# STRUCTURAL CHANGES IN THE ECONOMY OF RUSSIAN NORTH-WESTERN REGIONS: INSTITUTIONAL FACTOR

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*Balancing out uneven regional development and territorial disparities is an urgent task. Solving it requires considering the geo-economic features of various parts of Russia's spatially structured territory. This study aims to describe trends in the economic space transformation and structural changes in the economies of the North-Western Federal District. Exploring the economic space transformation, the paper draws on economic theory and geography, the concepts of cluster and power generation cycles, regional economics and other theories. It presents the results of the institutional and economic research of income capitalization and the role of the institutional factor, along with regional gross value added (GVA) analysis by activity types. The study investigates the movement of capital (rent) in the economic space. There are several noticeable trends: the Arkhangelsk and Murmansk regions, the Komi and Karelia Republics have diversified their economies by developing manufacturing and mining, while the Murmansk and Pskov regions did that by stimulating agriculture. Regional factors generating rent at significant transaction costs are found to be affected by institutional factors. The paper concludes that structural changes in the economy of the Russian north-west regions are wavelike in nature. The indexes of regional GVA and industrial market development point to the existence of a transition zone between the structural phases of the wave, with the transition mostly taking place in 2014. The trigger for the second phase of the wave, along with new structural changes, was international sanctions and growing confrontation reducing capital outflow and contributing to further structural changes in the regional economy.*

**Keywords:**
economic space, institution, transaction, economic rent, investment

## Introduction

The elimination of territorial disparities is perceived as an urgent task. Addressing it requires taking into account geo-economic features of different parts of a country's spatially structured territory [1—4]. Spatial inequality is the difference in the value of indicators (gross value added (GVA), gross regional product (GRP), etc.) among regions [1]. Assessing these differences, researchers assume that economic actions are driven by their context rather than by the idea of

revenue maximization [3—5]. They tend to focus on organizational procedures considering both local processes [5] and the changing institutional order of interactions between agents in the localization of relationships between specific and general institutions [6—8]. Thus, researchers have directed increasing attention to the role of institutions in territorial development [8—10], as well as to the role of exogenous and endogenous factors in the development of peripheral regions [2; 11; 12]. They consider 'meso-phenomena' distinguishing them from micro- and macro-levels [13; 14]. Thus, within the adopted "meso-approach" to the interactions between general and specific rules in explaining agents' cooperation and coordination, "meso-institutions" come to the forefront. It is a new research category performing an important function of an intermediary between "general" and "specific" rules [8; 15; 16]. The concept of institutions allows studying spatial objects as meso-economic systems focusing on their organizational features. In a broad sense, mesoeconomics explores the evolution of economic groups (clusters, networks, etc.). That is why it is shaped by sectoral, spatial and institutional economics [17, c. 30]. Experts focus on uncertainty and transformations of the institutional order of interactions between agents, the functioning of meso-economic structures and the endogenous formation of agents' coordination mechanisms [7; 14; 16; 18; 19].

The objectives of this study fall within that scope. It aims at identifying trends in the transformation of the economic space and structural changes in the regional economies of the North-Western Federal District (NWFD).

## Research methods

Theoretically and methodologically, the economic space of the NWFD is considered through the lens of economic theory and geography, doctrines of territorial-production complexes (TPC) and energy-production cycles (EPC), regional economics and other sciences. The representation of the Northwest of Russia is a model of centre-periphery interactions [2]. In addition to an economic analysis, the research involves an institutional analysis comparing different institutional characteristics of sites to identify general and specific institutions and their impact on the regional economies. The subject of the analysis is a meso-institution (a contractual system established in a sector) and other existing institutions regulating business practices.

The research relies on the data from the Federal State Statistics Service (FSSS) (https://rosstat.gov.ru/folder/10705), including those on nominal GRP and GVA, investment, gross fixed capital formation, population. Statistical analysis has been carried out for individual and aggregated activities by regions (table 1). The criterion for grouping services and management actions into aggregates is the pricing mechanisms, both competitive (market-based) and non-competitive (non-market-based). Regional GVA and industry development indexes by regions of the NWFD were calculated using a well-known formula:

$$\mu_{ij}(t) = \frac{d_{ij}(t)}{D_j(t)} \frac{N(t)}{n_i(t)}, \tag{1}$$

where $d_{ij}$ is the volume of gross value added of $j$ sector (industry) of $i$ region;

$D_j$ is the volume of gross value added produced of $j$ sector (industry) of Russia, in million rubles;

$n_i$ is the population of $i$ region;

$N$ is the population of Russia;

$t$ is the years of observation (2005—2019).

The index characterizes the degree of development of regional sectors compared to the Russian average. Its excess of 100 % reflects the specialization of the region's economy.

The conducted trend analysis uses a modulated signal extraction method. It aims at identifying fluctuations in values of the information signal, the corresponding statistical indicator. The modulation allows isolating the corresponding useful signal carrying information about structural changes.
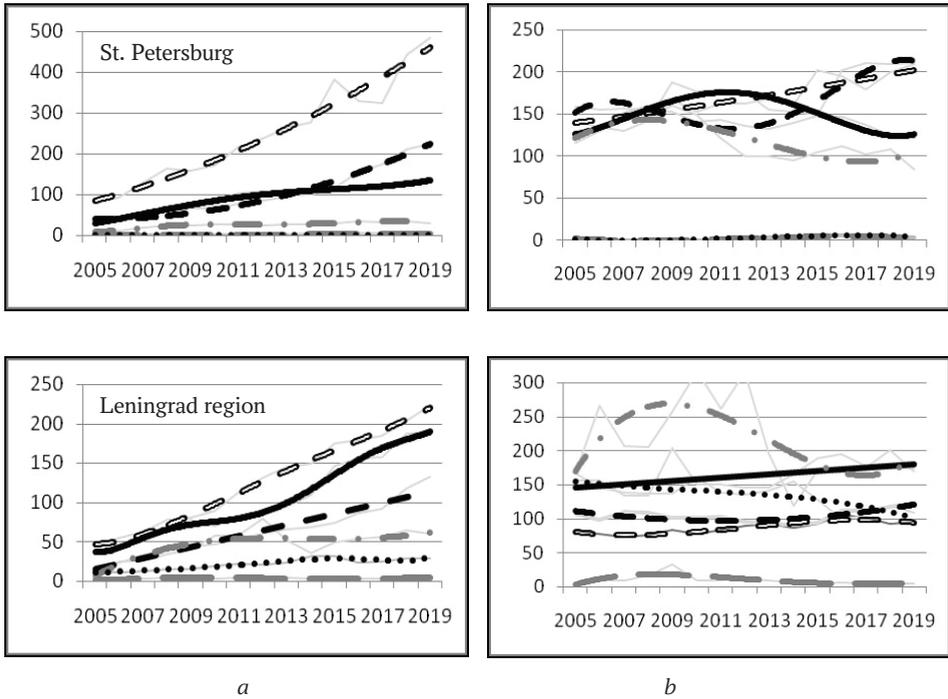
*Table 1*

**Grouping of activities by sector**

| Types of activities (according to FSSS) | Aggregated sectors of the economy |
|---|---|
| Mining | Mining |
| Manufacturing industries | Manufacturing industries |
| Construction | Construction |
| Wholesale and retail trade; repair of motor vehicles, motorcycles, household goods and personal items | Transactional sector of the economy (market services) |
| Transportation and storage; Information and communication activities | |
| Financial and insurance activities | |
| Real estate transactions, rental and provision of services | |
| Activities of hotels and catering establishments | |
| Public administration and military security; social insurance | Transactional sector of the economy (non-market services) |
| Education | |
| Activities in the field of culture, sports, leisure and entertainment | |
| Healthcare and social services provision | |
| Provision of other types of services | |
| Production and provision of electric energy, gas and steam; air conditioning. Water supply; sanitation, waste collection and disposal, pollution elimination activities | |
| Administrative activities and related additional services | |
| Agriculture, hunting, fishing, fish farming and forestry | Agriculture and forestry, etc. |

## Results

The earlier paper [2] presents the trends existing in the north-west regions of Russia at the beginning of the 21st century. However, as a result of the recent geopolitical events, the economic space experienced a new wave of structural shifts. The $\mu_{ij}$ (t) index time series analysis allows drawing conclusions about the structure of regional economies and their sectoral specialization. Figures 1—4 show the changes in an industry's (aggregate sector's) GVA and the regional GVA index ($\mu_{ij}$). The trend analysis followed the modulation of the relevant GVA signals of the sectors and $\mu_{ij}$ (t) regions. Each of the Figures represents different types of structural shifts and corresponding groupings of the regions.



Fig. 1. Changing structure of the regional economies specializing
in Transactional economy (market services) and Manufacturing:
*a* — GVA of the industry (sector) per capita, thousand rubles;
*b* — Regional GVA index, % of the national average

*Source:* author's calculations based on the FSSS data.

The data analysis leads to two conclusions. The first one is the division of the observation time interval into two periods with the notional trend break line in 2014. The second conclusion is that the previous trend noted in [2] has reversed in some regions. Some sectors are actively developing, even to the point of shifting specialization (provided that the average Russian level is exceeded) (see Table 2 and Figs. 1—4).
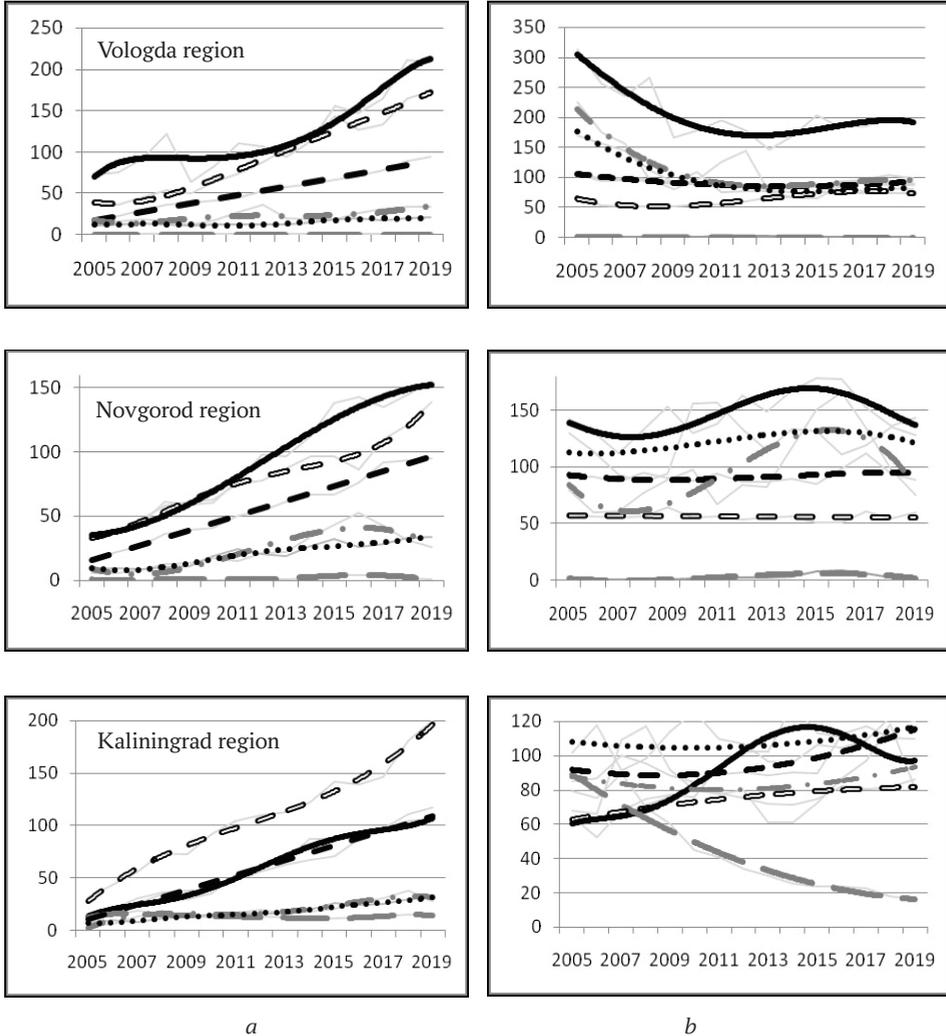


*a*                                                                                                    *b*

Fig. 2. Changing economic structure
of the regions specializing in Manufacturing

*Note:* notations are the same as in Fig. 1.

The Komi and Karelian Republics, the Arkhangelsk, Murmansk and Kaliningrad regions have diversified their economies by developing manufacturing industries as well as mining.
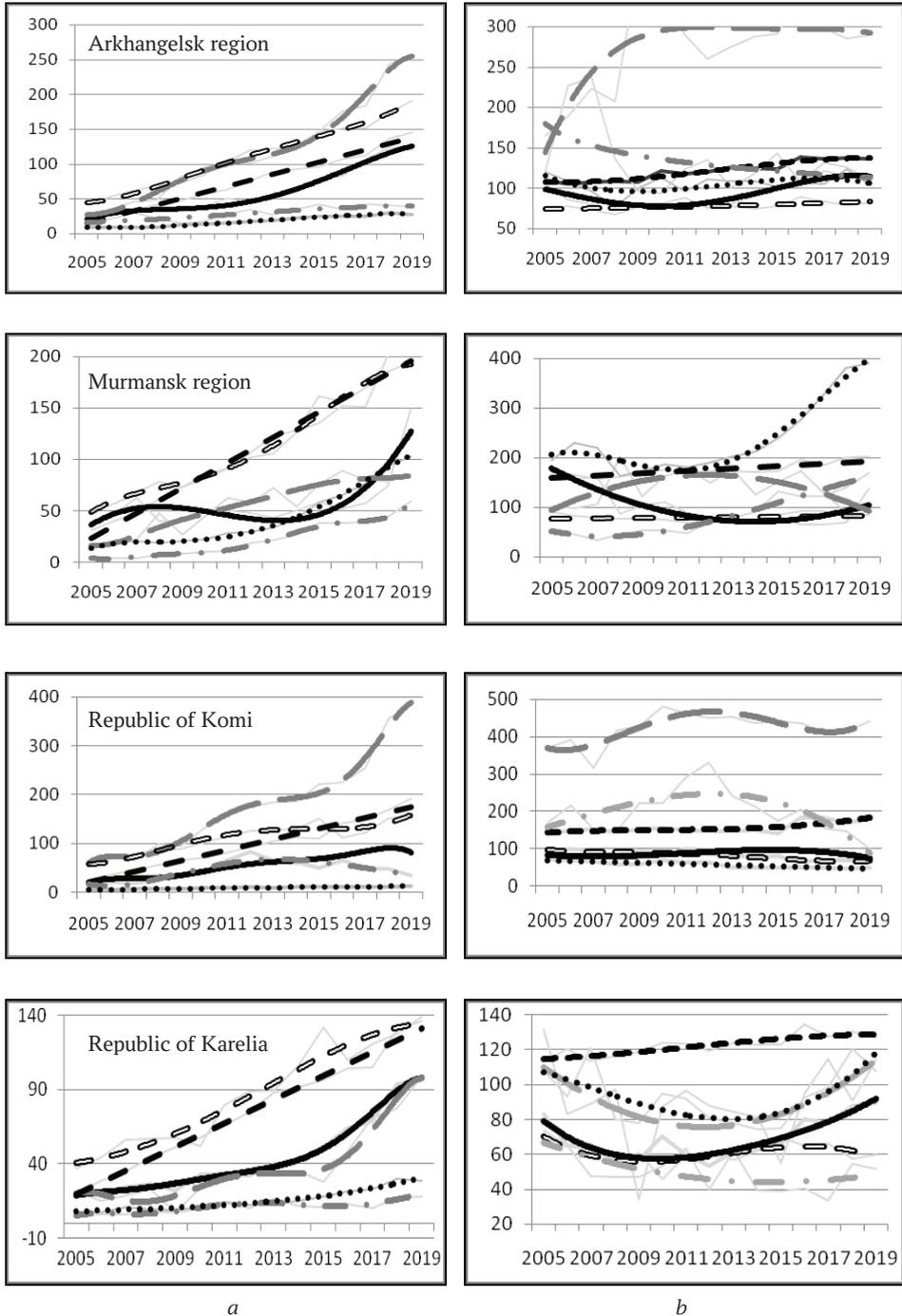
Fig. 3. Changing the economic structure of regions specializing
or growing in sectors: Mining and Manufacturing

*Note:* notations are the same as in Fig. 1.

There is an emerging specialization in the Pskov region («Agriculture, etc.») and in the Murmansk region in the same aggregate sector (with a focus on fisheries and fish farming). In addition, the Novgorod and Kaliningrad regions and the Republic of Karelia have shown an increased rate of development in the sector. However, the Murmansk region and the Republic of Karelia are expected to reduce the pace of development of the industry due to the 25 % drop in fish prices on the international market in the second half of the last year.
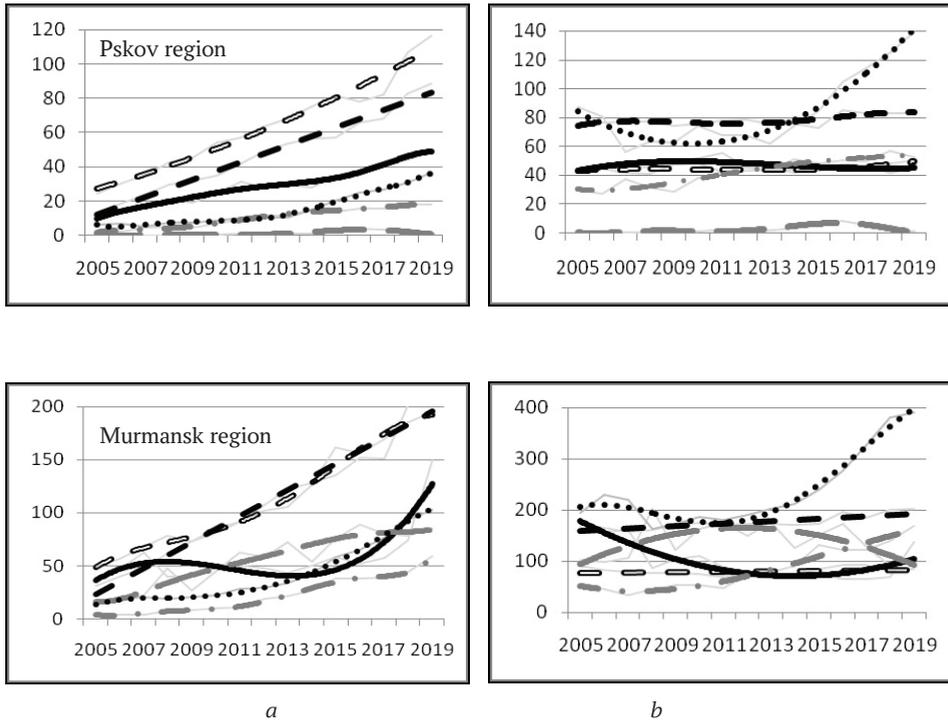


Fig. 4. Changes in the economic structure
of regions with a specialization in Agriculture, Forestry, etc.

*Note:* notations are the same as in Fig. 1.

The trend analysis (Fig. 1—4) indicates two trends, two phases of the "wave" of shifts in the economic space. Figure 5 shows a diagram of the macro-region and the two phases of the "structural wave" changing trends of regional development measured in GVA of the manufacturing industry. At first, the manufacturing industry is pulled to the centre, while peripheral regions suffer investment famine. That is phase I. Conversely, phase II involves the diffusion of capital to the periphery ensuring a high rate of development of the "manufacturing sector". We believe that TPCs of the periphery have responded positively to new opportunities based on their existing productive and infrastructural capacity and the rise of EPCs.
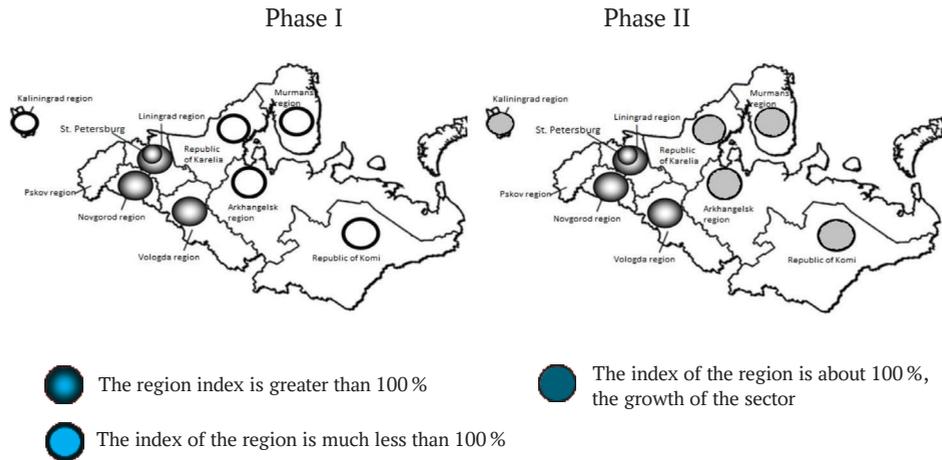
Phase I                                    Phase II



⬤ The region index is greater than 100 %          ⬤ The index of the region is about 100 %,
                                                        the growth of the sector

⬤ The index of the region is much less than 100 %

Fig. 5. A structural wave in the NWFD:
phase I — manufacturing was "pulled" into the centre of the macro-region,
phase II — active industry development in the periphery

The above-mentioned paper [2] proposes a classification of regions according to the level of development of particular sectors. However, the current context requires its revision. Therefore, we propose a new classification that takes into account the phasing of structural shifts (Table 2).

*Table 2*

**Grouping of regions by sectoral development**

| Types of economic activity | Phase I (before 2014) specialization | Phase II (after 2014) specialization industry growth |
|---|---|---|
| Market services | St. Petersburg, Leningrad region | St Petersburg Leningrad region |
| Manufacturing industries | St. Petersburg, Leningrad region, Vologda region, Novgorod region | St. Petersburg, Leningrad region, Vologda region, Novgorod region. Kaliningrad region, Arkhangelsk region, Murmansk region, Komi Republic, Republic of Karelia |
| Mining | Arkhangelsk region, Murmansk region, Komi Republic | Arkhangelsk region, Murmansk region, Komi Republic Republic of Karelia |
| Construction | St. Petersburg, Leningrad region, Arkhangelsk region, Komi Republic | St. Petersburg, Leningrad region, Arkhangelsk region, Murmansk region |
| Agriculture, hunting, fishing, fish farming | Vologda region, Novgorod region, Kaliningrad region | Novgorod region, Kaliningrad region, Murmansk region, Pskov region. Republic of Karelia |

## Discussion

Major problems of the national industrial development have become increasingly related to investment resources [20]. Thus, Russian companies have fallen on hard times due to sanctions, pressure on stock markets, extensive use of international structures and other factors withdrawing global liquidity. The shortage of long money impedes the periphery's economic development and industrial success.

Let us build a formal model reflecting both endogenous factors and externalities to disentangle the causes of the phase change. The traditional approach considering competitive pricing assumes that externalities do not change the market structure. Yet, we believe that spatial externalities create endogenous mechanisms characteristic of the market structure of the Chamberlain type. Chamberlain's formulation of the market structure that we use originates from the work by Dixit and Stiglitz [21]. We consider a choice-of-alternatives situation in which potential investments in a particular sector of a peripheral region serve as substitutes for each other. However, they are poor substitutes for outwards operations (to the centre). The market decision on the optimum is made taking into account unit intersectoral elasticities, as well as according to both principles existing within the region and principles established by external beneficiaries that underpin the choice of optimal strategies by the periphery's residents.

Next, let us estimate the rent income losses of two beneficiary groups (external and peripheral firms). It is estimated traditionally through the present net value of investments (*NPV*):

$$NVP = \sum_t [S + R \, (1 + r)^{-t}], \tag{1}$$

where $R$ is a rental income excluding inflation;
$r$ this is a discount rate;
$S$ is investment and operational costs (including all costs, both transformational and transactional).

Taking into account the spatio-temporal continuity of economic space, we view economic rent as the potential for an agent's movement in it determined by the initial and final position of the agent and properties of the space. It is evaluated in the system of property and non-property rights through the rent function transformed into the price of production. In line with the ideas of W. Elsner [18], we see the reason for the different efficiency of transactions in the endogenous formation of institutional mechanisms, primarily meso-institutions.

We assume that costs are determined according to average industry standards that are the same for all the regions. Thus, the rent flow is calculated through the GVA of regions' industries. Taking into account the limit of *NPV* function ($\lim_{t \to \tau} NPV = R/r, \tau \gg 0$), and the assumptions made, we estimate the rent loss through R function analysis.

During the first phase, the investment part of the capital moved not only from sector to sector (for instance, to mining in the Komi Republic and the Murmansk region [2]) but also from discriminated regions to other regions, in particular to St. Petersburg and Moscow agglomerations.

Except for projects by large corporations, usually related to the extraction and primary processing of natural resources, the peripheral industry has suffered from widespread liquidity shortages. Given the underutilization of production resources, this led to the stagnation of production, primarily in manufacturing (as one of the most capital-intensive industries) [2; 22].

To explain the mechanism of economic rent withdrawal, according to [4], we introduce a spatial differential economic rent of the first and second kind ($R_{1ij}$ and $R_{2ij}$):

$$R_{ij} = p_{ij}\, R_{1ij} + p_{ij}\, R_{2ij}\,, \tag{2}$$

where $R_{1ij}$ and $R_{2ij}$ indexes of sectoral ($j$) and territorial ($i$) GVA standard (rent function); $p_{ij}$ are sector ($j$) and territorial ($i$) price indexes.

In some cases, regional factors (e. g., natural resource endowments) may become major ones in rent-forming. The use of local resources influencing the spatial distribution of value chains can generate positive spatial economic effects [23]. In this case, the $R_{1ij}$ rent is mainly linked to the high economic potential of an area and the associated infrastructure framework.

The second part of the rent, $R_{2ij}$, also influences the conversion of rent into the price of production. It arises from different productivity of capital investments and other transactions that increase economic rent. At the same time, we no longer consider natural and technological causes as rent generating factors, instead, we consider the monopoly power of affiliated oligopoly groups and other institutional and spatially related factors.

The $R_{2ij}$ rent is allocated according to the market structure, exogenous trading rules shaped by different regulators. Thus, the price and its structure are a result of the institutional arrangement and transaction costs. The latter includes non-production costs, costs associated with securing contracts, and support for the enforceability of claims. Sensitive administrative and economic barriers create additional costs for firms with limited market power and peripheral areas with limited administrative resources. Thus, we consider regulatory factors connected with the nature of collective actions of agents as phenomena of economic space. There are not just firms and markets in the economy but also a dense network of contractual relationships linking them. To take into account the specific law (meso-institution) formed by the contractual system, we shall rewrite formula (2):

$$R_{ij} = a_{ij}\, p_{ij}\, R_{1ij} + \beta_{ij}\, p_{ij}\, R_{2ij}, \tag{3}$$

where $a_{ij}$ and $\beta_{ij}$ are normalizing coefficients.

While $a_{ij} \geqslant 0$, $\beta_{ij}$, can be either higher than zero or lower depending on the spatio-temporal dimension of the relationship structure. For instance, we should consider the emergence of new industries (including the attraction and retaining of industries and markets from outside the region) and various forms of new economic activities in regions in the context of differences in their spatial development [24]. Moreover, we should view the diversification of development paths in the context of beneficiary competencies, in particular those based on a combination of new analytical knowledge [25]. This is especially relevant in the context of the active digitalization of the economy.

We determine $a_{ij}$ and $\beta_{ij}$ coefficients using the results of the analysis of contracts and other institutional conditions for the sustainability of the local equilibrium and competencies. We assume that due to the emergence of negative synergies in the economic space ($\beta_{ij} \leqslant 0$), peripheral companies and territories are discriminated against and forced to operate according to external standards as they lack competencies.

An example illustrating this point is the timber market ("balance of birch") with the goods supplied by the resident companies in the Republic of Karelia and the Vologda region to Finland. The case is interesting because it has been the subject of antitrust investigations by Finnish and Russian competition authorities as it has signs of anti-competitive agreement (collusion) in commodity markets.

Based on the author's analysis of contracts, Fig. 6 shows the effects meso-institutions have on the conversion of rents into prices of production. It reflects the average (industry inter-regional market) profit, transformation and transaction costs.

In the price structure, transaction costs are part of operational (internal) costs. They reflect activities aimed to ensure order within the area of competence. At the same time, most of transaction costs (excess over the contract price) are caused by external factors not accounted for in supply contracts. These are certainly losses for the region.

In the diagram, the first and the fourth bars are defined by the average industry transformation costs and the "cost of the timber" on both sides of the border. The second, the third and the fifth bars show the result of different strategies chosen by the firms (with varying market power) under Chamberlin-type market conditions [21]. Increased transaction costs (difference in the height of the bars on both sides of the border) are not taken into account in the basic conditions of supply (EXW, FCA, DAF, etc.).

This conversion of rents into production prices is the result of the institutionalized economic order that weakens firms with limited market power and territories with limited administrative resources. In our opinion, this is the essence of the mechanics of $R_{2ij}$ rent extraction.
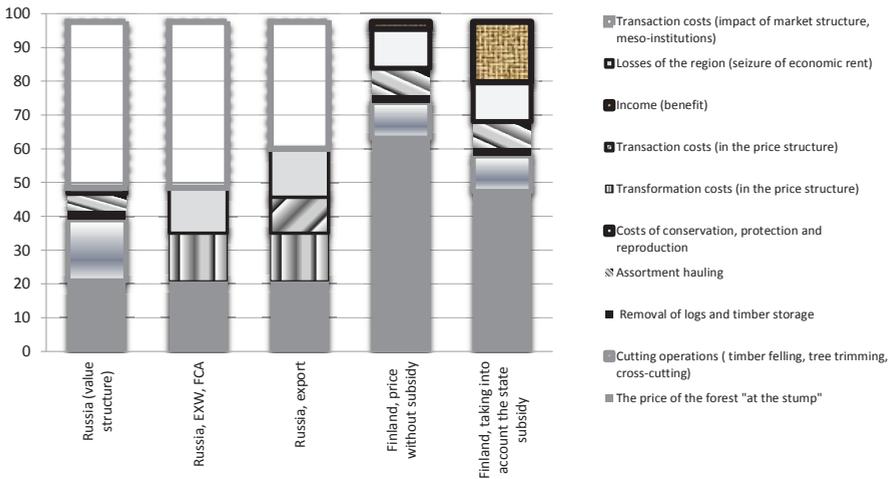
Fig. 6. Influence of meso-institutions on the conversion
of rent into production price using the example
of the contract price structure (pack-sack method) of one cubic metre of birch, Euro

*Source*: author's elaboration.

It is known that the established economic order is determined by the balance of extractive and inclusive institutions. Extractive institutions contribute to the concentration of power in the centre, while inclusive institutions distribute power to actors in regions [26]. The centre shapes trade and constructs extractive market institutions that enable it to siphon economic rents from the periphery. The situation in Russia is similar to that in the European space (according to [27]). The centre (as a licensor of new technologies and a beneficiary of rents) imposes market openness on the periphery (as a licensee technologically dependent on the centre losing out to it in terms of competencies). It extends to the periphery its legal framework that exclusively supports the competencies of external beneficiaries.

The control authorities on both sides of the border had questions to market participants because they "had noticed" signs of a cartel in the synchronized underpricing of a cubic metre of timber purchased in Russia violating paragraph 6 of the Finnish Antitrust Act prohibiting price fixing, Article 81 of the EU Charter prohibiting cartels, and Article 11 of the Russian Federal Act on Protection of Competition. However, Russian and Finnish competition authorities did not find a cartel agreement, as the whole situation was a result of the synchronized behaviour of the firms involved. We assume optimal strategy (Nash, game theory) was chosen due to the balance of market extractive and inclusive institutions rather than through an illegal agreement.

The institutional factor, which we consider to be the cause of structural shifts in the first phase, leads to an investment famine in the periphery (and low-liquidity sectors). The reason is as follows. ROI is calculated as:

$$ROI = [R - (S^P + S^T)]I^{-1},$$

where *I* is the volume of investments required for the production and sale of products, ensuring the legal protection of the contract network; *R* is income; *S* is current expenses.

Index "P" is transformational costs, index "T" is transaction costs associated with the enforcement of claims.

In addition, all other things being equal ($R_a = R_b$, $S_a^P = S_b^P$), transaction costs of an entity affiliated with an external beneficiary (index "a") become less than those of other entities (index "b"): $S_a^T \ll S_b^T$. Thus, $ROI_a \gg ROI_b$.

Given the existing institutional order, the distribution of income within the framework of the "centre-periphery" model shall correspond to the formula (1). A spatial externality results in the return on investment with a much greater increase in the liquidity of assets in an affiliated entity. However, in this case, the territory loses a part of the economic rent generated within it. On the one hand, the rent facilitates the intensification of production. On the other hand, affiliated agents take away the rent increment through extractive institutions (a potential pool of investments).

This situation certainly affects investment decisions. Thus, investments of the "centre" stimulate exclusively the flow of natural resources to manufacturing industries gradually concentrating closer to the centre, whether it is an EU country bordering on a Russian peripheral region or a Russian metropolis. When comparing contracts for the supply of crushed stone from the periphery to Moscow, a similar situation is observed. Developers use market power to dictate contract terms.

Figure 7 shows the volume of investment in actual prices in 2005—2020. It demonstrates a clear advantage of the centre over the industrial periphery. Data for Moscow and the Moscow region are added for comparison.
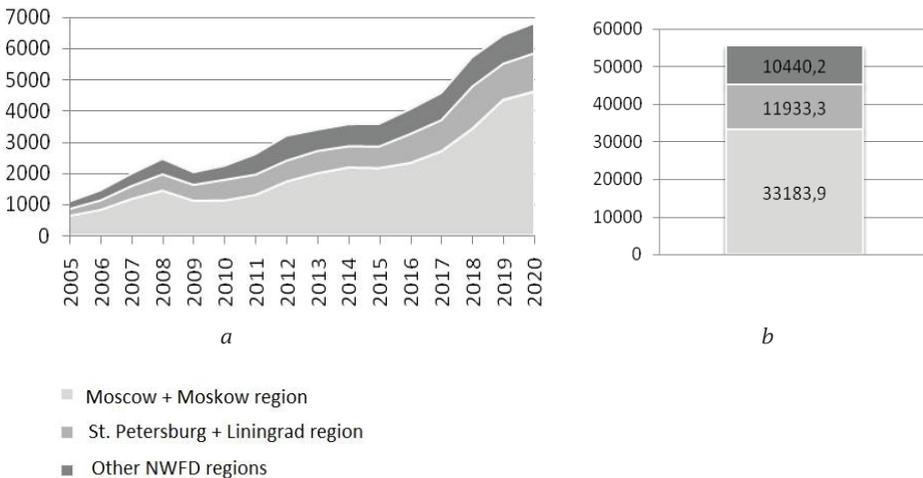


■ Moscow + Moskow region

■ St. Petersburg + Liningrad region

■ Other NWFD regions

Fig. 7. *a* — Fixed capital investment in NWFD
and Moscow agglomeration regions, in actual prices, rub bn. 2005—2020;
*b* — total investment

*Source*: FSSS data.

The trigger for the second phase of the wave and the new structural changes was, in our view, the geopolitical crisis. The subsequent sanctions and increased confrontation had a significant impact on the following structural changes in the economy of the studied regions. A tipping trend has emerged. In fact, the trend in capital outflows has reversed since 2014 (Fig. 8). At least until 2019, there was a decline in capital outflows from Russia, with a simultaneous increase in the money supply and a decline in direct investment from Russia.

During the second phase, the sanctions on the one hand and the Russian government on the other forced a larger scale move of capital to the periphery. Both credit incentives and the willingness of regional authorities and regional households in general to invest have contributed to this spillover. Furthermore, in our view, this period generally coincided with the start of fixed capital renewal in TPC-dominated regions with their characteristic EPCs.
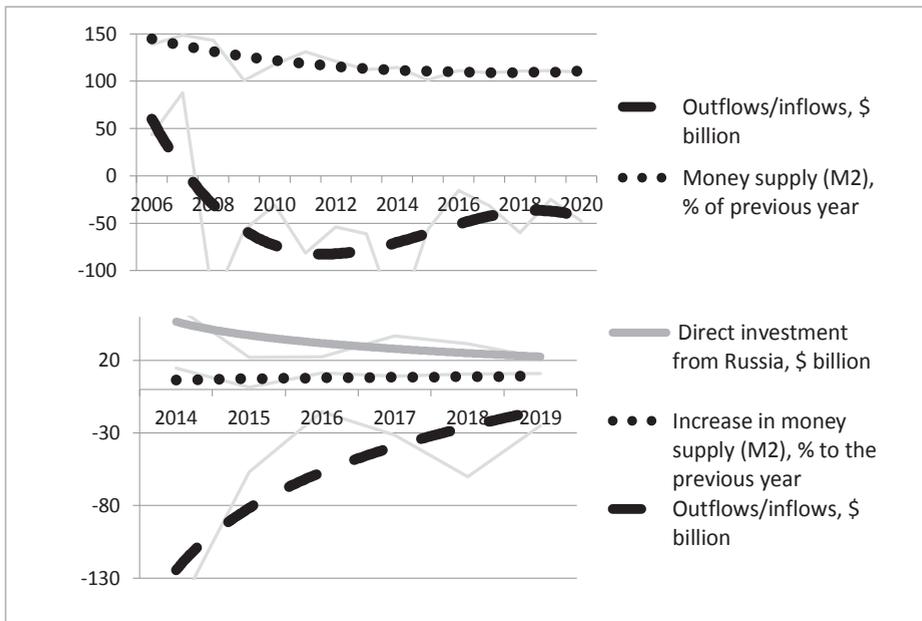


Fig. 8. Trends in the Russian financial policy outcomes

*Source*: author's calculations based on the FSSS data.

This renewal manifests in the changes in the consumption-accumulation ratio in GRP and trends in the development of sectoral markets characterising the structural deformation of regional economies. Gross fixed capital formation, as an investment component of GRP, reflects the nature and direction of generalized (within a region) business cycles.

Figure 9 shows generalized business cycles in the NWFD regions as a modulated signal induced by fluctuating values of the information signal. This signal is the indicator called "gross fixed capital formation, as a percentage of total GRP". Obviously, these macrostructural changes may not coincide in the phase. At the same time, we assume that the exogenous factor as a trigger has started to adjust the rhythm of business cycles.
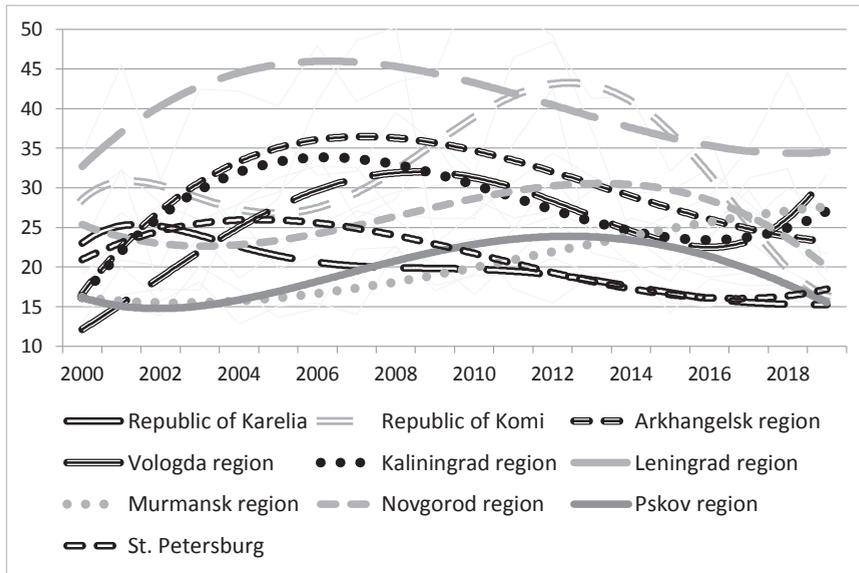


Fig. 9. Modulation of gross fixed capital formation,
as a % of total by the NWFD regions

*Source*: author's calculations based on the FSSS data.

Based on the above, we conclude that the combined impact of financial and institutional factors produces various structural shifts in the economic space. At the same time, after 2014, excessive liquidity in the centre, along with increased external sanctions and the determination of the government, caused the diffusion of capital to the periphery (the dominance of $R_1$ in the formula (1)), while the previous phase of the structural wave was dominated by the $R_2$ element.

## Conclusion

Geography, namely the central-peripheral configuration of space, has a profound impact on inter-regional disparity and economic growth in the regions [2—4; 28]. Forces that lead to the agglomeration of economic activity and aggregate growth are similar across the board [28; 29]. They lead to the differentiation of regions, which manifests itself not only in the differences in their GVA and

GRP but also in the different focus and pace of development and transactional efficiency. We agree with [18] that the reason is the endogenous formation of institutional mechanisms that coordinate actions of agents in uncertain collaborations and stable oligopolistic groups. The conjunction of general and specific rules is carried out through the contractual system as a meso-institution.

The negative synergy of the economic space (shown in this research and in earlier works [2; 4]) gives us grounds to conclude within the centre-periphery model that spatial inequalities are reproduced. This can be explained by objective reasons, including the established balance of extractive and inclusive institutions, the Chamberlain-type market structure, institutional and social embeddedness (the term is used in the sense of [30]). They all contribute to the gap between rents received by the centre and rents received by the periphery, determine a rent gradient and a corresponding decrease in the development potential of the periphery.

Therefore, it is necessary to increase the agency of regional authorities and to strengthen their competencies both through the use of local resources and through effective mechanisms to regulate the institutional structure of relations. This can be done through institutional engineering, adjusting the balance of extractive and inclusive institutions and regulating the legal order through networking and contractual interactions. In particular, the administration of a peripheral territory should provide protectionist support to its resident companies not affiliated with external beneficiaries. These companies are advised measures to reduce their reputational costs. Such a set of measures shall not be considered a violation of antimonopoly legislation, since it is to equalize conditions of competition and facilitate mutually beneficial cooperation.

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