is less than at the stages of functioning of capital components and obtaining effects from its use. Moreover, the specificity of constructing the spatial organization of a system that combines the educational capital elements is not the same at different stages of its life cycle due to the different significance of key factors and the relatively high mobility of resources. The obtained data demonstrated the presence of some negative features: the educational capital concentration areas are localized exclusively in the European part of the country, and significant contrasts with the neighboring regions do not allow them to effectively interact even with adjacent territories.

Disciplinary: Regional economy, Capital Management.

Cite This Article:

Suvorova, A. V. (2021). Regional Features of the Spatial Distribution of Educational Capitals in Russia. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies, 12*(6), 12A6M, 1-12. http://TUENGR.COM/V12/12A6M.pdf DOI: 10.14456/ITJEMAST.2021.118

1 Introduction

In recent years, the process of qualitative transformation of key sources of development of socio-economic different-level systems has become more and more obvious (Boschma, 2004). Currently, the highest level of competitiveness is characteristic of entities that are distinguished not by the availability of significant reserves of natural resources or material objects, but by the

ability to use them as efficiently as possible (Mair & Asada, 2019; Barbiroli & Raggi, 2009). Under these conditions, a prerequisite for successful development is the ability of individuals (and their communities) to quickly and comprehensively master new skills, acquire the necessary competencies and improve their potential (Paz-Baruch, 2020), whereas, for large-scale socio-economic complexes, the state of their educational capital is of critical importance (Sobczak & Bal-Domanska, 2020; Zborovsky & Ambarova, 2020). Educational capital is a very indicative characteristic of a complex system, expressing its readiness to confront threats and respond to global challenges, while the scale of the system itself can be different and educational capital can be a research object both at the macro and micro levels (Małajowicz et al., 2019).

In the case when it comes to large-scale systems, it is impossible to ignore the features of educational capital distribution in their space. The socio-economic space cannot be homogeneous. Spatial development management is of particular importance for those countries in which spatial organization cannot be called optimal. A remarkable example of such a case is Russia, which is characterized by a significant area and very high contrast of individual territorial units in all key development indicators, which makes it a promising research object.

Thus, the purpose of this study is to identify the features of placement of the educational capital components (the case of Russia). During the study, it is planned to solve the following tasks: to assess the level of concentration of the educational capital components in the country; to determine the scale of differentiation in the development of individual regions; to identify the most capital-intensive territories and reflect the specifics of their location relative to each other. It can be expected that due to the country's significant size and a sufficiently high level of imbalances, the degree of uneven distribution of the educational capital elements will be quite high, while the areas of their concentration will be localized in individual areas. This will be verified during the study.

2 Literature Review

The understanding of capital as a parameter of the development of territory has spread in the scientific literature rather recently. The concept of territorial capital began to form after the following publications: "Territorial Perspectives" (OECD, 2001) and "Territorial Features and Prospects of the European Union" (European Commission, 2005). It has been noted that each territory is characterized by its own specificity, has its own unique set of resources and opportunities for their capitalization and use in the interests of obtaining the necessary effects. This approach defines the basic properties of such a category as capital, noted by the supporters of classical political economy (Bohm-Bawerk, 1923). However, it is important to clarify the need to take into account the entire variety of resources and properties of the territory, including cultural characteristics, public image, social connections, etc. (Tóth, 2015; Danielewicz & Turala, 2016). A special place among the territorial capital elements is occupied by educational capital, which is generally attributed to the number of human capital components (Marcin, 2013; Ketova et al., 2020).

Such systematic understanding of educational capital determines the prospects of its study in conjunction with considering the transformation features of other parameters of development of a territory (Capello & Fratesi, 2012) and communities, for example, in the context of transformations of the social structure of society (Basit, 2013). The perception of education of the inhabitants of a territory as a factor of its capitalization allows for a comprehensive characterization of the educational potential in the logic of using those approaches that apply to the assessment of any capital (Ruback, 2002; Wudhikarn, 2020). Thus, government expenditures and investments in the educational sphere can be considered as the costs necessary for the accumulation of educational capital (Sanchez et al., 2016); the quality and features of skilled workers' movement - as the characteristics of individual components (Chau & Stark, 1999); an increase in GDP or GRP (Gross regional product) - as the effects (Zhong *et al*., 2017). Although a direct link between the educational capital of a territory and its economic development seems undeniable, the scale of influence largely depends on the quality of education, on the way it is linked to the needs of the labor market. For example, Gimpelson (2016), in his study on the demand for highly qualified personnel in the modern Russian economy, concludes that the quality of institutions is low. The relationship between investment in the educational complex and the growth of educational capital may also be unclear: some scholars (Song, 2018; Ogundipe, Mobolaji, & Ogundipe, 2021) record low returns on investment in this area for many territories, primarily for less developed ones (Fleisher et al., 2010).

Supplementing such analysis with the assessment of spatial aspects allows touching upon a range of issues related to the specifics of allocation of the educational capital elements, the features of its accumulation, and use at different points in space. In addition, the features of educational capital localization, identified at different stages of its existence, often differ, since educational capital is mobile, it is not tied to a point in space, rather, it rather characterizes the abilities of its "carrier", who can move quite easily (Stark et al., 1998). Taking into account the spatial factors of educational potential capitalization can be limited to inter-territorial comparisons, for example, to explain the interregional or intercountry differences in the scale of economic growth (Gungor, 2010; Duran, 2019); or can be used to identify the causes (and consequences) of distortions of the socio-economic space, for example, its polarization (Beladi et al., 2011), leading to an exacerbation of contradictions between successful and underdeveloped territories (Hermannsson et al., 2019), large cities and sparsely populated settlements (Balland *et al*., 2020).

The issues of identifying the specifics of educational capital localization are reflected in the works of researchers studying Russian practice. A review of these publications reveals a range of problems. For example, Moroshkina and Potasheva (2020) note that the accumulated educational potential of Russian youth is insufficiently transformed into well-being and weakly involved in the formation of competitiveness of regional economies; Shirinkina and Kodintsev (2019) identify low efficiency in the use of human capital with a high level of formal education and work experience.

Thus, it should be noted that there is a lack of a wide range of studies, within which not only the regional features of the accumulation and use of educational capital in Russia are considered, but a spatial analysis of these processes is carried out.

3 Method

The testing ground for this study is Russia - 85 regions are localized in its territory, the statistical data on which were analyzed (the data of Rosstat (2020) for 2019 are used). The need to assess educational capital from different positions identified a list of indicators of particular interest, these should include budgetary expenditures on the education sector; the number of students in higher educational institutions, and the number of those employed with higher; gross regional product.

It is important to note the following key aspects of these indicators. First, all the cost characteristics of the regions are deflated, which ensures their comparability, due to the transition away from the inter-territorial difference in prices - by using an index reflecting the ratio of the cost of a fixed set of goods and services in the region to the average cost of the same goods and services in the country (Malkina, 2019). Secondly, the analyzed period does not change when considering various indicators (statistics for 2019 are used), thus, the study does not imply identifying the features of the transformation of resources throughout their life cycle, but focuses on changing the characteristics of capital localization when considering different stages of its functioning at a single point of time. Third, the value of the gross product produced in the region reflects the efficiency of the use of educational capital rather indirectly; however, it allows getting a very clear idea of the results of inclusion of all the territorial capital in the socio-economic processes of the region.

The choice of methods is due to the importance of taking into account the spatial specifics of the processes of formation, development, and use of educational capital. The assessment of the level of capital concentration, the characteristic of the differentiation degree of development of individual spatial units, as well as the determination of the features of its localization, are of interest. A general idea of the scale of spatial inequality can be obtained using the Hall-Tideman index (Hall & Tideman, 1967) and the Gini coefficient (Gini, 1921).

The Hall-Tydeman index (HT) is a rank index of concentration and is traditionally used to characterize markets, although it can be applicable for territorial analysis (Kostyaev, 2019):

$$HT = \frac{1}{2\sum_{i=1}^{N} R_i y_i - 1}, \quad (1)$$

where R_i - rank of the region (the region, the value of the indicator of which is maximum, has a rank equal to 1); y_i - share of the region.

The Gini coefficient (G) is commonly used to characterize income inequality, and it is also applicable to assess the specificity of spatial development (Ding et al., 2017; Nam, 2017):

$$G = 1 - 2\sum_{i=1}^{N} x_i cumy_i + \sum_{i=1}^{N} x_i y_i, \quad (2),$$

where N - number of regions; x_i - share of the i-th region; y_i - share of the total resources attributable to the i-th region; $cumy_i$- accumulated share of the total resources attributable to the i-th region.

In this study, the spatial correlation method based on the assessment of Moran's indices has found an application (Moran, 1948). Its use allows detecting the concentration areas. Particular attention in this study is paid to the local Moran's index (I_{L_i}), which is used to assess the mathematical connectivity of each region under consideration with other territories:

$$I_{L_i} = z_i \sum w_{ij} z_j, \quad (3),$$

where w_{ij} - standardized distance between the i-th and j-th regions; z_i and z_i - standardized values of the studied indicator for the i-th and j-th regions.

Calculations I_{L_i} make it possible to group the analyzed territories, highlighting the leaders, and form the concentration areas with each other and those territories that fall into the zone of their influence due to their location. This grouping of regions is based on the ratio of their characteristic standardized values of the considered indicator (z_i) and spatially weighted centered values (w_{zi}), while taking into account only those territories for which the values of the local index are significant ($|I_{L_i}|$ exceeds the average value $|\overline{I_L}|$ upon the considered indicator).

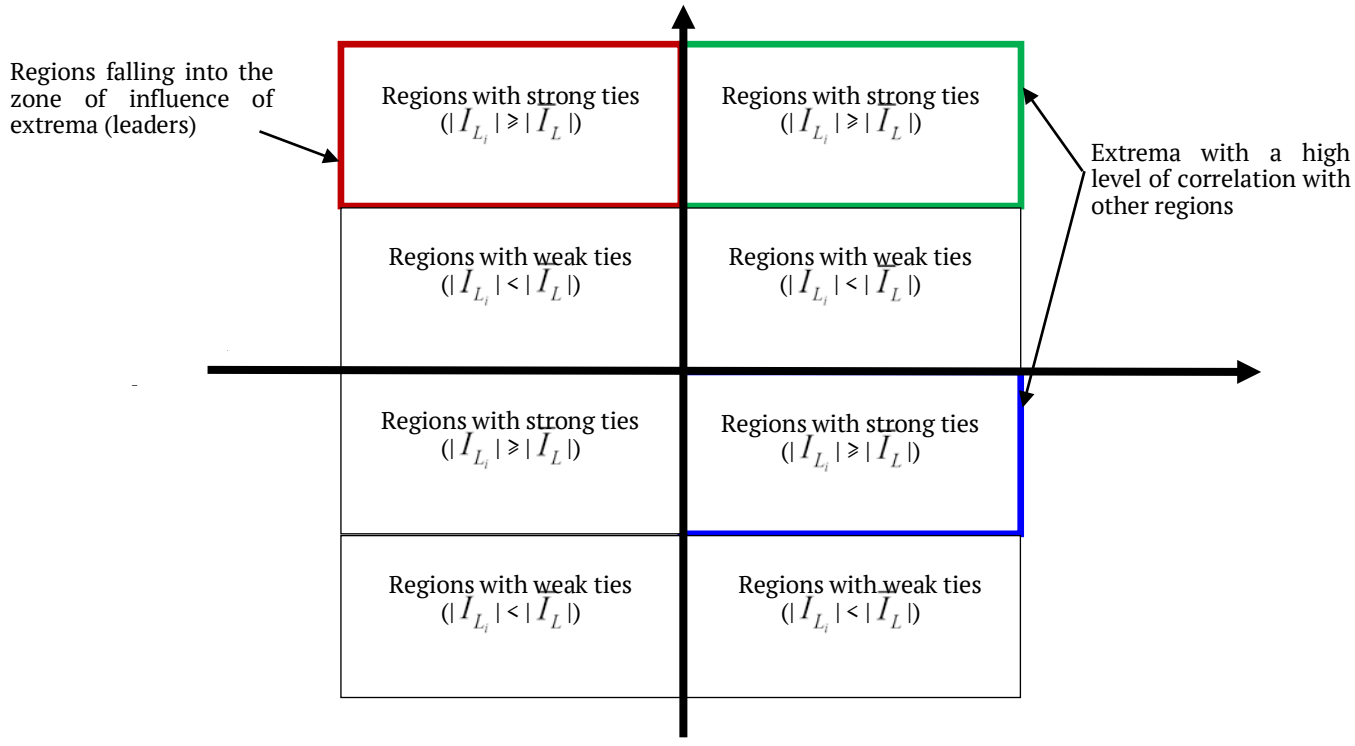


Figure 1. Matrix of groups of regions by Moran's index

The use of cartographic visualization tools is also important for research. The cartographic analysis allows for a visual demonstration of the features of the location of different territories.

4 Result and Discussion

The degree of heterogeneity in the placement of individual educational capital elements in Russia is quite high, although it does not indicate the absolute inequality of regions and the collection of all assets into several of the most significant locations (Table 1).

Table 1. The scale of spatial inequality in Russia by some parameters (calculations based on Rosstat data (2020).

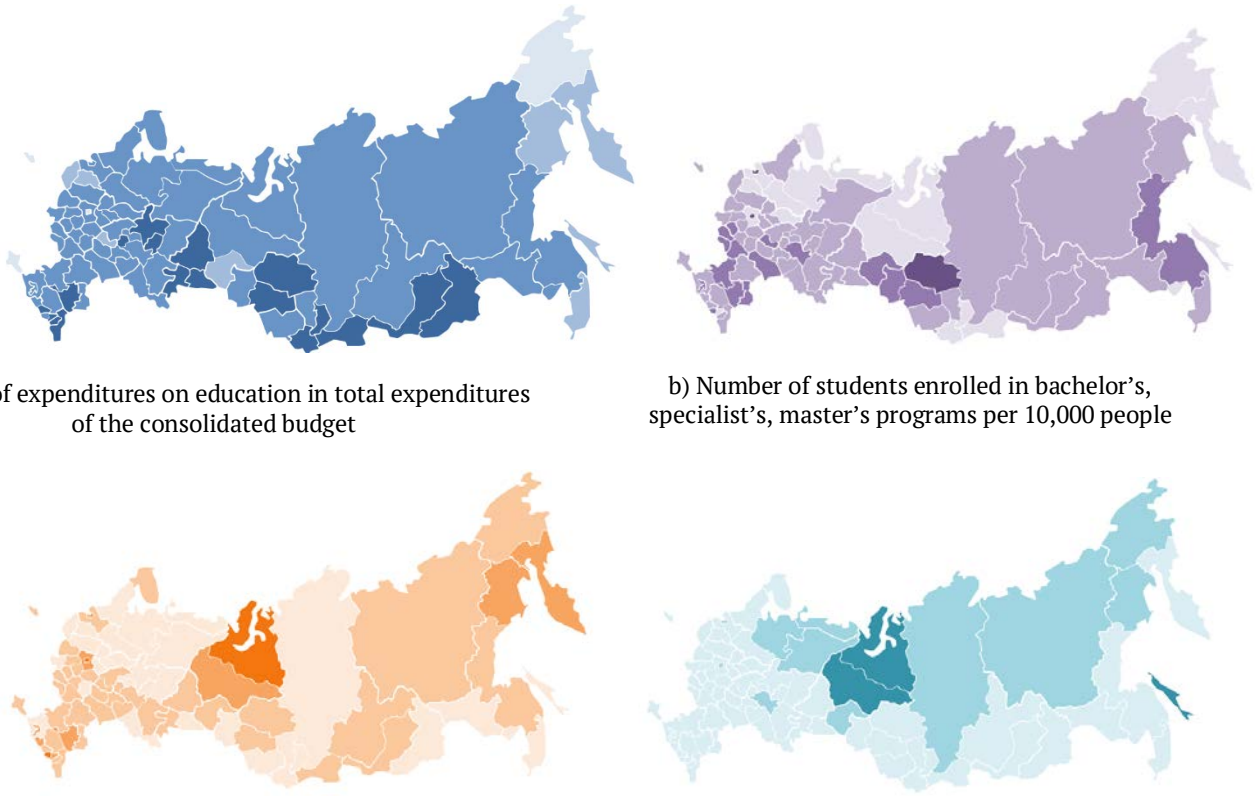
Indicator	HT index	Gini index
Consolidated budget expenditures on education	0.022	0.450
Number of students enrolled in bachelor's, specialist's, master's programs	0.027	0.557
Number of the employed with higher education	0.025	0.532
Gross regional product	0.027	0.562

The values of the Hall-Tideman index for each of the considered parameters are much closer to the minimum value (0.012) than to the maximum (1.000), which means that there are no undisputed leaders with development parameters exceeding the aggregate development parameters of all other participants. In addition, the calculated values of the Gini index characterize the lack of uniformity in the distribution of both resources for the accumulation of educational capital in the regions and the results of its use.

Thus, at the early stages of the life cycle of assets forming educational capital, the parameters of individual regions do not differ significantly from each other, however, the distribution of resources and reserves that represent the country's educational potential, as well as the degree of their capitalization, are much more uneven.

This is also confirmed by the comparison of maps constructed using data converted into a relative (comparable) form for the four considered parameters. If the share of education expenditures in the total expenditures of the regional consolidated budget (Figure 2a) does not change significantly, the differentiation of regions in terms of the share of students in the number of residents and the share of the employed with higher education in their total number (Figure 2b, 2c) is traced much more obviously. At the same time, there is no single pattern of localization of reserves (students) and resources (highly qualified personnel) of the country's educational potential.

The greatest degree of interregional inequality characterizes the parameters associated with the results of economic activity of the territories (Figure 2d); however, there is no clear relationship between the productivity of socio-economic processes taking place in the regions and the availability of educational capital elements in them. The highest GRP per capita values are characteristic of the northern territories, which are provided with natural resources and yet characterized by a low number of inhabitants.



a) Share of expenditures on education in total expenditures of the consolidated budget

b) Number of students enrolled in bachelor's, specialist's, master's programs per 10,000 people

c) Share of the employed with higher education

d) Gross regional product per capita

Figure 2. Localization of Russian regions according to the selected development parameters (regions with the highest values of indicators are indicated in a darker color)

The lack of a pronounced interdependence between the considered indicators is also confirmed by the correlation analysis. None of the pair correlation coefficients exceeded even 0.4 (Table 2). It can also be noted that the lists of the leading regions (as well as the outsider regions), which can be compiled based on the analysis of each parameter, differ rather significantly. All this may be evidence of instability of the spatial organization of the educational capital system.

Table 2. Pair correlation coefficients (calculations based on Rosstat's (2020) data.

Indicator		K1	K2	K3	K4
Share of education expenditures in the total expenditures of the consolidated budget (Expenditures)	K1	1.000			
Number of students enrolled in bachelor's, specialist, master's programs per 10,000 students	K2	0.046	1.000		
Share of the employed with higher education (Employed)	K3	-0.183	0.227	1.000	
Gross regional product per capita (GRP)	K4	-0.267	-0.224	0.336	1.000

The identification of concentration areas of its individual elements within the country, carried out using the method of spatial correlation (Figure 3), generally confirms this thesis. The set of extrema with a high level of connectivity with nearby territories is somewhat different for different parameters analyzed. For example, expenditures on education are concentrated mainly in the regions that form a kind of belt of the country's European part, while the areas with the largest number of students are rather scattered. Besides, several regions can be identified that consistently fall into the number of extremum territories (Figure 3c): St. Petersburg, Moscow, the Moscow, and Nizhny Novgorod Regions. Their positions in the resulting ratings are quite expected. Moscow and

St. Petersburg are the largest cities in the country that accumulate a significant amount of resources and are centers of attraction for qualified specialists. The Moscow Region, which is an important part of the Moscow agglomeration, is largely difficult to separate from Moscow. The Nizhny Novgorod Region is one of the Russian leaders in the field of science and education.

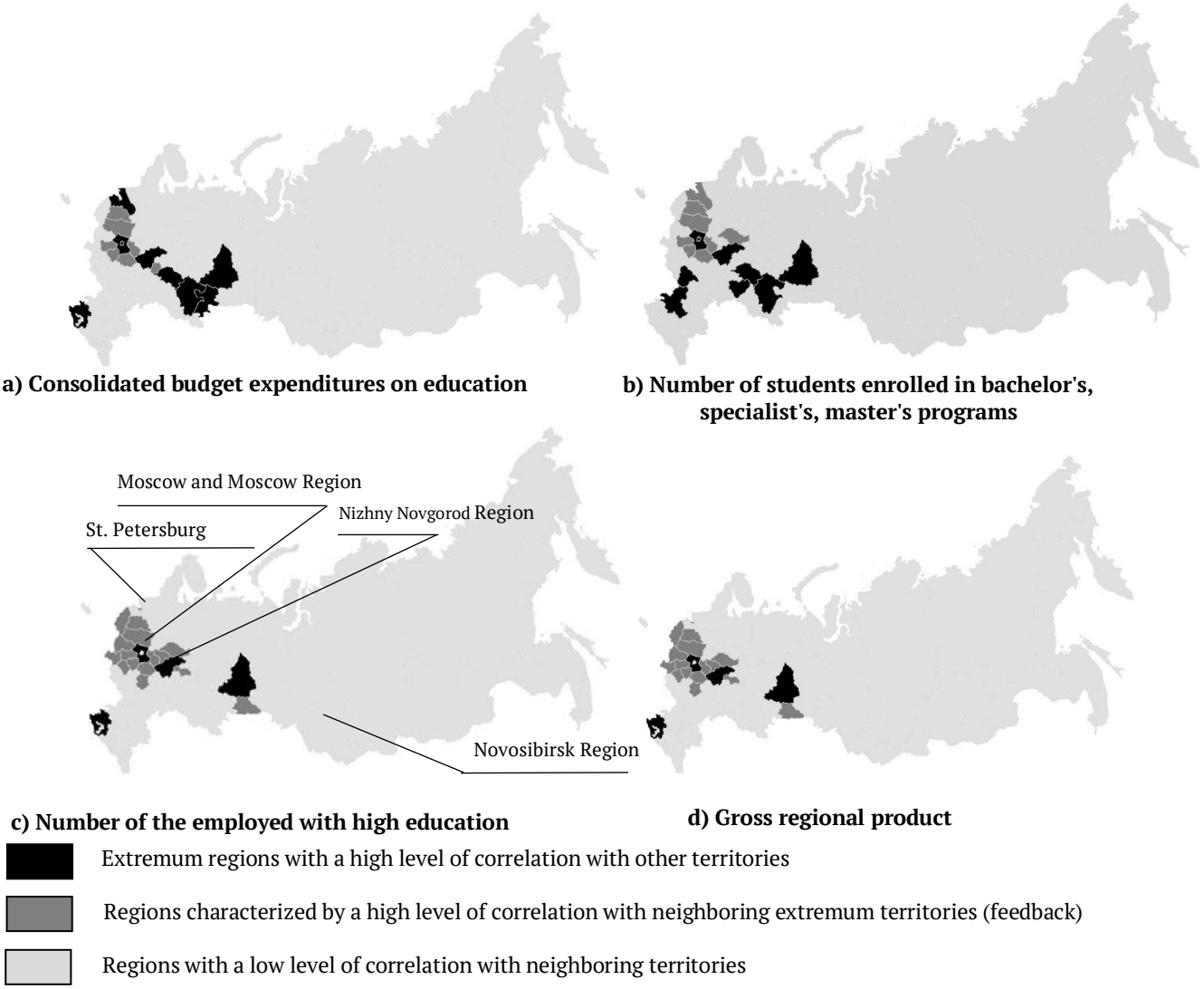


Figure 3. Spatial correlation between Russian regions

It is also obvious that in the country it is possible to identify other major educational centers that play an important role in the entire national economy. For example, these include the Novosibirsk Region (see Figure 2c) - the place of localization of significant educational institutions, scientific and research centers. However, this region was not included in the number of concentration areas: it is located too far from other “powerful” actors, which does not allow it to take advantage of geographical proximity to potential partners, available to the regions of the country’s central part.

Meanwhile, the location near major educational, scientific, economic centers can become not so much an advantage as a disadvantage for a territory. The regions surrounding the Moscow Region (highlighted in dark gray in Figure 2) differ too much in their educational potential, which

creates a threat of an outflow of their resources (including graduates of higher educational institutions or highly qualified personnel) into the Moscow agglomeration.

Here are some important conclusions that can be drawn from the results of the study. First, most of the Russian regions demonstrate an obvious interest in the formation and growth of educational capital, as evidenced by the approximately equal share of budgetary funds allocated for the development of the educational sphere. Obviously, the scale of allocated resources differs significantly from region to region. Consequently, more successful and economically developed territories receive an additional impetus to economic growth due to the possibility of significant support for their educational sector, which in modern conditions is becoming an important factor in positive transformations. In the long term, this can only increase inter-territorial inequality.

It can be stated that the spatial organization of the educational capital system is being transformed. The reasons for this constant change lie in the mobility of resources. This gives regions that do not direct a large amount of investment in the development of the educational sphere the opportunity to attract the necessary external assets.

Second, an increase in the degree of unevenness of their distribution in space is characteristic of the later life cycle stages of the elements that make up educational capital. This could indicate the gradual contraction of the educational capital components as their form changes into a limited number of territorial units (large cities and agglomerations, economically developed regions), which makes the prospect of attracting knowledge, skills, and competencies from other regions difficult to implement.

Third, it should be noted that the spatial organization of the educational capital system is not optimal. The large-scale areas of its concentration are very few in number and are located quite close to each other, while, on the contrary, a significant part of the regions is located remotely. In addition, the underdevelopment of the mechanisms for translating positive effects from the economic development leaders to their immediate environment devalues the opportunities for the regions neighboring the educational capital concentration areas.

Thus, the obtained research results can be used in the development and implementation of regional policy measures. Taking into account the fixed deficiencies of the spatial organization of the national socio-economic system and the risks of further transformations makes it possible to identify managerial priorities for improving the mechanisms of inter-territorial interaction. In particular, it is necessary to differentiate the approach to regulating the development of different regions, using the advantages from the implementation of agglomeration associations. The results can form the basis for further research on identifying regional features of the spatial distribution of other forms of territorial capital (health capital, cultural capital, infrastructure capital, etc.).

5 Conclusion

Educational capital is a very indicative characteristic of the heterogeneity of territorial development. An indicative case is the consideration of the case of Russia. The degree of heterogeneity in the placement of individual educational capital elements in Russia is quite high,

although it does not indicate the absolute inequality of the regions. An important feature is the dependence of the level of uneven distribution of educational capital elements on the stage of their life cycle. In later stages, the level of unevenness is higher than in earlier stages. A distinctive characteristic of different life cycle stages is the specificity of constructing the spatial organization of the educational capital system. The list of determining factors at different stages is not the same, which affects the patterns of localization of capital components. It was found that the educational capital concentration areas are located in the most densely populated part of Russia (but there are no such areas in the eastern regions). Moreover, the geographical proximity of the regions does not contribute to their rapprochement with each other according to the considered parameters of socio-economic development. This creates significant contrasts between the educational capital concentration areas and the surrounding territories.

6 Availability of Data And Material

Data can be made available by contacting the corresponding author.

7 Acknowledgment

This study is supported by the Russian Science Foundation under grant 20-78-00067.

8 References

Balland, P.-A., Jara-Figueroa, C., Petralia, S. G., Steijn, M. P. A., Rigby, D. L., & Hidalgo, C. A. (2020). Complex Economic Activities Concentrate in Large Cities. *Nature Human Behavior, 4*(3), 248-254.

Barbiroli, G., & Raggi, A. (2009). Resource- and Eco-Effectiveness as a New Paradigm of Development to Prevent Resource Depletion and Environmental Imbalance. *International Journal of Sustainable Development & World Ecology, 16*(3). doi:10.1080/13504500902919698

Basit, T. N. (2013). Educational Capital as a Catalyst for Upward Social Mobility amongst British Asians: A Three-Generational Analysis. *British Educational Research Journal*, *39*(4), 714-732. doi:10.1080/01411926.2012.677414

Beladi, H., Marjit, S., & Broll, U. (2011). Capital Mobility, Skill Formation and Polarization. *Economic Modelling*, *28*(4), 1902-1906. doi:10.1016/j.econmod.2011.03.019

Bohm-Bawerk, E. (1923). *The Positive Theory of Capital*. New York: G.E. Stechert.

Boschma, R. (2004). Competitiveness of Regions from an Evolutionary Perspective. *Regional Studies, 38*(9), 1001-1014. doi:10.1080/0034340042000292601

Capello, R., & Fratesi, U. (2012). Modelling Regional Growth: An Advanced MASST Model. *Spatial Economic Analysis, 7*(3), 293-318. doi:10.1080/17421772.2012.694143

Chau, N. H., & Stark, O. (1999). Migration under Asymmetric Information and Human Capital Formation. *Review of International Economics, 7*(3), 455-483. doi:10.1111/1467-9396.00175

Danielewicz, J., & Turala, M. (2016). Territorial Capital as a Determinant of Development Processes in Functional Areas. *Acta Universitatis Lodziensis. Folia Oeconomica, 2*(39), 55-68. doi:10.18778/0208-6018.319.04

Ding, G., Xie, Y., & Zhao, P. (2017). Spatial Inequality of Regional Fiscal Expenditure on Science and

Technology Based on Gini Coefficient Decomposition and Polarization Measurement. *Boletin Tecnico/Technical Bulletin, 55*(9), 132-139.

Duran, H. E. (2019). Asymmetries in Regional Development: Does TFP or Capital Accumulation Matter for Spatial Inequalities? *Journal of Economic Asymmetries, 20*. doi:10.1016/j.jeca.2019.e00119

European Commission. (2005). *The Territorial State and Perspectives of the European Union. Towards a Stronger European Territorial Cohesion in the Light of the Lisbon and Gothenburg Ambitions. A Background Document for the Territorial Agenda of the European Union*. Luxemburg: European Commission. http://urenio.org/el/wp-content/uploads/2009/01/the-territorial-state-and-perspectives-of-the-european-union.pdf

Fleisher, B., Li, H., & Zhao, M. Q. (2010). Human Capital, Economic Growth, and Regional Inequality in China. *Journal of Development Economics, 92*(2), 215-231. doi:10.1016/j.jdeveco.2009.01.010

Gimpelson, V. E. (2016). Does the Russian Economy Need Human Capital? Ten Doubts. *Voprosy Ekonomiki, 10*, 129-143. doi:10.32609/0042-8736-2016-10-129-143

Gini, C. (1921). Measurement of Inequality of Incomes. *The Economic Journal, 31*(21), 124-126. doi:10.2307/2223319

Gungor, N. D. (2010). Education, Human Capital Inequality and Economic Growth: Evidence from Turkey. *Regional and Sectoral Economic Studies, 10*(2), 53-71.

Hall, M., & Tideman, N. (1967). Measures of Concentration. *Journal of the American Statistical Association, 62*, 162-168. doi:10.1080/01621459.1967.10482897

Hermannsson, K., Scandurra, R., & Graziano, M. (2019). Will the Regional Concentration of Tertiary Education Persist? The Case of Europe in a Period of Rising Participation. *Regional Studies, Regional Science, 6*(1), 539-556. doi:10.1080/21681376.2019.1680313

Ketova, K. V., Rusyak, I. G., & Vavilova, D. D. (2020). Mathematical Modeling and Neural Network Prediction of the Structure and Dynamics of Human Capital of the Russian Federation. *Tomsk State University Journal of Control and Computer Science, 53*, 13-24. doi:10.17223/19988605/53/2

Kostyaev, A. I. (2019). Rural Areas of Russia's North-West Borderland: Problems and Development Paths. Baltic Region, *11*(4), 93-113. doi:10.5922/2079-8555-2019-4-6

Mair, C., & Asada, R. (2019). Efficient Use of Natural Resources. In W. Leal Filho, A. M. Azul, L. Brandli, P. G. Özuyar, & T. Wall (Eds.). *Responsible Consumption and Production. Encyclopedia of the UN Sustainable Development Goals*. Springer, Cham. doi:10.1007/978-3-319-71062-4_13-1

Marcin, K. (2013). Intellectual Capital as a Key Factor of Socio-Economic Development of Regions and Countries. *Procedia Economics and Finance, 6*, 288-295. doi:10.1016/S2212-5671(13)00142-1

Małajowicz, A. B., Żegleń, P., & Bernat, T. (2019). Knowledge and Educational Capital in the Process of Modern Society Creation. In *Procedia Computer Science. 23rd International Conference on Knowledge-Based and Intelligent Information & Engineering Systems, 159*, 2461-2469. Budapest.

Malkina, M. (2019). Spatial Wage Inequality and Its Sectoral Determinants: The Case of Modern Russia. *Oeconomia Copernicana, 10*(1), 69-87. doi:10.24136/oc.2019.004

Moran, P. A. P. (1948). The Interpretation of Statistical Maps. *Journal of the Royal Statistical Society, 10*(2), 243-251. doi:10.1111/j.2517-6161.1948.tb00012.x

Moroshkina, M. V., & Potasheva, O. V. (2020). Interregional Differentiation of Russian Regions by Levels of Educational Potential and Government Spending on the Education System. *Lecture Notes in Networks*

and Systems, 111, 375-383. doi:10.1007/978-3-030-39797-5_38

Nam, K.-M. (2017). Is Spatial Distribution of China's Population Excessively Unequal? A Cross-Country Comparison. *Annals of Regional Science, 59*(2), 453-474. doi:10.1007/s00168-017-0839-0

OECD. (2001). *Territorial Outlook*. https://www.oecd-ilibrary.org/urban-rural-and-regional-development/oecd-territorial-outlook_9789264189911-en.

Ogundipe, A. A., Mobolaji, O., & Ogundipe, O. M. (2021). An Analysis of the Effect of Human Capital Investment on Economic Development in Nigeria: Does a New Indicator Alter Existing Evidence? *Asian Economic & Financial Review, 11*(1), 17-29.

Paz-Baruch, N. (2020). Educational and Learning Capital as Predictors of General Intelligence and Scholastic Achievements. *High Ability Studies, 31*(1), 75-91. doi:10.1080/13598139.2019.1586656

Rosstat. (2020). *Regions of Russia. Socio-Economic Indicators. 2020: Statistical Book*. Moscow: Rosstat.

Ruback, R. S. (2002). Capital Cash Flows: A Simple Approach to Valuing Risky Cash Flows. *Financial Management, 31*(2), 85-103. doi:10.2307/3666224

Sanchez, A. R. P., García, M. J., & Chico, J. R. (2016). Human Capital, Investment on Education and Economic Growth: A Review and Updating of Regional Economic Asymmetry in Spain (1980-2012). *Revista de Estudios Regionales, 106*, 21-53.

Shirinkina, E., & Kodintsev, A. (2019). Multiparameter Influence of Factors on the Return of Human Capital. *Espacios, 40*(14), 1-14.

Sobczak, E., & Bal-Domanska, B. (2020). Employment Structures vs. Educational Capital in the European Union Regions. In *Studies in Classification, Data Analysis, and Knowledge Organization. Biennial Conference of the International Federation of Classification Societies, IFCS 2017*, 485-494. Tokyo.

Song, X. (2018). Analysis for Capital Investment Efficiency in Higher Education of Northeast China Based on DEA Model. *Kuram ve Uygulamada Egitim Bilimleri, 18*(6), 3202-3208. doi:10.12738/estp.2018.6.223

Stark, O., Helmenstein, C., & Prskawetz, A. (1998). Human Capital Depletion, Human Capital Formation, and Migration: A Blessing or a "Curse"? *Economics Letters, 60*(3), 363-367.

Tóth, B. I. (2015). Territorial Capital: Theory, Empirics and Critical Remarks. *European Planning Studies, 23*(7), 1327-1344. doi:10.1080/09654313.2014.928675

Wudhikarn, R. (2020). The Hybrid Intellectual Capital Valuation Method. *Economic Research-Ekonomska Istraživanja*. doi:10.1080/1331677X.2020.1860798

Zborovsky, G. E., & Ambarova, P. A. (2020). Silver Education as a Resource for Regional Development. *RUDN Journal of Sociology, 20*(4), 939-952. doi:10.22363/2313-2272-2020-20-4-939-952

Zhong, Z.-C., Luo, S.-H., Wang, W.-C., Chen, X.-Y., Wei, Y.-L., & Mo, W.-R. (2017). Analysis on Influence of Stock of Education Capital and Fixed Assets on GDP Based on Three Types of Regression Model. *Eurasia Journal of Mathematics, Science and Technology Education, 13*(8), 5921-5926.

Arina V. Suvorova is an Associate Professor, and Acting Deputy Director for Research, Institute of Economics of the Ural Branch of Russian Academy of Sciences, Ural State University of Economics. She is a Cand. Sci. (Economic). Her research interests include Forecasting of the National Economy, Theory of Regional Markets, City Economics, City Studies, Forecasting and Planning of the Regional Economy.
ORCID: https://orcid.org/0000-0003-4050-2083