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## Territorial capital of Russian regions and its spatial organization

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### ABSTRACT

**Relevance.** The new challenges that exacerbate long-standing issues stimulate the Russian economic system to evolve faster and to seek greater efficiency. One of the impediments to this process, however, is the inertness of the spatial organization of the national economy. There is a need for more detailed research on the characteristics of the national economic space for evidence-based policy-making in the sphere of spatial development.

**Research objective** The study aims to describe the organization of Russia's economic space by focusing on the patterns of localization of its territorial capital.

**Data and methods.** The study uses official statistical data on Russian regions provided by the Federal State Statistics Service (Rosstat) and a set of indicators of regional inequality. Methodologically, the study relies on the methods of spatial autocorrelation analysis and cartographic analysis.

**Results.** It has been shown that there are significant regional disparities combined with the high level of polarization of the Russian space. There is a scarcity of asset concentration areas, which are mostly located in the country's western part, leaving the eastern part lagging behind and limiting its potential. The territories that are struggling the most are those devoid of resources and located remotely from the areas of asset concentration. The patterns of geographic distribution of gross regional product are to a great extent similar to the patterns of distribution of production capital, which may point to the existence of factors leading to regional divergence. The distribution of creative capital in Russia is far from optimal, which prevents it from becoming a major driver behind the country's economic growth.

**Conclusions.** Policy-makers need to take into account the patterns of asset distribution in devising measures for enhancing territorial capital and setting priorities for the country's economic spatial development.

### KEYWORDS

spatial development, distribution, territorial capital, natural capital, production capital, creative capital, spatial analysis, regional disparities, polarization

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## Территориальный капитал регионов России и его пространственная организация

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### АННОТАЦИЯ

**Актуальность.** Новые вызовы, усугубляющие давние проблемы, стимулируют российскую экономическую систему к более быстрому развитию и стремлению к большей эффективности. Однако одним из препятствий этому процессу является инертность пространственной организации хозяйства. Необходимы более детальные исследования характеристик национального экономического пространства для обоснованного формирования политики в сфере пространственного развития.

**Цель исследования.** Целью исследования является описание организации экономического пространства России с акцентом на закономерности локализации ее территориального капитала.

**Данные и методы.** В работе использованы официальные статистические данные о сложившейся в регионах России ситуации, предоставленные Федеральной службой государственной статистики (Росстат). Основой мето-

### КЛЮЧЕВЫЕ СЛОВА

пространственное развитие, размещение, территориальный капитал, природный капитал, производственный капитал, креативный капитал, пространственный анализ, межрегиональная неоднородность, поляризация

дического инструментария исследования выступают показатели оценки степени межтерриториального неравенства, методы пространственной корреляции и картографического анализа.

**Результаты.** Подтверждено существование значительного межрегионального неравенства и высокого уровня поляризации российского пространства в сочетании с недостаточным количеством зон концентрации, особенности размещения которых ограничивает возможности развития восточной части страны. Выявлено существование ареалов, не обладающих преимуществами во владении ресурсами и удаленных от зон концентрации активов, для которых остро стоит угроза «выпадения» из экономического пространства. Определено, что экономический ландшафт результатов хозяйственной деятельности во многом коррелирует с пространственной организацией производственного капитала, что может свидетельствовать о наличии предпосылок для региональной дивергенции. Показано, что наименее оптимально организовано пространство функционирования креативного капитала; это препятствует его превращению в значимый фактор экономического роста страны.

**Выводы.** Полученные результаты обосновывают необходимость учета особенностей размещения ресурсов при решении задачи наращивания территориального капитала, а также позволяют сформулировать приоритеты управления пространственным развитием национальной экономики.

#### БЛАГОДАРНОСТИ

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## 俄罗斯区域资本及其空间布局

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#### 摘要

**现实性:** 我们所面对的新挑战加剧了长期存在的问题, 这也迫使俄罗斯经济体系更迅速发展, 并努力提高效益。然而, 这一进程的障碍之一是经济空间布局的惯性。我们需要对国家经济空间的特点进行更详细的研究, 以便为空间发展政策制定提供参考。

**研究目标:** 该研究的目的是描述俄罗斯经济空间布局, 重点是其区域资本的规律化。

**数据和方法:** 本文采用了俄罗斯联邦国家统计局 (Rosstat) 提供的有关俄罗斯地区情况的官方统计数据。研究方法是基于区域差异指标、空间相关性和制图分析。

**研究结果:** 俄罗斯存在明显的区域差异和高度的两极分化, 再加上城市群数量不足, 这样的布局限制了俄罗斯东部地区的发展机会。文章揭示了一些无资源优势、远离资产集中区的区域存在。对这些地区来说, “脱离”大经济区的威胁很严重。文章确定, 经济活动地形在很大程度上与生产资本的空间布局相关, 这可能是区域分化的先决条件。研究证明, 创新资本的空间布局不太理想, 这也是使其无法成为国家经济增长的重要因素。

**结论:** 研究结果表明, 在解决加强区域资本问题时, 有必要考虑到资源配置的特殊性。这也使我们能够制定出国民经济空间发展管理的优先事项。

#### 关键词

空间发展, 配置, 地区资本, 自然资本, 生产资本, 创新资本, 空间分析, 区域差异性, 两极化

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### Introduction

In dealing with increased economic turbulence and fiercer competition, economic entities have to inventorize their assets and maximize the efficiency of their use. One of the key factors that determine the economic growth of a territory is the geographical distribution of resources (Kurbatova et al., 2022) and organization of the economic space. This is especially true of such vast and complex territorial systems as Russia.

The spatial development of territories determines their access to resources, the efficiency of resource use and their capacity to employ resources of different types to secure the desired outcomes. Another question that deserves closer attention is how asset localization patterns form the unique configurations of space.

One of the approaches to studying the spatial development of territories is by looking at the capital that these territories have (in this context

capital is viewed as a unique set of resources necessary for a positive change). Territorial capital is commonly understood as a set of assets localized in a particular territory that ensures the development potential of this territory (Camagni, 2009). Territorial capital may be also defined as ‘a stock of resources specific to the place and available to those who live and work in it’ (Ventura et al., 2008). This study focuses on the territorial capital of Russia on the regional level, more specifically, the territorial capital that each of the Russian regions (subjects of the Russian Federation) accumulates within its borders.

The purpose of this study is to examine the distribution of territorial capital across the economic space of Russia. To achieve this, the study’s objectives will include the following:

- to select the parameters for the analysis of how specific components of territorial capital are localized;
- to determine the degree of heterogeneity of the country’s economic space;
- to identify the key characteristics of the localization of specific resource types.

### Theoretical Framework

There exists a substantial body of literature on the spatial organization of the Russian economy. The researchers compare individual territorial units with each other and identify the most significant problems in the organization of their economic space (Tatarkin, 2012); analyze the institutional foundations of the country’s spatial development by considering strategic planning documents (Mikheeva, 2018; Zubarevich, 2019); and describe the spatial factors and mechanisms that underlie the economic transformations in particular areas<sup>1</sup>. However, much of the recent research literature has failed to investigate the patterns of localization of Russia’s territorial capital.

The concept of territorial capital was set forth by Camagni (2008, 2009), although the idea underlying this concept – that of the unique resources that every region has and which determine the yields for various types of investment and thus the most promising paths of development – started to take shape earlier at the begin-

ning of the 2000s in the documents of the OECD<sup>2</sup> and the EU Commission<sup>3</sup>.

There is a growing academic interest in the concept of territorial capital and some of its aspects, for example, the methods of measuring territorial capital (Benassi et al., 2021; Dabrowska & Szlachta, 2017; Dodescu et al., 2018); problems of territorial capital accumulation (Alberti, 2017; Egyed & Racz, 2020); territorial capital as a factor of resilience in times of crisis (Fratesi & Perucca, 2016; Sarmiento-Mirwaldt, 2015) or as a factor contributing to the economic growth of individual territorial units (Getzner & Moroz, 2022; Morretta, 2021).

All of the above-cited studies view territorial capital as an important factor in regional development: it is mostly seen as a unique set of resources and ways of using them that determine the performance of socio-economic systems. While there is a general agreement concerning the diversity of resources constituting territorial capital, the question about how this capital can be structured still leaves much room for debate (Castelnovo et al., 2020; Danielewicz & Turala, 2016). More attention is paid now to the intangible aspect of territorial capital, for example, cultural heritage (Sykes & Ludwig, 2015), interpersonal relationships (Giffinger & Hamedinger, 2013), the image and identity of cities and regions (Polyakova et al., 2019).

In general, the studies of territorial capital tend to focus on the potential of specific locations or measurements of specific indicators used in the practices of management of regional and national systems. There is, however, a perceived lack of comprehensive research on the configurations of territorial capital (Cojanu & Robu, 2019; Romao & Nijkamp, 2018). To bridge this gap, it would make sense to compare the resource distribution in different territories, to analyze the capital these territories have for further development, and to examine the spatial disparities within the whole given macro-region. In other words, an investigation of the territorial capital of a given area may shed light on some of the key characteristics of its spatial organization.

<sup>2</sup> Territorial Outlook. (2001). Retrieved from OECD: [https://www.oecd-ilibrary.org/urban-rural-and-regional-development/oecd-territorial-outlook\\_9789264189911-en](https://www.oecd-ilibrary.org/urban-rural-and-regional-development/oecd-territorial-outlook_9789264189911-en)

<sup>3</sup> 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. (2005). Retrieved from European Commission: <https://www.urenio.org/el/wp-content/uploads/2009/01/the-territorial-state-and-perspectives-of-the-european-union.pdf>

<sup>1</sup> Spatial development of modern Russia: trends, factors, mechanisms, institutions. (2020). Novosibirsk: IEOPP Publishing House SO RAN, 502. (In Russ.)

Another important aspect that deserves closer inspection in this respect is the types of available resources and their use. This study will focus predominantly on natural, production and creative capital. Each of these categories is commonly considered as a potential source of positive transformations for territorial systems of different levels. There is sufficient research literature devoted to each of these categories and to the ways these resources can be used most efficiently.

Natural capital is given significant attention in the studies of the prospects of rural areas' transformations (Xu et al., 2019), environmental challenges and sustainable development (Hou et al., 2020). Production capital is often analyzed in the macro-economic context (Bustonov, 2019; Dunaev & Kirilenko, 2018). The most intense discussions, however, surround the development of the creative economy and creative capital – these two questions are high on the research agenda nowadays. On the one hand, such a surge of scholarly interest may be explained by the role that knowledge, innovation, and creativity play in the modern world. Through the support of creativity and knowledge creation, communities and territorial systems are capable of generating multiple positive effects from the investment of any type, increasing their competitiveness on the global markets, and achieving the best results even if other resources are scarce. On the other hand, the major issue that scholars of creativity have to deal with is the sheer complexity of this object of study: it is a challenging task to evaluate the creativity of a large-scale territorial system. The studies that measure natural and production capital are usually based on the data about the amounts of resources available in a given territory (e.g. natural resources or their types) (see, for example, Tarabarinova & Golovina, 2021) or the means of production (Skarstein, 2011). It is, however, much harder to estimate the amount of creative capital in a given territory since creativity is an intangible asset which is difficult to measure precisely because of its intangible nature. In this case indirect measures can be used.

The creative capital of communities and complex socio-economic systems has come under the scrutiny of scholars relatively recently since for a long time creativity was regarded exclusively as an individual characteristic. There is a vast body of research devoted to the methods of personal creativity assessment (Puryear et al., 2019; Roth et al., 2021) and methods for enhanc-

ing personal creativity (Kemple & David, 2020; Kontrova et al., 2021). There is also a growing research evidence regarding the creative capital of firms (Stojcic et al., 2018); sectors of economy (Becuț, 2016; Patlasov & Zharov, 2018); and territorial systems (Montalto et al., 2021; Sleuwaegen & Boiardi, 2014).

It is quite obvious that the approaches used for personal creativity assessment are not suitable for the analysis of large-scale socio-economic systems. The research on the latter requires its own methodological foundations and tools. One of the approaches applied to assess the creativity of territorial systems may be to analyze the development of creative industries, such as art, culture, design, media, and digital technologies, which have the potential to create added value and jobs through generation, production and operation of intellectual property products (Baculakova, 2018; Kaverina et al., 2019; Petrenko & Koroleva, 2017). Another approach is to look at such indicators reflecting the creative activity of communities as patent activity (Kozina & Bole, 2018) or the share of highly skilled employees (Montalto et al., 2021). Quite promising in this respect is the combination of these two approaches. This is the principle that underpins the methodology used in the European Commission's Cultural and Creative Cities Monitor, which comprises 29 indicators reflecting three major facets of a city's cultural and socio-economic life – 'creative economy', 'cultural vibrancy' and 'enabling environment' (Fekete & Morvay, 2019).

A study of territorial capital distribution (or its specific elements) does not need to be based on a broad range of indicators. To identify areas of concentration and regional disparities in access to resources, it is not necessary to consider all the processes within the macro-system in detail, it is enough to choose one parameter (or a set of parameters) that would reflect patterns of asset localization and focus on the development of individual elements of the given space. This is the methodological approach that has been taken in this study.

## Method and Data

This study examines the characteristics of Russia's economic space on the regional level by analyzing the data on 85 Russian regions and their territorial capital. For each of the chosen aspects of territorial capital, the following indicators were selected: for natural capital, the total volume of

timber<sup>4</sup>; for production capital, the value of fixed assets (except for the assets that are totally worn out and obsolete); and for creative capital, the number of highly skilled employees and patent applications<sup>5</sup>. These indicators were selected in order to gain a more comprehensive picture of the way natural resources, knowledge and creativity are used in Russian territorial systems. The evaluation of workforce quality and employees' propensity to generate, promote, and realize new ideas is particularly important because these are the factors that can spur innovation processes in production.

Another important kind of data is the information on gross regional product (GRP)<sup>6</sup>, which shows the value of the goods and services produced in the given area and characterizes the efficiency of resource use. On the one hand, GRP is the result of the territory's economic activity and on the other, it provides a foundation for further growth – for example, through investment into asset development or asset acquisition. The relationship between the value of the goods and services produced and elements of the territorial capital appears to be somewhat less obvious because GRP depends on a vast range of factors apart from those covered by this study. By comparing patterns of the distribution of GRP and specific elements of territorial capital, however, we can get some important insights into the role played by assets of different types in the national economy and the characteristics of its spatial organization.

The focus on territorial capital determines the choice of methodological tools used to evaluate the development of specific components of the national socio-economic space, to identify areas of asset concentration, analyze patterns of asset distribution and compare them with each other.

To gain a better understanding of the extent of heterogeneity of Russia's space, the following

tools were used: the Gini coefficient (Gini, 1921); the Theil index (Theil, 1967); and the Hall-Tideman index (Hall & Tideman, 1967). These indices were calculated for the years 2015, 2018, and 2020. The choice of these time periods was determined by the availability of the data on the number of highly skilled employees. The Gini coefficient shows how far a system's wealth or income distribution among the users (social groups, territories) deviates from a totally equal distribution. This coefficient compares the cumulative proportions of the population against the cumulative proportions of wealth that specific individuals (or groups of individuals) receive. The Gini coefficient ranges from 0 (totally equal distribution) to 1 (totally unequal distribution). The Theil index, like the Gini coefficient, measures the inequality in the distribution of assets. However, unlike the Gini coefficient, the Theil index does not compare the actual situation with that of perfect equality but instead captures the extent to which the distributions of random variables differ from each other. Therefore, the higher is the index's value, the more likely it is that the resources will be cumulatively concentrated in the hands of just one user and their distribution will be uneven. The Hall-Tideman index measures the seller concentration in the market or the concentration of territorial units in space: the closer its value is to 1, the higher is the level of asset concentration in one or several locations.

For a more detailed analysis, which aims to identify the specific patterns of asset localization, we need spatial data visualization tools and spatial modelling methods. Cartographic analysis was used to offer a visual representation of the spatial organization of territorial capital elements. Territorial units (regions) were highlighted in different colours depending on their indicator values, which were converted from absolute to relative. The information in the maps is supplemented with the results of spatial analysis, which identifies the areas of asset concentration that are different from their neighbours or serve as constitutive elements of larger resource centres. These areas were identified with the help of the spatial autocorrelation method based on the evaluation of the Moran's I (Moran, 1948). This method was used to detect areas of concentration (spatial clusters encompassing large numbers of territorial units) by calculating the local Moran's I (1), which is used to measure the correlation between each region and the other territories:

<sup>4</sup> The indicator data are provided by Rosstat in: Regions of Russia. Socio-economic situation. Retrieved from: <https://rosstat.gov.ru/folder/210/document/13204> (Accessed: 04.02.2022)

<sup>5</sup> This indicator features in the compendium published by Rosstat: On the number and needs of organizations in workers by professional groups. Retrieved from: <https://rosstat.gov.ru/compendium/document/13266> (Accessed: 04.02.2022). Highly skilled employees include managers and specialists of the highest qualification levels.

<sup>6</sup> The indicator data are provided by Rosstat in: Regions of Russia. Socio-economic situation. Retrieved from: <https://rosstat.gov.ru/folder/210/document/13204> (Accessed: 04.02.2022)

$$I_{L_i} = z_i \sum w_{ij} z_j, \quad (1)$$

where  $I_{L_i}$  is the local Moran's I for the  $i$ th region;  $w_{ij}$  is the standardized distance between the  $i$ th and  $j$ th regions;  $z_i$  and  $z_j$  are the standardized values of the given indicator for the  $i$ th and  $j$ th regions.

The areas of concentration also include the regions that are ahead of others in this or that parameter and are located in proximity to each other. These are the territories with positive values of standard distances ( $w_{z_i}$ ) and significant values of the local Moran's I ( $|I_{L_i}|$  exceeds the mean value of  $|I_L|$  in the given indicator).

A more detailed description of the methodology for calculating the spatial autocorrelation can be found in my previous publications (see, for example, Lavrikova & Suvorova, 2019; Suvorova, 2021). The application of the cartographic and spatial analysis methods implies that the input data set covers only one year. This study focused on the statistics for 2019 since this was the period for which the information on GRP was available.

## Results

Distribution patterns of territorial capital are to a great extent determined by the type of the resources that constitute the core of this capital (Table 1).

The highest degree of heterogeneity in the distribution of resources is characteristic of natural resources and the R&D component of creative capital. The uneven distribution of timber is not a surprising fact since the access to this resource depends on the natural and climatic conditions, which vary significantly from one region to another. Regional disparities in the number of patent applications are determined by factors of a different kind, in particular the localization of research centres, which are concentrated in just a few Russian regions. It should be noted, however, that in the given period, the indicators for both of these parameters showed a certain decline. The most balanced distribution is characteristic of the number of highly skilled professionals: this result is quite predictable since labour force with different skills and qualifications is a vital asset for any economic system and this resource is much less specific than the research potential. Interestingly, the values of the Gini coefficient and Theil index are rather high in all the given indicators (for example, some authors (Aivazian, 2012; Shevyakov & Kiruta, 2009) describe the level of inequality as 'normal' if the Gini coefficient equals 0.3), pointing to considerable spatial heterogeneity in the distribution of fixed assets and highly skilled workforce. The calculations show that assets are

Table 1  
Spatial heterogeneity of the distribution of natural, production and creative capital in Russia

	2015	2018	2020
<b>Gini coefficient</b>			
Total timber volume	0.768	0.729	0.728
Value of fixed assets	0.604	0.600	0.610
Number of highly skilled employees	0.515	0.495	0.524
Number of patent applications (inventions and utility models)	0.735	0.724	0.728
<b>Theil index</b>			
Total timber volume	1.238	1.043	1.039
Value of fixed assets	0.768	0.800	0.829
Number of highly skilled employees	0.509	0.463	0.553
Number of patent applications (inventions and utility models)	1.416	1.233	1.237
<b>Hall-Tideman index</b>			
Total timber volume	0.050	0.043	0.043
Value of fixed assets	0.030	0.029	0.030
Number of highly skilled employees	0.024	0.023	0.025
Number of patent applications (inventions and utility models)	0.044	0.042	0.043

Source: the author's calculations are based on statistical data (Rosstat), indices: Regions of Russia. Socio-economic situation, 2021. Retrieved from: [https://gks.ru/bgd/regl/b21\\_14p/Main.htm](https://gks.ru/bgd/regl/b21_14p/Main.htm); On the number and needs of organizations in workers by professional groups, 2020. Retrieved from: <https://rosstat.gov.ru/compendium/document/13266>; On the number and needs of organizations in workers by professional groups, 2018. Retrieved from: [https://gks.ru/free\\_doc/2019/potrorg/potr18.htm](https://gks.ru/free_doc/2019/potrorg/potr18.htm); On the number and needs of organizations in workers by professional groups, 2016. Retrieved from: [https://gks.ru/free\\_doc/2017/potrorg/potr16.htm](https://gks.ru/free_doc/2017/potrorg/potr16.htm); <https://rosstat.gov.ru/compendium/document/13266> (Accessed: 06.02.2022)

not concentrated in a limited number of centres (the values of the Hall-Tideman index are much closer to 0 than to 1). However, as far as the natural capital or the R&D component of the creative capital are concerned, the economic space tends to concentrate around particular points.

The cartographic analysis has revealed a number of remarkable peculiarities in the spatial organization of territorial capital. For instance, most timber resources are located in the south-eastern and north-western parts of the country. Many Russian regions enjoy sufficient access to this type of resources (Fig. 1). Therefore, it can be said that the areas of concentration identified through spatial analysis are quite large in size. Moreover, they are found in European and Asian parts of the country.

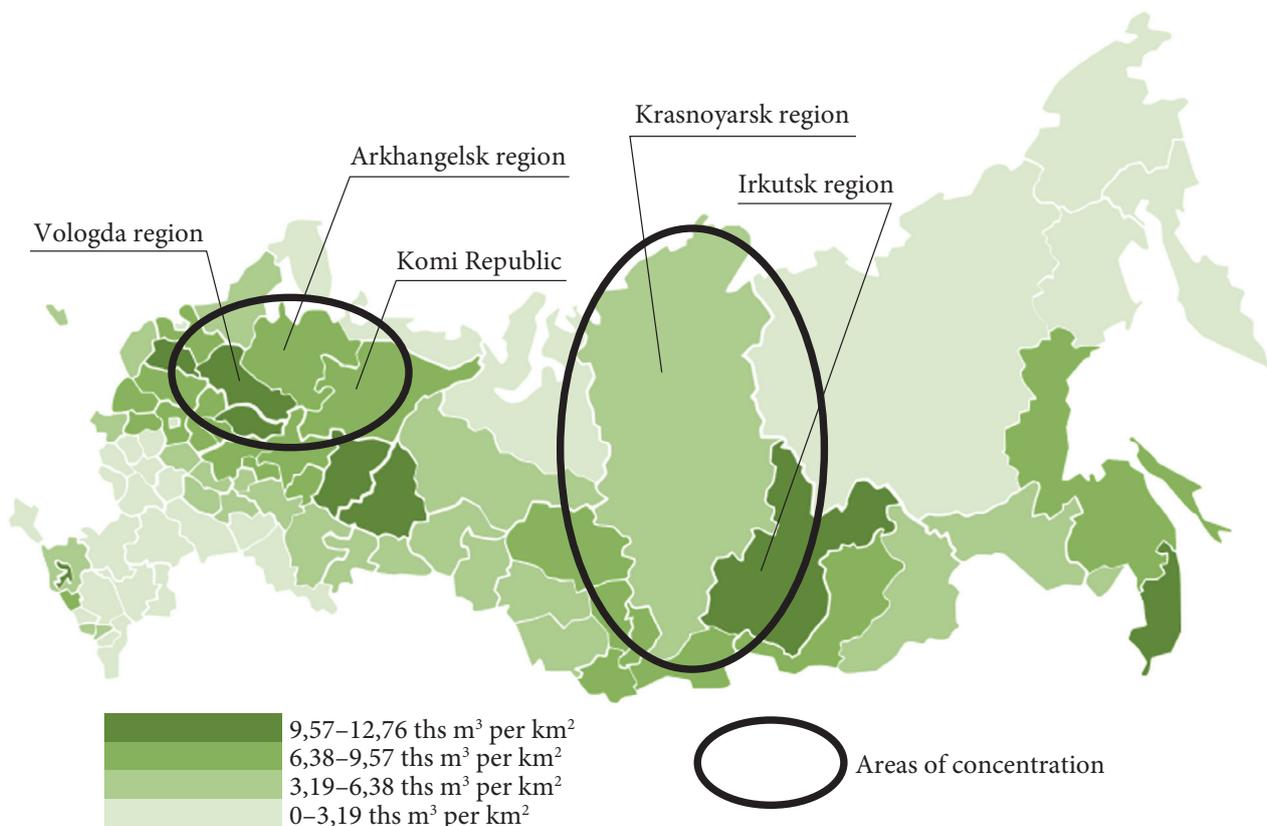
There may appear discrepancies between the results of the cartographic and spatial analysis since some areas of concentration may not coincide with the clusters of the most forest-rich areas. These discrepancies, however, can be explained by the differences between the absolute and relative representation of data: in the latter case, we are considering the relative values expressed per unit of sur-

face area; and in the former case, absolute values since it is important to evaluate the total amount of resources in the given territory and its neighbours.

The difference between the absolute and relative leaders of the polarization processes becomes more evident in the analysis of the distribution of fixed assets across the national space. This can be explained by the fact that the data on specific regions in this parameter (total number of employees) can be converted into relative values (Fig. 2).

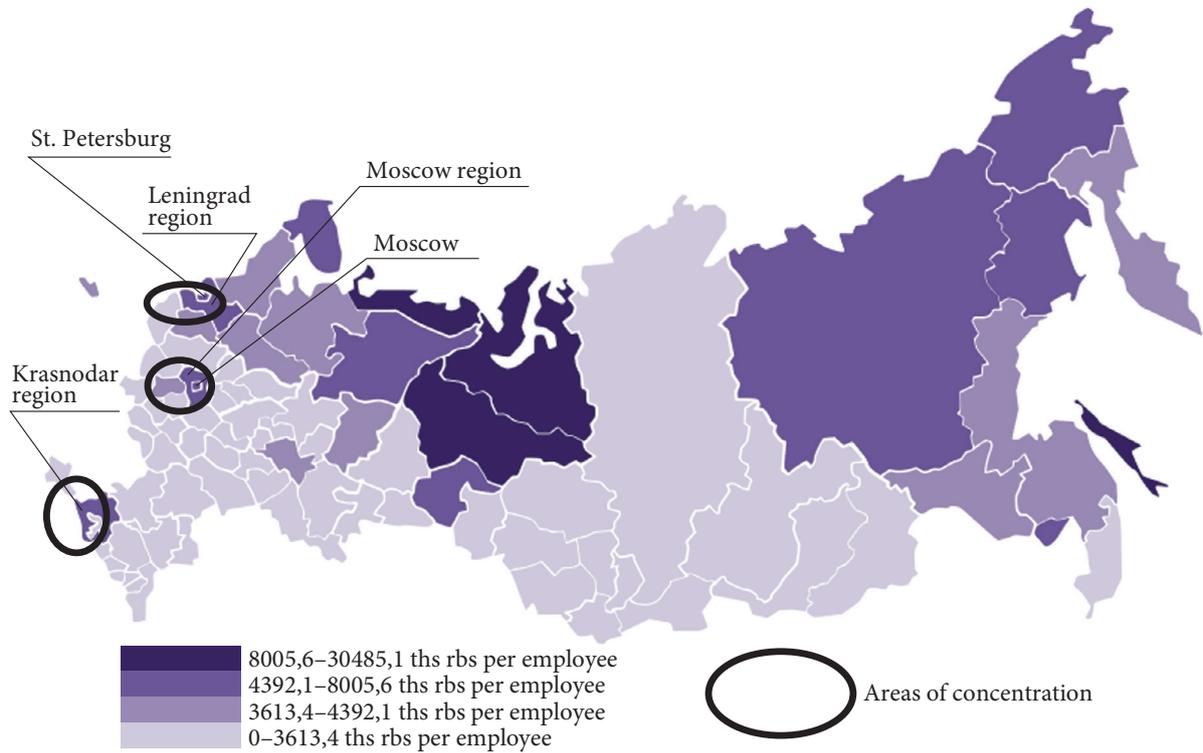
The areas of concentration of fixed assets (cities of federal significance – Moscow and St. Petersburg – and their regions; Krasnodar region) are comparatively small and located in relative proximity to each other in the western part of the country. They are also surrounded by the territories that are considerably behind them in this indicator. Thus, even though the number of areas of concentration of fixed assets has exceeded the number of areas of concentration of natural assets (which, in its turn, influenced the Hall-Tideman index), the patterns of their localization show significant regional disparities in production capital.

Similarly, the distribution of the highly skilled workforce (see Fig. 3) is extremely uneven. More-



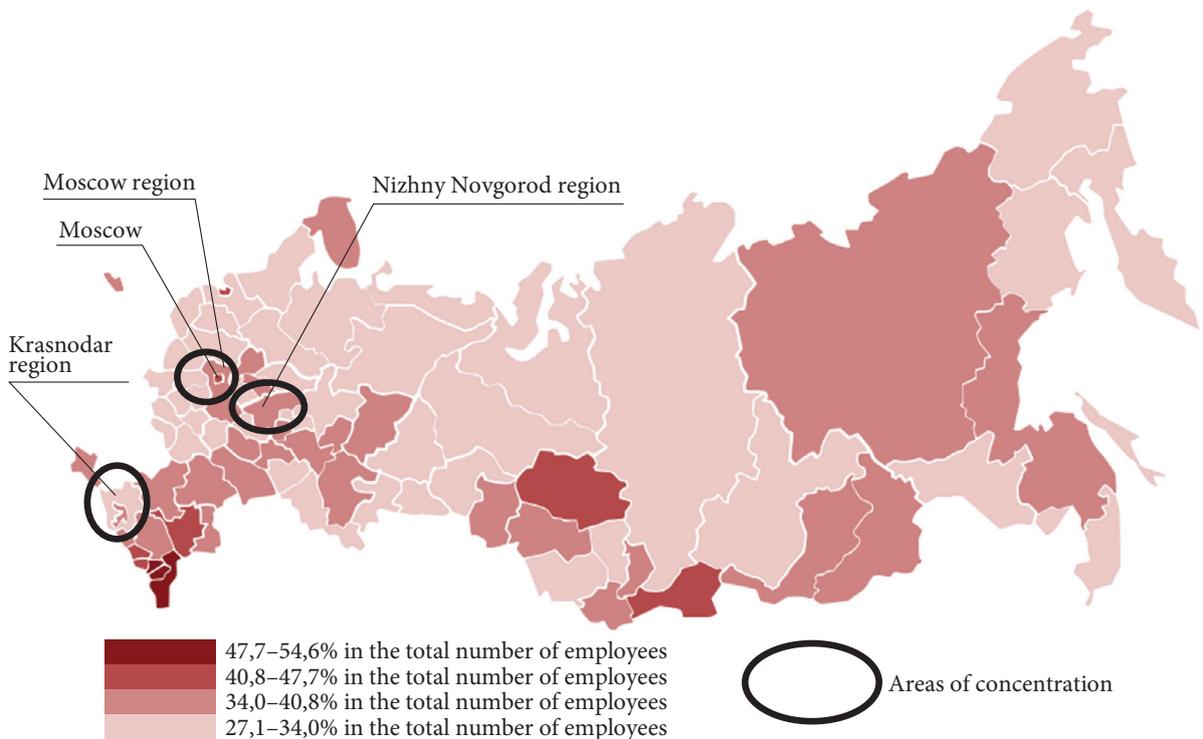
**Figure 1.** Distribution of timber across the space of the Russian Federation

Source: the author's calculations are based on statistical data (Rosstat), indices: Regions of Russia. Socio-economic situation, 2020. Retrieved from: [https://gks.ru/bgd/regl/b20\\_14p/Main.htm](https://gks.ru/bgd/regl/b20_14p/Main.htm) (Accessed: 06.02.2022)



**Figure 2.** Distribution of fixed assets across the space of the Russian Federation

Source: the author’s calculations are based on statistical data (Rosstat), indices: Regions of Russia. Socio-economic situation, 2020. Retrieved from: [https://gks.ru/bgd/regl/b20\\_14p/Main.htm](https://gks.ru/bgd/regl/b20_14p/Main.htm) (Accessed: 06.02.2022)



**Figure 3.** Distribution of highly skilled workforce across the space of the Russian Federation

Source: the author’s calculations are based on statistical data (Rosstat), indices: On the number and needs of organizations in workers by professional groups, 2020. Retrieved from: <https://rosstat.gov.ru/compendium/document/13266>;

On the number and needs of organizations in workers by professional groups, 2018.

Retrieved from: [https://gks.ru/free\\_doc/2019/potrorg/potr18.htm](https://gks.ru/free_doc/2019/potrorg/potr18.htm) (Accessed: 06.02.2022)

Note: The data for 2019 used in the analysis were obtained by averaging (integrating) the statistical data from Rosstat for 2018 and 2020.

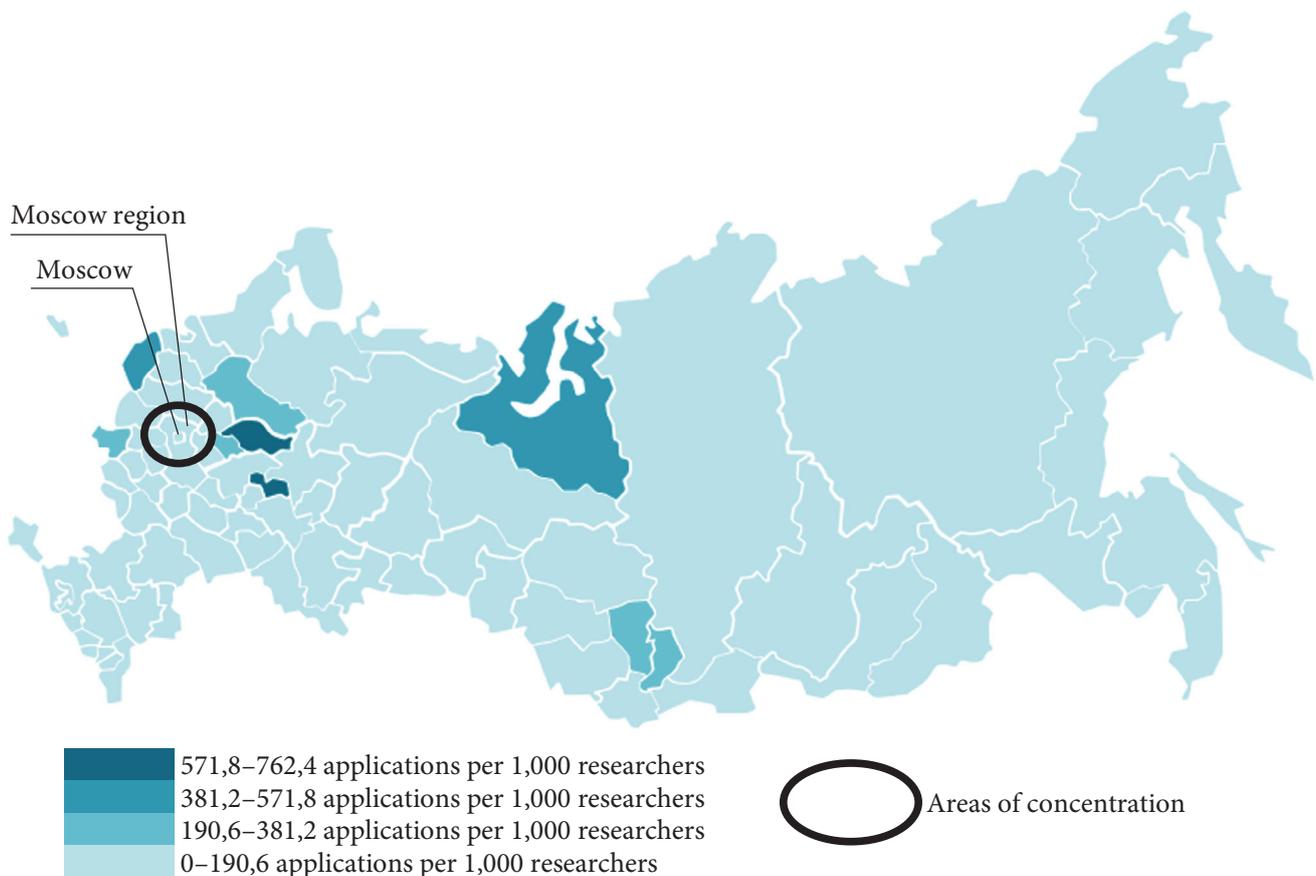
over, two out of the three areas of concentration of highly skilled employees (Moscow, Moscow region, and Krasnodar region) coincide with the areas of concentration of production capital. There are some interesting patterns in the distribution of the territories that are (in relative terms) rich in the given types of resources – in the southern part of the country there are clusters of areas where highly qualified professionals make up a large share of the total number of employees. This might be due to the high level of informal employment in these territories rather than the abundance of advanced production facilities in need of creative and competent human resources.

The analysis of creative activity in Russian regions, which was evaluated by comparing such parameters as the number of patent applications and the number of researchers, has shown some insignificant differences. In this indicator, regional disparities are much smaller than in the other relative indicators (Fig. 4). There are striking differences in the scale of R&D activities across

Russian regions: there is one huge area of concentration of patent activity in Moscow and Moscow region, which accumulates a significant number of research institutions and high-tech manufacturing facilities.

The indicator reflecting the economic performance of Russian regions (GRP) also shows resource-based regional specialization: resource-rich northern regions and capital regions (Moscow and St.Petersburg) have the highest GRP per capita (Fig. 5). The two largest cities in the country (together with Krasnodar region, which was given a new impetus for development by the 2014 Olympics) are also areas of concentration of the output value.

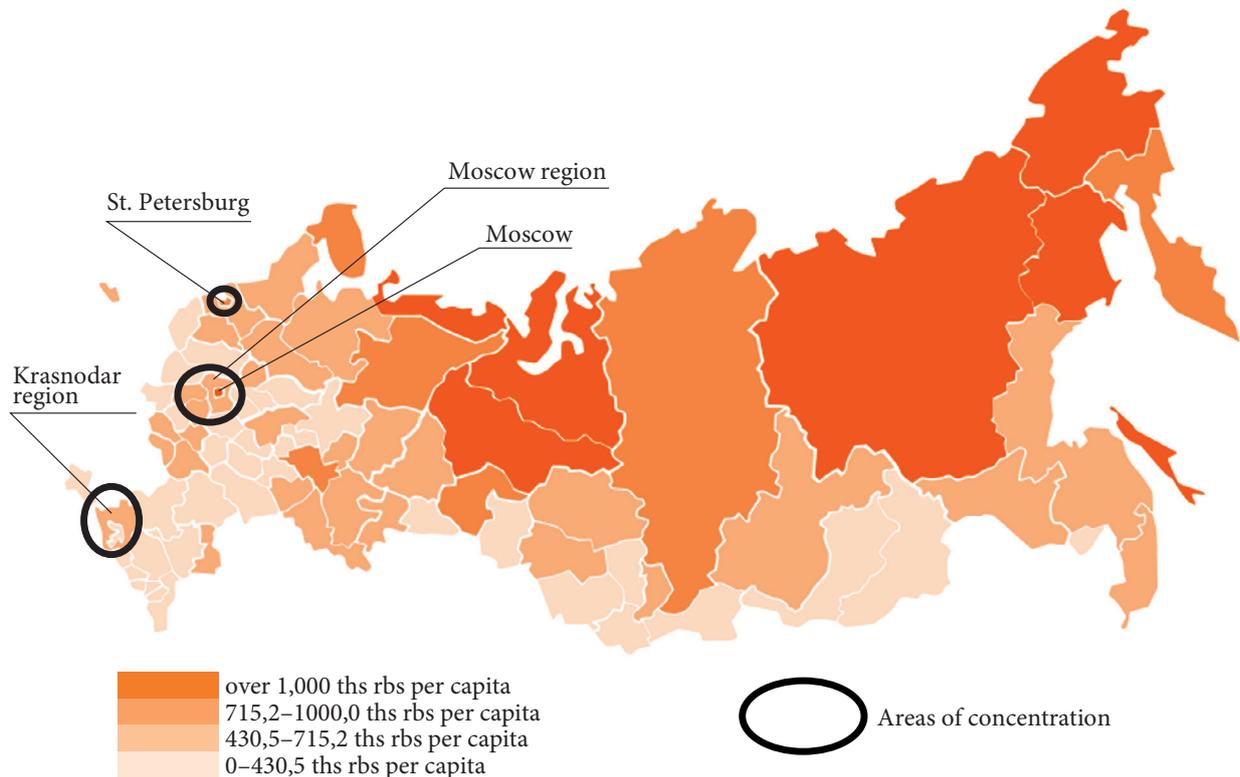
There are discrepancies between the maps that show the distribution of gross product and the maps based on other kinds of data. The patterns of distribution of GRP and production capital have the most in common while the relationship between GRP and the distribution of natural capital (at least regarding timber) and creative capital is less evident.



**Figure 4.** Distribution of patent activity across the space of the Russian Federation

Source: the author's calculations are based on statistical data (Rosstat), indices: Regions of Russia.

Socio-economic situation, 2020. Retrieved from: [https://gks.ru/bgd/regl/b20\\_14p/Main.htm](https://gks.ru/bgd/regl/b20_14p/Main.htm) (Accessed: 06.02.2022)



**Figure 5.** Distribution of manufacturing output across the space of the Russian Federation

Source: the author's calculations are based on statistical data (Rosstat), indices: Regions of Russia. Socio-economic situation, 2020. Retrieved from: [https://gks.ru/bgd/regl/b20\\_14p/Main.htm](https://gks.ru/bgd/regl/b20_14p/Main.htm) (Accessed: 06.02.2022)

## Discussion and implications

My calculations have confirmed the negative trends in the country's spatial development that are shown by the previous research and described in strategic planning documents (primarily the Strategy of Spatial Development of the Russian Federation until 2025<sup>7</sup> – the key document setting goals for the transformations of the national socio-economic space).

For all the chosen components of territorial capital, significant levels of spatial heterogeneity were detected. These findings agree with those of Belyaeva et al. (2021), Anokhin and Kuzin (2019). They also support the evidence of Fedorov (2019) and Treivish (2020), who point out a significant level of polarization of Russia's space combined with the scarcity of concentration areas capable of performing the functions of growth centres. Moreover, the localization of these concentration

<sup>7</sup> Spatial Development Strategy of the Russian Federation for the Period up to 2025. (2019). Retrieved from: Ministry of Economic Development of the Russian Federation: [https://www.economy.gov.ru/material/directions/regionalnoe\\_razvitiye/strategicheskoe\\_planirovaniye\\_prostranstvennogo\\_razvitiya/strategiya\\_prostranstvennogo\\_razvitiya\\_rossiyskoy\\_federacii\\_na\\_period\\_do\\_2025\\_goda/](https://www.economy.gov.ru/material/directions/regionalnoe_razvitiye/strategicheskoe_planirovaniye_prostranstvennogo_razvitiya/strategiya_prostranstvennogo_razvitiya_rossiyskoy_federacii_na_period_do_2025_goda/) (In Russ.)

areas creates constraints for the development of eastern territories (Kolomak, 2020; Solomennikova & Cheremisina, 2022).

The in-depth analysis of the patterns of distribution of territorial capital provide a more detailed picture. On the one hand, localization patterns vary depending on which particular element of territorial capital we are dealing with at the moment, which means that the list of leaders and laggards may differ in each particular case. The areas that cause the most concern, however, are those that have neither relative nor absolute advantages associated with resources of different types and that are located far from the areas of asset concentration and are thus unable to benefit from such proximity. Territories, for example, in Southern Siberia, are left at the periphery of national economic activity and opportunity. Such peripheral territories (peripheral in the economic rather than geographical sense) risk being excluded from intensive economic interactions and thus can lose much of their potential and turn into some sort of 'hollows' in the country's economic landscape. The situation is aggravated by the fact that the trends in GRP are for

the most part similar to those observed in production capital. Production capital, in its turn, largely depends on the efficiency of economic processes in the previous periods. Thus, regional disparities keep being reproduced as the lagging regions get trapped in a vicious cycle, unable to improve their resource efficiency and economic performance.

It is, therefore, not surprising that the distribution of unique resources necessary for the development of one specific sphere (in this study the availability of such resources is described with the help of such indicators as timber volume and patent activity) is the most uneven. It should be noted, however, that the localization of the elements of creative capital, which is traditionally considered to hold much promise for economic growth, is imperfect to say the least: the growth poles that are formed by these elements are scattered to such an extent that they lose much of their importance, thus rendering these resources insignificant on

the macro-level. This means that without a clear understanding of how the assets should be distributed in space and what should be located near them, any attempts to build up sufficient territorial capital will be doomed to failure.

These findings may also provide some insights for regional and federal policy-makers targeting specific spatial characteristics of the national economy. There is no doubting that a differentiated approach is necessary to manage different territorial systems. Particular attention should be given to the lagging regions devoid of the resources of their own and located far from resource-rich areas. It is crucial to develop mechanisms for stimulating such regions to establish and maintain productive economic relationships with other regions. The results of this study may contribute to further research on territorial capital and in particular the development of methodological tools to monitor the transformations in the national economic space.

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