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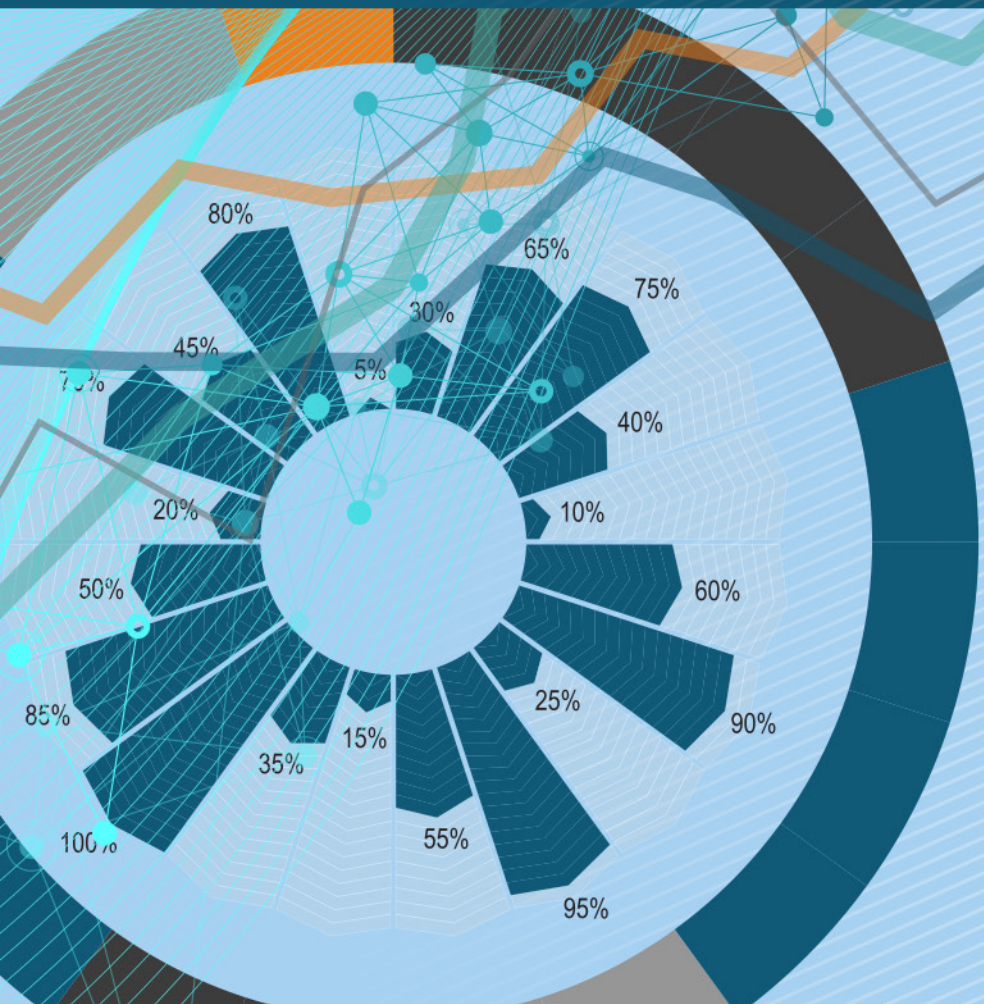

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Contents

The impact of national competitiveness on innovation activity in the economy: the Russian Federation

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Abstract. The paper investigates the relationship between the level of development of competitiveness of the Russian economy and its innovation activity in 2011-2020. This paper uses economic and mathematical modelling techniques to verify the hypothesis about the existence of a direct (statistically relevant) correlation between the level of national competitiveness and the four indicators characterising innovation activity in Russia. The study shows a clear direct (statistically relevant) correlation between the level of competitiveness of the Russian economy and the share of organisations providing technological innovation, innovative goods, works and services, by constituent entities of the Russian Federation.

Keywords: national competitiveness, innovation activity, WEF, correlation analysis, Russian economy.

JEL codes: C12; C10; O17

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Introduction

The theory of national competitiveness finally developed in the late 1990s. Its major was Porter's concept. According this concept, factor productivity determines the level of national competitiveness. Morover, the ultimate goal of increasing national competitiveness is improvement of the population quality of life (Porter, 1998).

National competitiveness can generally be defined as a country's ability, on the one hand, to produce goods and services meeting the international market requirements and, on the other hand, to increase the welfare of its population through growing of real income.

This approach to defining of national competitiveness and its determinants is one of the key factors in the shift from pure theory to real political and economic decision-making or policymaking, which are the very concept of national competitiveness. For example, the EU's Lisbon Strategy is based on the recognition of the need to improve competitiveness, and achieving a high position in the World Economic Forum's global competitiveness rankings is becoming part of the socio-economic development strategies of entire countries (e.g. Kazakhstan) (Shkiotov, 2018).

Now, almost a quarter of a century later, the topic of national competitiveness still attracts the attention of economists. On the one hand, it is the result of strong criticism of M. Porter's concept (Cho, 1998), which is still debated in academia, and, on the other hand, it is the result of the fundamental transformation of global and local economies, influenced by digitalisation.

A review of recent publications in the field of national competitiveness shows the shift of the interest of researchers to applied work on the technological component of national competitiveness. Thus, Ollo-López & Aramendía-Muneta (2012) note the direct impact of ICT on a country's competitiveness and level of innovation; a study by Androniceanu et al. (2020) use correlation analysis to link competitiveness, innovation and quality of life in EU countries; a study of a large hotel chain in India (Danurdara, Darmawan & Kalsum, 2021) also confirms the link between digital innovation and business competitiveness; the same link, but at the level of national economies, is verified by Fonseca & Lima (2015) and Khyareh & Rostami (2022).

The purpose of this study is to verify the correlation between the level of national competitiveness and innovation activity in the economy, on example of the Russian Federation.

The choice of the research objective is not incidental. According to the rankings of The Global Competitiveness Report (WEF), recently the Russian economy achieved significant progress of national competitiveness level (see Table 1). There is an issue about the dependence of the improvement in Russia's competitive position in this ranking on the level of innovation activity in the economy.

Methods

We based our study on the methodology described in detail in the work of Shkiotov S., Markin M. (Shkiotov, Markin et al., 2020).

The main hypothesis of the study considers a direct (statistically relevant) link between the level of national competitiveness and innovation activity in the Russian economy.

The additional hypothesis of the study considers a direct (statistically relevant) link between innovation performance and innovation activity in the Russian economy. It allows us to understand the dependence of assessment of the level of innovative development of the economy in Russia and international practice.

Indices characterizing innovation activity in Russia:

- Level of innovation activity of organisations by Russian entities, 2011-2020 (INN_ORG)
- Share of organizations providing technological innovation in the total number of organisations surveyed, by constituent entities of the Russian Federation, 2011-20 (VES_INN);
- Share of innovative goods, works and services in the total volume of shipped goods, works and services, by constituent entities of the Russian Federation, 2011-20 (TOV_INN);
- Volume of innovative goods, works, services, by constituent entities of the Russian Federation, 2011-20 (Q_TOV_INN).

Indices characterizing the level of national competitiveness:

- The Global Competitiveness Index (GCI), 2011-2020.

Indices characterising the level of innovative capacity of the economy:

- Global Innovation Index (GII), 2011-2020.

All data provided by Federal State Statistics Service, The Global Information Technology Report 2011-2019 (Network Readiness Index 2020-2021); The Global Competitiveness Report 2011-2019.

Sampling countries: the Russian Federation.

Research method is correlation analysis. During this study, a significance level of 5% was assigned to test the validity of the correlation coefficient.

Table 1 provides the background of the analysis.

Table 1 – Data for correlation analysis for the Russian economy, 2011-2020

Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Global Competitiveness Index (GCI), scores	4.2	4.2	4.2	4.2	4.4	4.4	4.5	4.6	6.3	N/A
Global Innovation Index (GII), scores	35.85	37.9	37.20	39.14	39.32	38.50	38.76	37.90	37.62	35.63

Source: World Economic Forum, 2011-2020

Results

The results of the correlation analysis and their visual interpretation are presented in Table 2 and Figures 1-2.

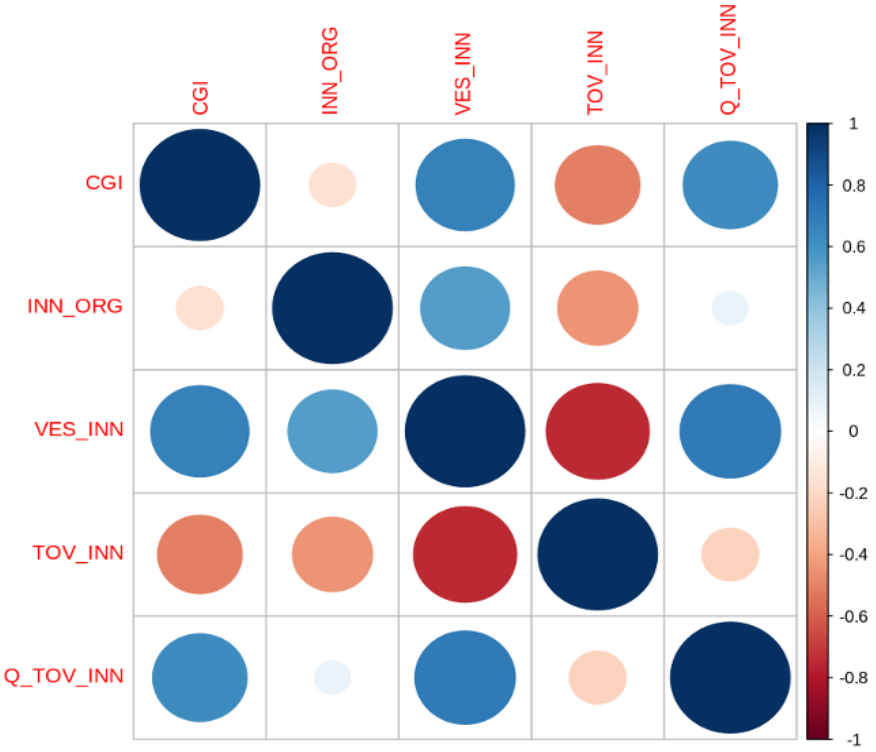

Figure 1. Scatter chart on the Global Competitiveness Index of the Russian economy (GCI) and innovation activity in the economy, 2011-2020

Source: composed by author

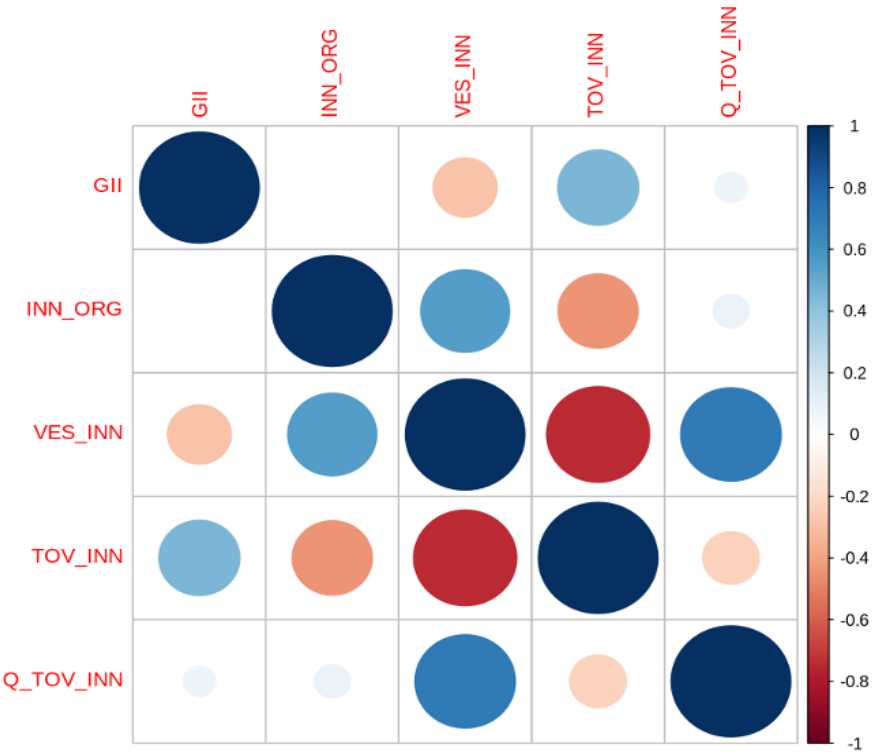

Figure 2. Scatter chart on Global Innovation Index of innovation capacity (GII) and innovation activity in the Russian economy, 2011-2020

Source: composed by author

Table 2 – Results of correlation analysis

	Level of innovation activity of organisations	The share of organisations providing the technological innovation	Share of innovative goods, works and services in the total volume of goods shipped	Volume of innovative goods, works, services, by constituent entities of the Russian Federation, 2011-2020
Global Competitiveness Index (GCI)	None	0.6770629 Strong linear	None	0.6236655 Strong linear
Global Innovation Index (GII)	None	None	None	None

Source: composed by author

Discussion

Generally, the results obtained for the Russian economy confirm the conclusions of López & Aramendía-Muneta (2012); Androniceanu et al. (2020); Fonseca & Lima (2015); Khyareh & Rostami (2022) about the existence of a direct (statistically relevant) correlation between the level of economic competitiveness and innovation activity.

The supplementary hypothesis proposed in the study was not supported by the data provided.

Conclusions

Table 2 shows a clear direct (statistically relevant) correlation between the level of competitiveness of the Russian economy and the share of organisations providing technological innovation, innovative goods, works and services, by constituent entities of the Russian Federation.

The controversial results of the study can be explained by the limitations of the model used (insufficient sampling for correlation analysis; changing methodology for data collection and assessment of complex indicators such as GCI, GII; uncertainty in the conceptual framework (differences in understanding of innovation and national competitiveness phenomena).

Therefore, the hypotheses and results derived will draw attention to applied research on competitiveness of economics of Russia.

References

1. Ollo-López, A., & Aramendía-Muneta, M. E. (2012). ICT impact on competitiveness, innovation and environment. *Telematics and Informatics, 29*(2), 204–210. https://doi.org/10.1016/j.tele.2011.08.002

2. Androniceanu, A. M., Kinnunen, J., Georgescu, I., & Androniceanu, A. (2020). A multidimensional approach to competitiveness, innovation and well-being in the eu using canonical correlation analysis. *Journal of Competitiveness, 12*(4), 5–21. https://doi.org/10.7441/joc.2020.04.01

3. Danurdara, A. B., Darmawan, H., & Kalsum, E. U. (2021). The role of digital innovation and its impact on competitiveness and performance: the case of business hotel in Indonesia. *Quality - Access to Success, 22*(184), 179–185. https://doi.org/10.47750/QAS/22.184.23

4. Fonseca, L. M., & Lima, V. M. (2015). Countries three wise men: Sustainability innovation, and competitiveness. *Journal of Industrial Engineering and Management, 8*(4), 1288–1302. https://doi.org/10.3926/jiem.1525

5. Khyareh, M. M., & Rostami, N. (2022). Macroeconomic Conditions, Innovation and Competitiveness. *Journal of the Knowledge Economy, 13*(2), 1321–1340. https://doi.org/10.1007/s13132-021-00752-7

6. Marčeta, M., & Bojnec, Š. (2021). Innovation and competitiveness in the European Union

countries. *International Journal of Sustainable Economy, 13*(1), 1–17. Available at: https://doi.org/10.1504/IJSE.2021.113316

7. Markin, M., Shkiotov, S., Ugryumova, M., Savicheva, A. (2020). Verification of the Correlation between the Level of National Competitiveness, Quality of Life and Productivity on the Example of the Developed and Developing Countries of the World. *International Journal of Psychosocial Rehabilitation. 24*(3), 2958-2973. DOI: 10.37200/ijpr/v24i3/pr2020329. ISSN:1475-7192

8. Shkiotov, S., Markin, M. (2018). *Competitiveness of countries in the global economy: econometric aspects of analysis: Monograph*. - Yaroslavl: YSTU Publishing House (in Russian)

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Demographic risks, challenges, problems and disparities in the regions of the Central district of Russia

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Abstract. The paper considers the trends of population reproduction in Russia, highlighting its negative phenomena, processes, trends and imbalances. Also the paper dwells on demographic risks, their challenges and imbalances. We try to analyze the dynamics of population, population composition by sex and age, the ratio of urban and rural population, birth and death rates and life expectancy by using data on four regions of the Central Federal District: the Vladimir, Ivanovo, Kostroma and Yaroslavl regions. Also we take into account the factors influencing the dynamics of key demographic indicators and the impact of the coronavirus pandemic on demographic characteristics.

Keywords: demographic risks, threats, problems, imbalances, population greying, population size, depopulation, contracted reproduction, population composition, urban-rural population ratio, infant natality, population mortality, life expectancy, the Vladimir region, the Ivanovo region, the Kostroma region, the Yaroslavl region.

JEL codes: J11; J12; J13; R23

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Introduction

Presidential Decree No. 204 of 7 May 2018 "On the National Development Goals of the Russian Federation for the period until 2030" defines the "population preservation, health and well-being of people" as a primarily one. The problem of demographic preserving of Russia and demographic challenges attracts the attention of specialists from various fields of scientific knowledge – economics, demography, sociology, geography, etc.

The problems of overcoming the demographic crisis in Russia are the issues of the system of social reproduction processes. According to V.A. Gordeev, the study of social reproduction is a fundamental basis for the development of theoretical economics. Over the past 10-15 years in Russia there has been a steady interest to the issues of regional reproduction, because, on the one hand, both the importance of decentralized decisions and the responsibility of the regions for their own socio-economic development has increased, and, on the other hand, the regions contain the reserves to improve economic efficiency to a large extent (Gordeev, 2022).

Specialists highlight the challenges and risks to the country's demographic preserving. We agree with A.V. Kuchumov and E.V. Pecheritsa, possessing the demographic problems as "the catalyst for almost all existing global problems. Demographic issues have become a real global challenge, which prevention requires the efforts of all countries. According to the authors, the main demographic threats are depopulation;

degradation of the family institution; unregulated migration processes; population greying (Kuchumov & Pecheritsa, 2020).

The risks associated with the COVID-19 pandemic are also under study:

- public health risks (personal risk of "facing" COVID-19, risk of becoming ill yourself or someone close to you, risk of increased non-coronavirus-related disease, risk of worsening psychological health, risk of increased mortality);
- risks of creating and preserving families (risk of worsening family understanding in self-isolation or remote working, risk of falling marriage rates, risk of increasing divorce rates, risk of changing reproductive attitudes);
- risks of satisfaction of person's needs in education, acquisition of income (risk of a drop in the quality of education in distance learning settings, loss or reduction of wages and other income);
- risk of migrant situation (migration outflow of population from the region), etc.

There are direct and indirect risks. Sigareva, Sivoplyasova & Pletneva (2020) based their study on population surveys and concluded the less significance of direct risks in terms of demographic situation; in turn the indirect risks associated with a rapid transformation of economic situation. The risks relating to worsening of economic conditions of families, the decline of their material well-being (growing of unemployment, loss of wages and monetary savings) and the risks of spending spree are assessed as high and maximum ones.

The study of risks and their ranking (1 point – minimum risk, 2 points – low risk, 3 points – average risk, 4 points – high risk, and 5 points – maximum risk) allows establishing an effective system of measures to prevent and outcome these risks (Sigareva, Sivoplyasova & Pletneva, 2020).

Considering these demographic and the associated risks, problems and imbalances can be noted as:

- depopulation of the Russian people. Nowadays, there are two paradigms of the family: The first is the modernization paradigm, according to it all negative and positive changes in the family are perceived and interpreted as private, specific manifestations of the general and progressive process of family modernization and population reproduction, replacing one type ("traditional") with another ("modern") within the framework of modernization of the whole society (industrialisation, urbanisation, emancipation of women and children, etc.). The second one is the paradigm of the family crisis including family and values of the family way of life (declining of socio-normative regulation of family life, transformation of cultural symbols and patterns, reduction in the value of marriage, family with children, unity of all family generations) (Berendeeva & Zosimova, 2018).

There is a theory of demographic transition. It includes the transition from "high fertility and heavy mortality" to "low fertility and low mortality", which explains the inevitability of small families. As Sinelnikov (2021) notes, the theory of demographic transition "recognises the unsustainability and childlessness of most modern families as an irreversible and positive phenomenon, integrally associated with the modernization of society". The adherents of this theory ("modernizers") consider this transition as a progressive process, which occurs earlier in some countries and later in others, and which causes depopulation, including the Russian Federation. Pandemic of COVID-19 complicated this process, which led to increasing of mortality rates.

By Table 1, the natural decrease in population in Russia has been accelerating since 2016, while the migration increase since 2018 does not cover the natural decrease. For example, in 2019 population decline in Russia was 0.02%, and in 2020 (COVID-19 pandemic) - 0.39%.

Table 1 – Components of change in the total population of the Russian Federation (thousand people)

Period	Population at 1 January	Changes for the year			Population at 31 December	Total increase for the year, per cent
		total growth	natural increase of the population	positive migration balance		
2015	146,267.3	277.4	32.0	245.4	146,544.7	0.19

Period	Population at 1 January	Changes for the year			Population at 31 December	Total increase for the year, per cent
		total growth	natural increase of the population	positive migration balance		
2016	146,544.7	259.7	-2.3	262.0	146,804.4	0.18
2017	146,804.4	76.0	-135.8	211.8	146,880.4	0.05
2018	146,880.4	-99.7	-224.6	124.9	146,780.7	-0.07
2019	146,780.7	-32.1	-317.2	285.1	146,748.6	-0.02
2020	146,748.6	-577.6	-702.1	124.5	146,171.0	-0.39

Source: Demographic Yearbook of Russia, 2021

According to the Federal State Statistics Service's estimate, the resident population of the Russian Federation was 145.3 million at 1 March, 2022. Since the beginning of the year, the population has decreased by 220,500 or 0.15% (the same period of the previous year it decreased by 156,900 or 0.11%). In January-February 2022, along with natural population decline (-178.7 thousand people) there was a migration outflow (-41.8 thousand people) (Rosstat, 2022).

The depopulation factor of interregional migration flows is relevant for many regions of Central Russia. We analyzed these migrations data on the example of population outflows from the Vladimir, Ivanovo, and Yaroslavl regions to the Moscow agglomeration and showed the role of educational and labour migration of young people in total one (Berendeeva & Berendeeva, 2022);

- depopulation in rural areas. The proportion of the rural population in the Russian Federation was 25.3%, while in the Ivanovo region it was 18.2% and in the Yaroslavl region 18.5% (Regions of Russia, 2021). Researchers write about the demographic shrinkage of the population of small settlements. For example, there observed the reduction of the number of rural settlements in 54 constituent entities of the Russian Federation in 2010-2016. For the management system at the sub-regional level, especially for rural settlements with small population size, the problems of lack of "points of growth" and subsidization of local budgets, low level of entrepreneurial activity are typical (Sosnin & Stolbova, 2018).

The depopulation of small and single-industry towns is on the top. The main economic risks of single-industry towns are related to the crisis of city-forming enterprises, narrow specialization of economic activities (Elizarova & Berendeeva, 2018). At the same time, research shows the similarity of the natural and migratory movements of the population of small towns with those in rural areas in terms of their nature and intensity. In turn, in the large villages located on the suburbs of large cities and regional centres, the demographic processes proceed quite favorably;

- significant demographic differentiation between urban and rural populations. For example, Gayazov, Akhmetova, Utyasheva & Shamsutdinova (2020) show this differentiation by using natural and migratory population growth, total fertility rate, life expectancy, etc.

Batrakova (2021) notes a presence of sustainable and large-scale intra-regional inequality along with inter-regional one.

The statistics show a higher rural than urban migration loss as a result of inter- and intra-regional population migrations (Berendeeva & Berendeeva, 2022). Thus, Tebekin (2021) highlights a chain of socio-demographic problems and economic losses typical for the most regions of the country: reduction of jobs in schools and hospitals as a result of their optimization, the need for labour migration of teachers and doctors, the search for spatially accessible other educational and medical institutions, the need for labour migration for part of the working-age population. It can be concluded that "the availability of social infrastructure facilities – schools and hospitals – is the basis for the development of settlements in the Russian Federation" (Demographic Yearbook of Russia, 2021).

- unregulated migration in Russian regions poses risks of increased crime, drug trafficking, terrorism, epidemics, weapons trafficking, and inter-ethnic conflicts; under-receipt of taxes from the use of illegal

migrant labour, etc. Analyzing the impact of the COVID-19 pandemic, researchers note that "contemporary migration in an increasingly globalized world has itself become a trigger for accelerating the spread of the disease" (Sigareva, Sivoplyasova & Pletneva, 2020).

Today, experts note the poor quality of migration accounting in Russia as a whole and especially in the Moscow and St. Petersburg agglomerations. Migrants have the most difficulties with registration (e.g. migrant statistics according to the Ministry of Internal Affairs and the Federal State Statistics Service differ). It is difficult to assess the intensity of the impact of migration processes on the formation of the region's population clearly, hence an indirect assessment using forecasting methods is used.

This study of interregional and intraregional migration flows shows the existence of migrations of residents of many Central Russian regions permanently or temporarily (on a rotational basis) to the Moscow agglomeration, which is dictated by economic factors: the large number and diversity of vacancies and higher wages in the Moscow agglomeration. The Moscow agglomeration is constantly demanding qualified personnel;

- decline of birth rate, reduction in the birth rate, transition of the family to a nuclear one, and the predominance of a contracted reproduction type. According to the Federal State Statistics Service's sample survey of the reproductive plans of the population (the last survey was conducted in 2017), almost 37% of Russian women aged 18 to 44 participated in the survey had one child, about 27% had two children, about 6% had three, and a little over 1% had four or more children. Almost 30% of Russian women surveyed are childless. The average age of mothers at childbirth has increased. Thus, in 2000-2004, the average age of the mother at the birth of the first-born was 22.3 years, in 2015-2017 it increased by 3.8 years to 26.1 years (Rosstat, 2022).

Typical of the current phenomenon is the conscious avoidance of childbearing (so-called "voluntary childlessness'), which is gaining in popularity at the moment. According to Kobleva (2022), the motivational sphere of voluntary childless partners, especially for women, is more often fulfilled by the motive of professional realization, with the decision not to have a child coming more often from women of reproductive age, who do not want to divert from their career and personal growth to childbirth and the creation of a family. Childless women appear to be more socially adapted compared to mothers in terms of professional qualifications: success and level of professional training.

Kulkova's analysis shows the availability of almost a third of women to change their reproductive plans due to the pension reform. The changes of reproductive behaviour are multidirectional: some women have shown an intention to have more children due to the opportunity to retire earlier than women with few or no children, others to reduce the expected number of children. The main reason for the possible positive impact of the pension reform on women's reproductive behaviour was the opportunity to retire earlier (having three or more children). According to the survey, the negative impact of the pension reform on the birth rate is related to a possible reduction of grandparents' support in taking care of children due to the increased retirement age, as almost 60% of women expect such support if they have children (Kulkova, 2021).

There is an opinion about the negative impact of COVID-19 pandemic on reducing fertility and transforming reproductive behaviour (Sigareva, Sivoplyasova & Pletneva, 2020).

For the most families the financial situation declines with the birth of a child. For example, a study by Arkhangelskiy, Elizarov & Dzhanaeva (2021) has shown the difference of families intending and do not intending to have another child by four parameters. "Families who are going to have another child, have, on average, a lower number of existing children (i.e. they are more likely to have the intention of having their first and second child), a higher importance of children and a lower "loss" in importance to material well-being, higher average per capita income and a relatively higher estimate of the standard of living of the family".

- Russia's total fertility rate declined year by year from 23.2 ppm (1960) to 15.7 (1965), 13.4 (1990), 8.3 (1999), 13.3 (2012), 12.9 (2016), 10.9 (2018), 9.8 (2020);

- the total fertility rate (TFR) declined from 2.417 (1961-1962), to 1.193 (1995), 1.045 (1999). There was an increase: 1,189 (2002), 1,439 (2010), 1,672 (2016), 1,579 (2018), 1,505 (2020). But the reserves for growth of this indicator are exhausted and, in general, there remains a contracted reproduction of the country's

population (the limit of simple reproduction for Russia is 2.1-2.15) (Regions of Russia, 2021);

- net reproduction rate provides the replacing the generation of women by their daughters while maintaining the same fertility and mortality rates over time.) It declined from 1.1 (1961-1962) to 0.54 (1999) and 0.84 (2016), 0.72 (2020). The reduction of the rural population has a negative impact on the reproduction of the Russian population: the net reproduction rate for the rural population (0.83) is higher than for the urban population (0.686) (Demographic Yearbook of Russia, 2021).

One of the factors providing decline of Infant natality (along with the demographic transition) is the decline in the number of women of reproductive age. As shown in Table 2, in 2021 the number of women in the 20-24 years is 2.67 million lower than in 2010, and the 25-29 years by almost 1.8 million lower. The majority of newborns are born by the women of 20-29 years. But since 2009, the maximum number of births in Russia has been between the women' ages of 25-29, rather than 20-24, i.e. the birth of the first child is postponed by women (Demographic Yearbook of Russia, 2021).

Table 2 – Number of women of primary reproductive ages in the Russian Federation, by year

Period	2010	2019	2020	2021
Total women aged 15-49*	37 227 890	34 683 401	34 502 030	34 182 566
20–24 years	5 999 283	3 486 971	3 380 456	3 329 784
25–29 years	5 972 314	5 007 956	4 598 561	4 181 285
30–34 years	5 545 999	6 332 379	6 276 114	6 151 363

Source: Demographic Yearbook of Russia, 2021

As shown in Figure 1, the number of women of primary reproductive age in the Russian Federation is declining. Since 2010 it raised from the 20-29 age groups to the 30-34 age group in 2019. It may have a negative impact on the total number of births;

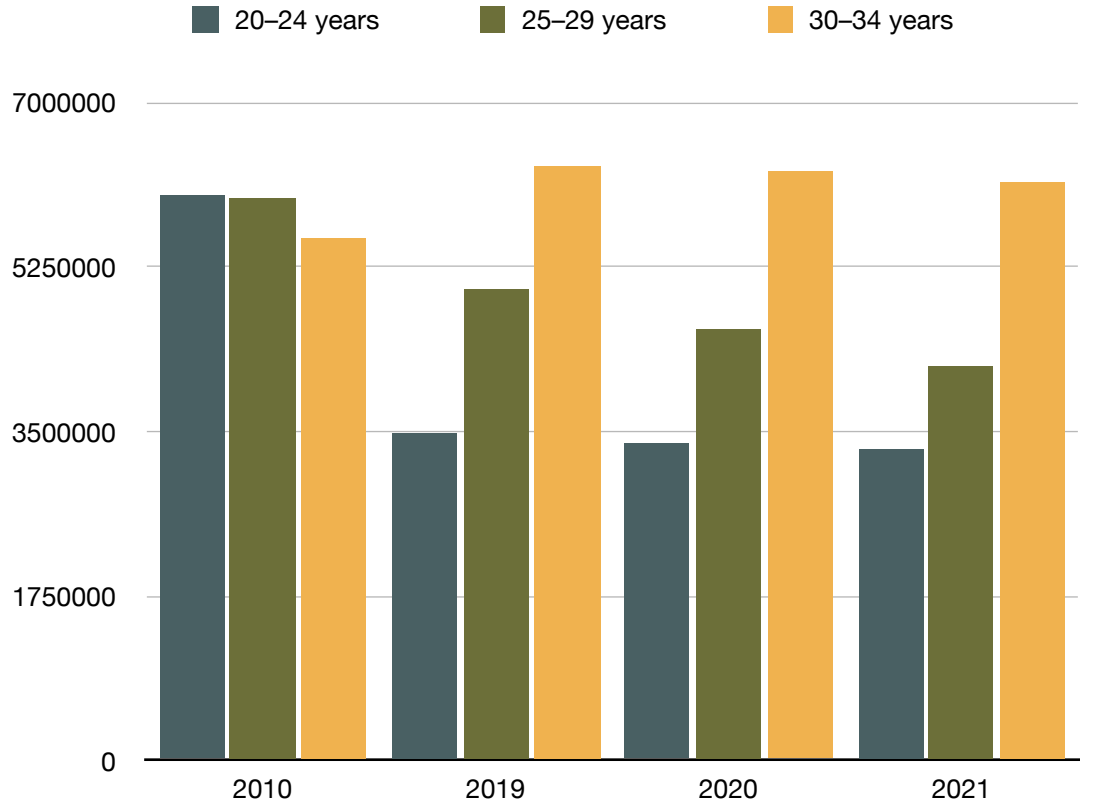

Figure 1. Dynamics of the number of women of primary reproductive age in the Russian Federation in 2010, 2019, 2020 and 2021, thousand people

Source: composed by authors

- population greying One distinguishes between "ageing from below" as a gradual decrease in the number of children due to a decline of birth and "ageing from above" as an increase in the number of older people due to decreasing of mortality in old age and a slow increase in the number of children. Population greying defines by the follows:

(a) The average age of the population as at 1 January was 34.9 (1990), 37.6 (2002), 38.9 (2010), 39.7 (2017). Thus, the average age of a Russian has risen by 4.8 years since 1990;

(b) the percentage of people over the working age has increased in Russia from 20.5% (2005) to 25.4% (2017) of the total population at the end of the year (Regions of Russia, 2021).

By Dobrohleb & Barsukov (2020), in some countries there is a decline in economic growth caused by a significant increase in the proportion and size of the older generation. As the authors note, "Russia... after the demographic dividend implementation phase is in an intermediate state between "aging from below" and "aging from above" due to the fact that fertility is at a fairly low level, and mortality at older ages is still significantly higher than in developed countries.

- Gender imbalance (asymmetry of the sexes) in the Russian sex and age pyramid. The gender imbalance is less in regions with a younger population. Accordingly, this difference is maximum one in the Central and North-West Federal Districts, where the rate of greying is higher, and minimum in the North Caucasus Federal District, where the proportion of young people is higher. Our study shows the determining impact of population pressure coefficients and total infant natality rates on the ratio of men to women in Russian regions; in particular, declining of infant natality depends on ageing and increasing population pressure;

- declining of the indicators of the public health. Since the 1960s, there has been an increase in the total mortality rate of the population: 7.4 ppm (1960), 15.0 (1995), 16.4 (2003), 14.2 (2010), 12.9 (2016). Male over-mortality persists, the age-specific male mortality rates exceeding those of females many times, especially at the working age (not typical for developed countries). The main resource for increasing life expectancy in our country for older age groups (over 50 years) is the reduction of mortality, primarily by diseases of the circulatory system and cancers, and for younger age groups, especially men, the reduction of mortality by external causes, which are responsible for the greatest demographic and socio-economic damage (Sizova & Berendeeva, 2021).

Thus, the purpose of this study is to analyze the dynamics of the main demographic indicators in the regions of Central Russia and the impact of these indicators on the prospects of population reproduction.

Methods

The methodological basis of our study consist in comparative analysis of statistical indicators by the Federal State Statistics Service of the Russian Federation on demography in the constituent entities of the Russian Federation, and scientific papers on the analysis of the demographic situation and demographic structures (by sex and age), demographic processes (infant natality, mortality, family formation, etc.) and phenomena (childlessness, voluntary childlessness, etc.) in Russian regions.

Results

We analyzed data on the main demographic indices using Federal State Statistics Service data on the example of the Central Federal District (CFD) regions – Vladimir, Ivanovo, Kostroma and Yaroslavl regions

The main demographic indices are population size, urban/rural population ratio, male/female ratio, age composition, birth rates (total crude birth rate and aggregate birth rate), mortality (total crude death rate), natural increase/decline, life expectancy.

We analyzed the population size dynamics of the regions. By Table 3, the population of the Vladimir, Ivanovo, Kostroma and Yaroslavl regions is declining: in 2005-2020 in the Vladimir region it declined from 1486 to 1342 (by 144 000 or 9.7%), and in the Ivanovo region from 1102 to 987 (by 115 000 or 10.4%), or 9.7%), in the Kostroma region from 700 to 628 (by 72 thousand persons or 10.3%), in the Yaroslavl region from 1313 to 1241 (by 72 thousand persons or 5.5%).

The population of the CFD is growing due to Moscow (in 2005-2020 from 10924 to 12655 thousand people, or 15.8%) and the Moscow region itself (from 6784 to 7708 thousand people, or 13.7%).

Table 3 – Population in the CFD (estimate at the end of the year; thousand people)

Period	2005	2010	2015	2018	2019	2020	Declining / growth for 2005-2020
Russian Federation	143,236	142,865	146,545	146,781	146,749	146171	+2.0
Vladimir region	1 486	1 441	1 397	1 366	1 358	1342	-9.7
Ivanovo region	1 102	1 060	1 030	1 004	997	987	-10.4
Kostroma region	700	666	651	637	633	628	-10.2
Moscow region	6 784	7 106	7 319	7 599	7 691	7708	+13.7
Yaroslavl region	1 313	1 271	1 272	1 260	1 254	1241	-5.5
Moscow	10 924	11 541	12 330	12 615	12 678	12655	+15.8

Source: Regions of Russia, 2021

Figure 2 shows the depopulation trend for these regions. Ivanovo and Kostroma regions have the highest rates of population decline among these 4 regions.

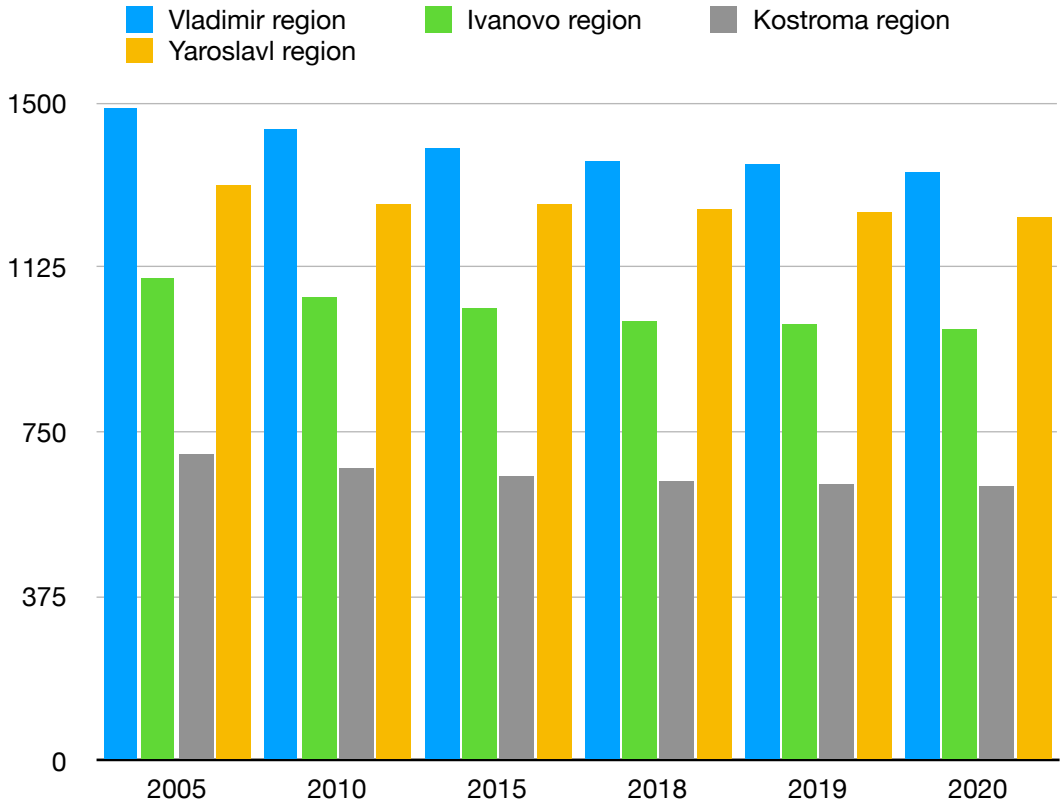

Figure 2. Regional population dynamics for 2005-2020, thousand people

Source: composed by authors

The majority of the population in these regions as in Russia as a whole lives in urban areas. The percentage of the urban population in 2020 is (in descending order) 81.8% in the Ivanovo region, 81.5% in the Yaroslavl region, 78.2% in the Vladimir region, 73.0% in the Kostroma region (Regions of Russia, 2021).

We analyzed male/female ratio in Russia. If in the country as a whole in 2020 there were 1165 women

per 1000 men, the same ratio was 1158 in the Vladimir region, 1206 in the Ivanovo region, 1174 in the Kostroma region, 1224 in the Yaroslavl region, which indicates a gender imbalance of the population, which is most noticeable in the Yaroslavl and Ivanovo regions.

Scientific literature on demography and migration studies considers the main factors influencing gender imbalance:

(a) Biological factors: predominance of boys among newborns (the ratio of girls among newborns used in calculations, including in the mortality table, is 0.488), women higher life expectancy;

(b) gender's differences in mortality (Russia has a male over-mortality rate and, consequently, a men lower life expectancy);

(c) a structural factor: a high proportion of the older generation, dominated by women, and a low proportion of young people under 30, dominated by men (this factor is a consequence of the low birth rate since the 1990s in Russia and the higher mortality of men, especially those of working age);

(d) different intensity of male and female migration (predominance of male migration) (Sizova & Berendeeva, 2021).

The gender imbalance in active reproductive age affects the socio-demographic problems of society: due to the high mortality of men of these ages there is an absence of husbands and fathers in families and grooms in the marriage market and, all other things being equal, it affects the decline of the birth rate. Potential mothers are unable to realize their reproductive attitudes due to the absence or loss of a marital partner. At the same time, state expenditure on support for single-parent families, orphans and children left without parental care, survivor pensions, etc., is increasing.

Also we analyzed the age composition of the population. By Table 4, between 2005 and 2020, the population under working age in the regions under study increased slightly: in the Vladimir region from 14.4% to 16.6%, in the Ivanovo region from 14.4% to 16.4%, in the Kostroma region from 15.4% to 18.4%, and in the Yaroslavl region from 14.3% to 17.4%. The working-age population declined from 61.3% to 54.4% (by 6.9%) in the Vladimir region, from 60.8% to 55.0% (by 5.8%) in the Ivanovo region, from 61.7% to 53.5% (by 8.2%) in the Kostroma region and from 61.2% to 54.5% (by 6.7%) in the Yaroslavl region. At the same time, the percentage of people above the working age has been growing and reached 28.1-29% in the regions (2020). With the raising of the retirement age in 2019, a retirement schedule has been drawn up by year of birth with a transition to the retirement age of 65 for men and 60 for women.

Table 4 – Age composition of the population in the regions (estimate at the end of the year; as a percentage of the total population)

Period	Below working age population		Working age population		Population above working age	
	2005	2020	2005	2020	2005	2020
Vladimir region	14.4	16.6	61.3	54.4	24.3	29.0
Ivanovo region	14.4	16.4	60.8	55.0	24.8	28.6
Kostroma region	15.4	18.4	61.7	53.5	22.9	28.1
Yaroslavl region	14.3	17.4	61.2	54.5	24.5	28.1

Source: Regions of Russia, 2021

By Figure 3, from 2005 to 2020, the percentage of working-age population in the Yaroslavl region decreased and the percentage of people above working age increased. The situation is similar for all the regions under study.

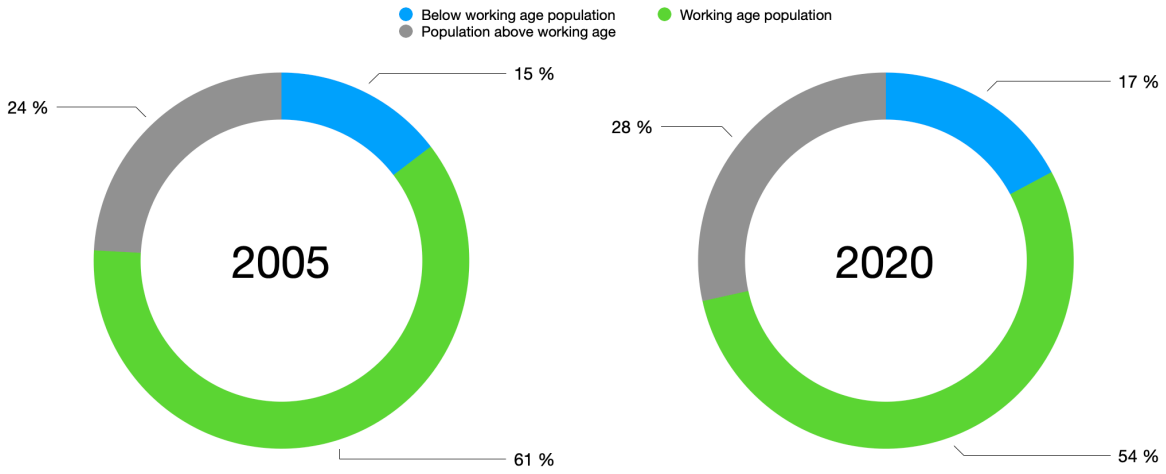

Figure 3. Population composition by age in the Yaroslavl region in 2005 and 2020, as a percentage of the total population

Source: composed by authors

The demographic burden coefficient (per 1,000 people of working age are incapable of work) as of January 1, 2021 (in descending order: in the Kostroma region – 870 people, in the Vladimir region – 838, in the Yaroslavl region – 836 and in the Ivanovo region – 817 (Regions of Russia, 2021).

We analysed the birth rates for 4 regions of the CFD. By Table 5, the total birth rate has reduced for all the regions during 2005-2020 in the Vladimir region – from 9.1 to 7.5 ppm (%), in the Ivanovo region – from 8.7 to 7.6%, in the Kostroma region – from 9.8 to 8.5%, in the Yaroslavl region – from 9.3 to 8.5%. The lowest birth rate is in the Vladimir region (79-th in the Russian Federation) and in the Ivanovo region (78-th in the Russian Federation), 0.9 ppm lower than in the Kostroma and Yaroslavl regions respectively.

Table 5 – Total birth rate (number of births per 1,000 population, ppm)

Period	2005	2010	2015	2018	2019	2020	Rank, Russian Federation, 2020
Russian Federation	10.2	12.5	13.3	10.9	10.1	9.8	-
The Central Federal District	8.7	10.7	11.7	9.9	9.3	9.0	8
Vladimir region	9.1	10.8	11.6	9.3	8.1	7.5	79
Ivanovo region	8.7	10.4	11.4	9.0	7.9	7.6	78
Kostroma region	9.8	12.1	12.5	9.7	9.1	8.5	61
Yaroslavl region	9.3	11.2	12.2	9.8	8.9	8.5	60

Source: Regions of Russia, 2021

By Figure 4, in 2020 in all 4 regions under study the total birth rates decreased compared to 2015: in the Vladimir region – by 4.1, in the Ivanovo region – by 3.8, in the Kostroma region – by 4.0, in the Yaroslavl region – by 3.7 ppm.

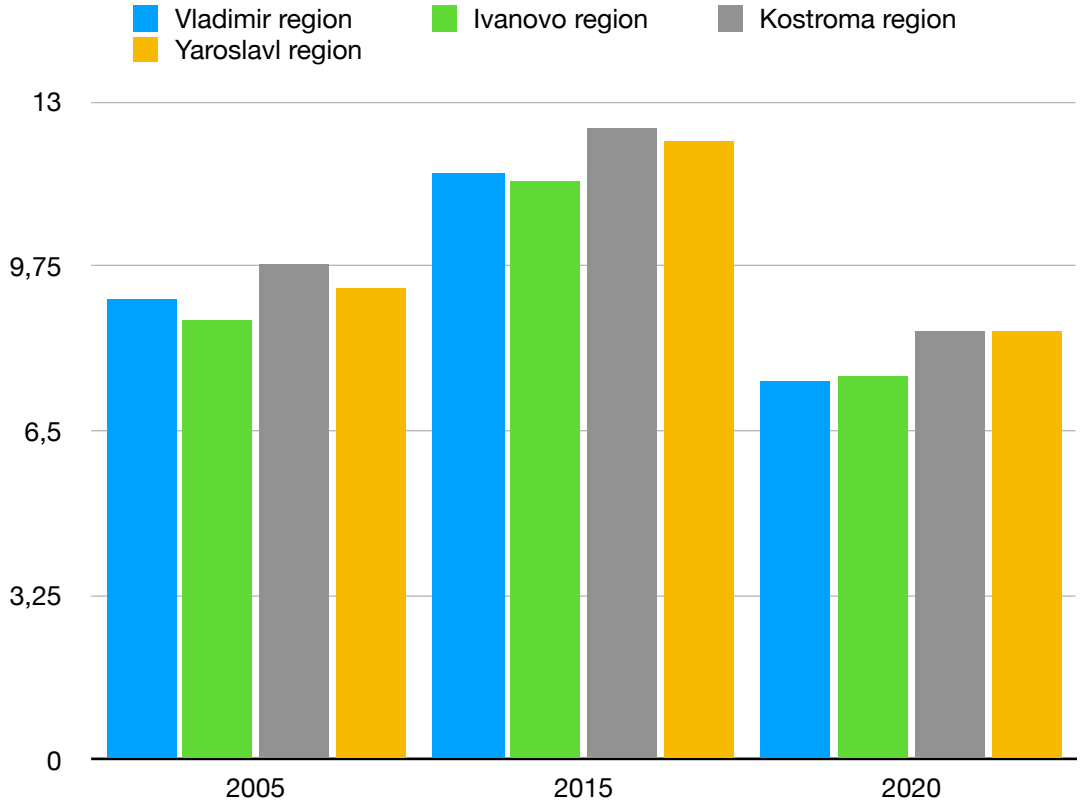

Figure 4. Dynamics of total birth rates in the regions in 2005-2020, ppm
Source: composed by authors

We analyzed the aggregate birth rate (ABR). By Table 6, over the period 2005-2020 the ABR in the regions under study was growing and reached a maximum in 2015 for the Vladimir region – 1.730, the Ivanovo region – 1.829, the Kostroma region – 1.890, the Yaroslavl region – 1.695. In the following years there was a decline in the ABR, but as a result, since 2005 the ABR has grown slightly: from 1.252 to 1.268 (by 0.016) in the Vladimir region, from 1.183 to 1.239 (by 0.056) in the Ivanovo region, from 1.334 to 1.464 (by 0.13) in the Kostroma region, and from 1.254 to 1.364 (by 0.11) in the Yaroslavl region. Thus, the Kostroma and Yaroslavl regions have the best growth rates.

Table 6 – Aggregate birth rate (number of children per woman)

Period	2005	2010	2015	2018	2019	2020
Russian Federation	1.294	1.567	1.777	1.579	1.504	1.505
The Central Federal District	1.160	1.367	1.575	1.441	1.396	1.407
Vladimir region	1.252	1.462	1.730	1.491	1.355	1.268
Ivanovo region	1.183	1.398	1.629	1.403	1.270	1.239
Kostroma region	1.334	1.650	1.890	1.610	1.543	1.464
Yaroslavl region	1.254	1.487	1.695	1.465	1.373	1.364

Source: Regions of Russia, 2021

We analyzed the mortality rate for 4 regions of the CFD. By Table 7, the crude mortality rate in the

regions in 2005-2020 have decreased: in the Vladimir region – from 20.2 ppm to 18.3 ppm, in the Ivanovo region – from 22.0 to 17.7 ppm, in the Kostroma region – from 21.3 to 16.7 ppm, in the Yaroslavl region – from 20.1 to 17.3 ppm. The highest crude mortality rate is in the Vladimir region (81-st in the Russian Federation in 2020) and Ivanovo region (76-th). Infant mortality rate is the lowest in the Ivanovo Region (18-th place in Russia) and Yaroslavl Region (21-st place in Russia).

Table 7 – Crude mortality rates (number of deaths per 1000 population, ppm)

Period	The crude mortality rate *						Neonatal mortality rate**	
	2005	2010	2015	2018	2019	2020	Rank,	
Russian Federation	16.1	14.2	13.0	12.5	12.3	14.6	-	4.5
The Central Federal District	17.1	15.2	13.5	12.9	12.6	15.1	6	3.9
Vladimir region	20.2	18.0	16.5	16.0	15.6	18.3	81	6.0
Ivanovo region	22.0	18.4	16.0	16.1	15.8	17.7	76	3.7
Kostroma region	21.3	17.7	16.0	14.9	14.7	16.7	62	7.7
Yaroslavl region	20.1	17.2	15.6	14.9	14.7	17.3	70	3.7

** number of deaths per 1,000 population*

*** (number of children died before the age of 1 year per 1,000 live births)*

Source: Regions of Russia, 2021

By Figure 5, the positive reduction of mortality trend in Russian regions since 2005 reversed in 2020, when the indicators increased due to the coronavirus pandemic. Compared to 2019, the mortality rate increased in the Vladimir region by 2.7 ppm, the Ivanovo region by 1.9 ppm, the Kostroma region by 2.0 ppm and the Yaroslavl region by 2.6 ppm.

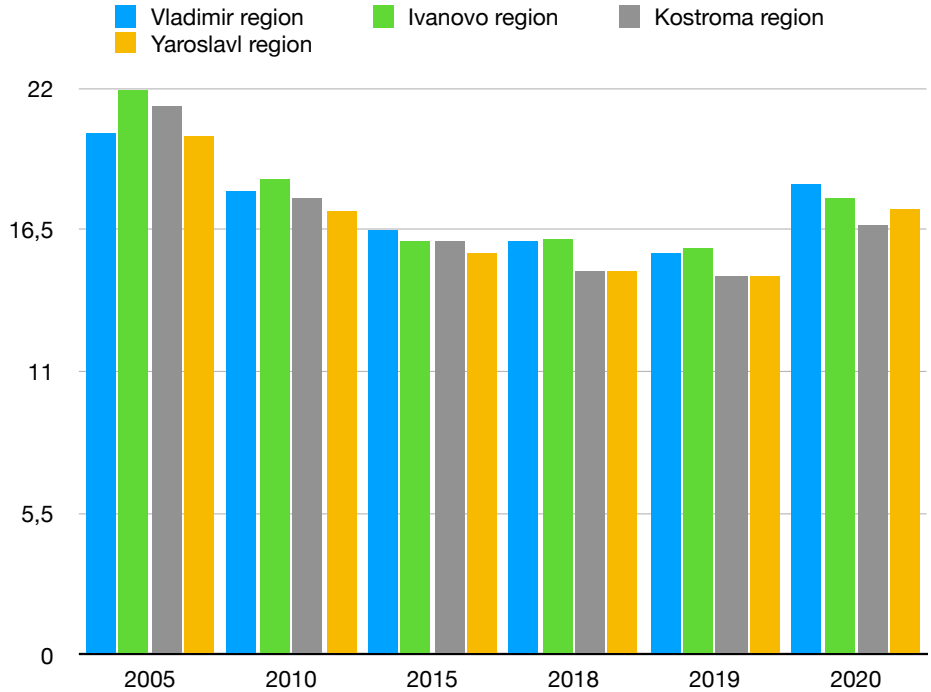

Figure 5. Dynamics of total mortality rates in the regions in 2005-2020, ppm

Source: composed by authors

The number of deaths per 100,000 inhabitants was 679.1 in the Vladimir region, 632.5 in the Ivanovo region, 581.4 in the Kostroma region and 616.2 in the Yaroslavl region. For example, in Moscow the index is 374.0. By Table 8, mortality rate excluding external causes is still higher in the Vladimir region (1,772 per 100,000 inhabitants) and lower in the Kostroma region (1,580.8 per 100,000 inhabitants).

Table 8 – Population mortality (without mortality rate from external causes) (number of deaths per 100,000 inhabitants)

Period	2011	2015	2018	2019	2020
Russian Federation	1 207,6	1 182,3	1 147,1	1 131,5	1 364,9
The Central Federal District	1 278,6	1 244,5	1 206,2	1 180,9	1 423,9
Vladimir region	1 564,7	1 518,2	1 495,7	1 452,4	1 722,0
Ivanovo region	1 545,0	1 489,7	1 501,3	1 490,7	1 672,8
Kostroma region	1 489,7	1 468,0	1 389,1	1 377,2	1 580,8
Yaroslavl region	1 431,0	1 419,4	1 383,8	1 362,3	1 624,3

Source: Regions of Russia, 2021

A positive trend is the decline of mortality in the working-age population in all regions under study from 2005 to 2019. In 2020 there is an increase due to the coronavirus pandemic. However, the rates in the regions under study are higher than in the Central Federal District and Russia as a whole. The highest mortality rate of the working-age population is in the Vladimir region (see Table 9).

Table 9 – Mortality of working-age population (number of deaths per 100,000 inhabitants)

Period	2005	2010	2015	2019	2020
Russian Federation	827.8	634.0	546.7	470.0	548.2
The Central Federal District	793.7	599.3	496.8	435.2	521.8
Vladimir region	1 040,3	800.8	654.0	562.3	679.1
Ivanovo region	1 168,1	787.3	614.0	562.6	632.5
Kostroma region	1 062,1	750.7	592.4	512.7	581.4
Yaroslavl region	1 031,0	714.2	585.1	506.8	616.2

Source: Regions of Russia, 2021

We analyzed the natural increase /decline of the population of the 4 regions. By Table 10, in spite of the reduction of crude mortality rate over 2005-2020, there was a decrease of crude birth rate, which in 2020 was lower than crude mortality rate in the Vladimir region by 10.8%, the Ivanovo region – by 10.1%, the Kostroma region – by 8.2%, the Yaroslavl region – by 8.8%. In 2020, the crude mortality rate was 2.44 times higher than the crude birth rate in the Vladimir region, 2.33 times higher than in the Ivanovo region, almost 2 times higher than in the Kostroma region, and 1.34 times higher than in the Yaroslavl region.

Life expectancy is growing, but its level is low: in Russia as a whole in 2020. – 71.54, in Central Federal District – 72.57, in the Vladimir region – 70.03, in the Ivanovo region – 70.66, in the Kostroma region – 70.92, in the Yaroslavl region – 70.94. The results show the difference between males and females life expectancy for regions under study ranges from 10.25 to 10.79 years (see Table 11).

Table 10 – Birth rate, mortality rate and natural population decline of Russian regions, ppm

Period	2005			2015			2020		
	crude birth rate	mortality rate	natural decrease	crude birth rate	mortality rate	natural decrease	crude birth rate	mortality rate	natural decrease
Vladimir region	9.1	20.2	-11.1	11.6	16.5	-4.9	7.5	18.3	-10.8
Ivanovo region	8.7	22.0	-13.3	11.4	16.0	-4.6	7.6	17.7	-10.1
Kostroma region	9.8	21.3	-11.5	12.5	16.0	-4.5	8.5	16.7	-8.2
Yaroslavl region	9.3	20.1	-10.8	12.2	15.6	-3.4	8.5	17.3	-8.8

Source: Regions of Russia, 2021

Table 11 – Remaining life expectancy of the population in 2020

	Total population	Rank, Russian Federation	Males	Females	Difference of males and females remaining life expectancy
Russian Federation	71.54	x	66.49	76.43	9.94
The Central Federal District	72.57	2	67.69	77.24	9.55
Vladimir region	70.03	65	64.59	75.30	10.71
Ivanovo region	70.66	45	65.14	75.91	10.77
Kostroma region	70.92	43	65.73	75.98	10.25
Yaroslavl region	70.94	42	65.40	76.19	10.79

Source: Regions of Russia, 2021

The main demographic indicators also include overall marriage and divorce rates. We have not considered them in the analysis, as these indicators only reflect registered marriages and divorces and do not reflect civil marriages and divorces. According to the Federal State Statistics Service, there are divorces per 1,000 registered marriages: 708 in the Vladimir region, 839 in the Ivanovo region, 854 in the Kostroma region, 713 in the Yaroslavl region.

Discussion

The main demographic threats are depopulation of the Russian people, demographic shrinkage of the population in small settlements, declining population size in rural areas, decreasing of the birth rates and the transition of families to nuclear ones, the predominance of contracted reproduction, unregulated migration processes, and population greying.

The risks and challenges include a significant differentiation in demographic indicators between urban and rural populations, a decline in the number of women of reproductive age, an increase in the average age of the mother at childbirth and postponement of the first child, deliberate refusal to have children, and decreasing indicators of the public health. There is an imbalance in Russia's regions in terms of gender and certain age groups of the population.

The risks related to the COVID-19 pandemic are: risks to public health, risks to family formation and

preservation, risks to human needs in education, receiving an income, risks to migrants, etc.

Conclusions

Our analysis for 2005-2020 shows the typical trends of depopulation for the regions under study – Vladimir, Ivanovo, Kostroma and Yaroslavl. Ivanovo and Kostroma regions have the highest rates of population decline. The population imbalance by gender is most evident in the Yaroslavl and Ivanovo regions.

These regions are characterized by "ageing from below" as a gradual decrease in the number of children due to a decline of birth and "ageing from above" as an increase in the number of older people due to decreasing of mortality in old age and a slow increase in the number of children. The demographic burden coefficient is the highest in the Kostroma region. These regions are characterized by an increase in the percentage of the population above working age and a decrease in the percentage of the population of working age.

The lowest birth rates are in the Vladimir and Ivanovo regions. The aggregate birth rate in the regions was rising and peaked in 2015, then declined and is now below the replacement level in these regions and corresponds to a sub-replacement type of the birth rate.

The crude mortality rate were declining until 2019. Since 2020, crude mortality rates have increased in these regions due to the effects of the coronavirus pandemic. The highest crude mortality rate is in the Vladimir and Ivanovo regions. A positive trend is the decline of mortality in the working-age population in all regions under study. The highest mortality rate of the working-age population is in the Vladimir region. The infant mortality rate is lowest in the Ivanovo and Yaroslavl regions.

References

1. Arkhangelsky, V. N., Elizarov, V. V., & Dzhanaeva, N. G. (2021). Children or Material Prosperity: Determination of Choice. *Uroven' zhizni naseleniyar egionov Rossii, 17*(1), 102-120. Retrieved from https://doi.org/10.19181/lsprr.2021.17.1.8 (in Russian).

2. Batrakova, L. G. (2021). Social and economic inequality of Russian regions. *Teoreticheskaya Ekonomika, 82*(10), 125-128. Retrieved from http://theoreticaleconomy.ru/index.php/tor/issue/view/11 (in Russian).

3. Berendeeva, A. B., & Berendeeva, O. S. (2022). Competition between the regions of the center of Russia for migration flows of the population: assessment and consequences. *Journal of Regional and International Competitiveness*, (1), 42-54. Retrieved from http://jraic.com/index.php/tor

4. Berendeeva, A. B., & Zosimova, L. A. (2018). *Fundamentals of demography.* Ivanovo: Ivanovo branch of the Private Educational Institution of Higher Professional Education "Institute of Management". «Informatika» (in Russian).

5. Gayazov, A. S., Akhmetova, G. F., Utyasheva, I. B., & Shamsutdinova, N. K. (2020). Socio-territorial features of natural and migration movement of the region's population in the Republic of Bashkortostan. *Sociologicheskie issledovaniya,* (12), 75-86 (in Russian).

6. Gordeev, V. A. (2022). The study of social reproduction - the fundamental basis for the development of theoretical economics. *Teoreticheskaya Ekonomika, 85*(1), 130-135. Retrieved from http://theoreticaleconomy.ru/index.php/tor/issue/view/14 (in Russian).

7. Dobrohleb, V. G., & Barsukov, V. N. (2020). Population Greying in Russia and China: Features and Socio-Economic Risks. *Uroven' zhizni naseleniya regionov Rossii, 16*(4), 36-48 (in Russian).

8. Elizarova, A. A., & Berendeeva, O. S. (2018). Risks of socio-economic development of single-industry towns in Russia. *Mnogourovnevoe obshchestvennoe vosproizvodstvo: voprosy teorii I praktiki: sb. nauch. tr.* Ivanovo: Ivanovskii gosudarstvennyi universitet, (15), 28-36 (in Russian).

9. Kobleva, Z. Kh. (2022). The phenomenon of deliberate childlessness in the conditions of transformation of family-marital relations. *Uroven' zhizni naseleniya regionov Rossii, 18*(1), 72-78 (in Russian).

10. Kulkova, I. A. (2021). The impact of raising the retirement age on women's reproductive intentions. *Sociologicheskie issledovaniya,* (5), 94-101 (in Russian).

11. Kuchumov, A. V., & Pecheritsa, E. V. (2020). Threats and risks of demographic security in the Russian Federation. *Tekhniko-tekhnologicheskie problemy servisa,* (4), 116-122 (in Russian).

12. Sigareva, E. P., Sivoplyasova, S. Yu., & Pletneva, Yu. E. (2020). Risks of demographic development under pandemic conditions. *Nauka. Kul'tura. Obshchestvo*, *26*(4), 98-116 (in Russian).

13. Sizova, O. V., & Berendeeva, A. B. (2021). *Demography of Russian Regions: Modelling Methods in the Analysis of Demographic Processes.* Ivanovo: Ivanovo State Chemical Engineering University (in Russian).

14. Sinelnikov, A. B. (2021). Demographic transition and family and demographic policy. *Sociologicheskie issledovaniya,* (10), 83-93 (in Russian).

15. Sosnin, D. P., & Stolbova, E. A. (2018). Territorial organization of local self-government facing the challenge of demographic contraction (on the example of Kursk region). *Regional'naya vlast', mestnoe samoupravlenie I grazhdanskoe obshchestvo: mekhanizmy vzaimodejstviya: sb. nauch. trudov II Vseros. nauch.-prakt. konf.* (pp. 88-92). Saratov: Povolzhskii in-t upravleniia im. P.A. Stolypina - filial FGBOU VPO Rossiiskaia akademiia narodnogo khoziaistva i gosudarstvennoi sluzhby pri Prezidente Rossiiskoi Federatsii (in Russian).

16. Tebekin, A. V. (2021). Analysis of the problems of the development of settlements in Russian Federation. *Teoreticheskaya ekonomika, 78*(6), 82-93. Retrieved from http://theoreticaleconomy.ru/index.php/tor/issue/view/7 (in Russian)

17. *Demographic Yearbook of Russia: Stat. coll. / Rosstat.* (2021). M. Retrieved from https://rosstat.gov.ru/storage/mediabank/dem21.pdf (accessed 26.04.2022) (in Russian).

18. *Source: Regions of Russia. Regions of Russia. Socio-economic indicators. 2021: stat. coll.* / *Rosstat* (2021). M. (in Russian).

19. Federal State Statistics Service. (2022). *Results of a sample survey of the population's reproductive plans in 2017.* Retrieved from https://rosstat.gov.ru/itog_inspect (accessed 26.04.2022).

20. Federal State Statistics Service. (2022). *Socio-economic Situation of Russia, January-March 2022.* Retrieved from https://rosstat.gov.ru/storage/mediabank/osn-03-2022.pdf (accessed 26.04.2022).

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Express assessment of the investment attractiveness and competitiveness of regional territories

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Abstract. The article considers the problem of developing a methodology for express assessment of investment attractiveness of territories of a region in conditions of incomplete information about the indicators for assessing the territory or the complexity of their formalisation. We use the methodology based on an expert assessment of the macroeconomic factors of the region and their processing using the tools of the hierarchy analysis method by T. Saati. The study allows for a sufficiently reliable numerical assessment of the attractiveness of individual territories in the region and the construction of a scale of their priority. The study dwells on the steps involved in assessing the investment attractiveness of a site by means of hierarchy analysis and proposes the basic criteria for assessing the territories of the regions. It contains the examples of the construction of pairwise comparison matrices. The paper makes conclusions on the integral indicator data, and a competitiveness (priority) ranking scale of territories is constructed based on the objective set. The express methodology of assessing the investment attractiveness of the territory presented in the article allows to analyze and assess the factors of the territory, justify the decision-making in conditions of uncertainty of the assessing factors, develop an integrated indicator of competitiveness of the analyzed territories of the region, make a rating scale of their priority for the investment prospects and development plans of the territory.

Keywords: investment attractiveness, territory competitiveness, hierarchy method, pairwise relationship matrix, territory evaluation criteria, evaluation methodology, integral criterion, rating scale, polygon method, "ideal point" method, ranking method, linguistic evaluation scale.

JEL codes: C89; E29; O18; R15

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Introduction

In order to develop the economy, regions intensify the fight for ratings of investment attractiveness (competitiveness) of their territory, as well as territories within the region. The issues of assessing the investment attractiveness or competitiveness of the region are researched well in the modern economic literature. There have been developed a lot of methods for quantitative assessing the competitiveness of the territory. Some methods use the major factor of territory attractiveness, while others try to identify many factors.

Substantiation for the choice of methodology depends on the objectives facing the investor, his strategic planning, the speed of assessment, the form of the result, etc. The mistakes of analysts of the economic development department of state institutions, as well as interested business structures in assessing the investment potential of the region, underestimation of the impact of various macroeconomic factors lead to under-received income in the implementation of the investment project.

The current methods of assessing the specific advantages of the territories of the region are not normative. Thus, changing of the decision-making approaches to the introduction of innovations due to digitalization

requires adaptation of existing methods to assess the attractiveness of the territories of the region.

The assessment of the attractiveness of the territories of the region is correlated with the quantitative indicator of the required investments can change the nature of the region social production, reveal the potential of the territory through structural shifts in its national economic complex, and ensure an innovative type of economic development. Each area of the region has many attractive places for investment. Due to the importance of directly depending on the amount of investment on the potential of the territory development, which is a function of the level of its investment attractiveness, the development of express assessment methods of investment attractiveness (competitiveness) of the territory for its preliminary analysis is relevant issue.

Methods

The investment attractiveness of the territory is considered by scientists as a set of regional factors of macro-, meso- and micro-level, contributing to the investment process (Barinov, 2017); different factors, depending on the goals of the investor (Valinurova, 2017); the forecast of ensuring returns with minimal risks (Glazyrin, 2014); investment potential and the level of non-profit investment risks (Narolina, 2009), etc. By the Law of the Russian Federation N 135-FZ (ed. from 05.10.2015) "On Protection of Competition" it is interpreted as the competitiveness of economic entities.

All of the definitions of the investment attractiveness of the territory contain the common issues: competitiveness, regional factors, return and investment risk. The reason is the serious investment in the region requires a thorough assessment of the investment attractiveness of its territory, consisting of many factors with unpredictable value of the final result.

The indicator of investment attractiveness of the territory characterizes the degree of its competitiveness in relation to other territories to attract labor, capital, innovation (Kosobutskaya & Ravuangirina, 2019). Therefore, along with the attractiveness of the territory, it is possible to specify the terms of analogues: competitiveness of the territory, the relative economic position in the region, the comparative success. Interpretation of definitions is appropriate to apply from the position of the main customer of the results of the assessment of the attractiveness of the territory. The major customers can be public authorities, municipalities, potential investors, evaluation structures of the labor market, capital, innovation, tourism, etc. Thus, "competitiveness" is a set of particularly valuable factors of great importance for the main customer.

The nowadays problem is not the absence or deficit of appropriate techniques (there are many), but their optimal selection. The papers by Panaseikin (2011), Litvinova (2013), Ataev (2015), Sandu (2016), Suglobov & Morozov (2016), Vologdin (2017), Petrov (2017), Trachenko & Dzhioev (2018), Ivanov & Sokolitsyn (2018), Polyakov, Fomicheva, Zhukov & Vasina (2018) on assessing of the competitiveness of the region are widely known. Rating of investment attractiveness of Russian regions is carried out by the National Rating Agency.

At the moment in Russia there is no unified so as the generally accepted methodology for assessing the investment attractiveness of territories of a region, distinguished by the ease of its use by both government agencies and investors, assessing potential investment objects, the reliability of the result. The currently used methods of assessing the attractiveness of the territory can be classified on the basis of economic and mathematical methods, correlation and regression analysis and known methods of expert analysis (Kosobutskaya & Ravuanzhinirina, 2019). In Russia, the methodology of the rating agency "Expert RA" refers to the basic method of assessing territories. The Institute for Advanced Studies (IAS) methodology (Nagaev & Vergetter, 1995) is the most well-known tool for assessing the attractiveness of a region abroad.

However, despite the profound level of elaboration of the issue of territorial assessment, it has not been sufficiently studied at the empirical level.

The methodologies do not completely consider social and economical changes of the region, especially under the Western sanctions. The reactions of potential investors to the impact of advertising and the prospects of a globalized economy have not been sufficiently identified. The article used the material of empirical studies of potential investors from the regions of central Russia.

Results

The paper proposes to consider the methodology of express-evaluation of investment attractiveness of

the territory of the region, based on scale of evaluation of hierarchies by T. Saaty (2014). The simplicity of this expert-analytical method includes the express-assessment of the impact of the factors of the attractiveness of the territory to the choice of a particular territory of the region to predict the possibility of investment in it. The hierarchy method is widely used in decision-making tasks, allowing it to be used quite effectively to select an attractive area for an investor out of a number of alternatives. In particular, to quickly calculate and select the most meaningful option for the area matching the objective best and having a high degree of decision credibility.

The methodology for a systematic approach to solving issues of assessing the attractiveness of territories using the hierarchy method includes the following steps:

Stage 1. Analysis of the problem, choice of objective and definition of the task.

The challenge is to develop an operational methodology for assessing the investment attractiveness of locations in a region under conditions of informational uncertainty about indicators of the economic situation at the time of making a decision.

Objective: to develop a methodology for a express assessment of the attractiveness of territories in a region based on expert data on the state of key macroeconomic factors with the construction of a scale of competitiveness of territories.

Objective setting: there are many proposals for the investment attractiveness of places in the region (municipalities) $T=\{T_1, T_2, \ldots, T_k\}$. Each of the alternatives T_i is characterised by a set of macroeconomic evaluation criteria for the territory: $K=\{K_1, K_2, \ldots, K_n\}$. It is necessary to develop a ranking of the attractiveness of the territories of the region, which will act as a scale for assessing their competitiveness.

Stage 2. Development of criteria (factors)$\{K_i\}$ for the investment attractiveness of territory $\{T_j\}$ of the region. The local criteria for assessing the competitiveness of territories within a region depend on the set objectives of the customer – municipal administration, potential investor, line ministry, specific individual, etc. We will assume the determining of the choice of criteria in the express assessment of a territory by its aggregate potential including the following main indicators: labour resources (quality of labour force) - K_1, infrastructure development - K_2, natural resources - K_3, production potential - K_4, ecology - K_5. The selected indicators will be regarded as criteria for assessing the attractiveness of the territory. Such indicators are deeply universal and cannot be clearly defined, but by expert comparison it is possible to assess whether the situation for the territory analyzed is more negative or positive one.

Therefore, there can exist a lot of criteria, depending on the depth of the objective when assessing the attractiveness of a region. The academia literature offers many criteria for assessing investment attractiveness, the choice of which depends on the objectives of the investor or the objectives of a particular government agency.

Stage 3. Selection of alternatives for the territories to be assessed. We consider four alternative territories in the region: $T=\{T_1, T_2, T_3, T_4, T_5\}$ in terms of their investment attractiveness.

Stage 4. Developing the structure of the decision tree when selecting an investment-attractive territory of the region (Figure 1).

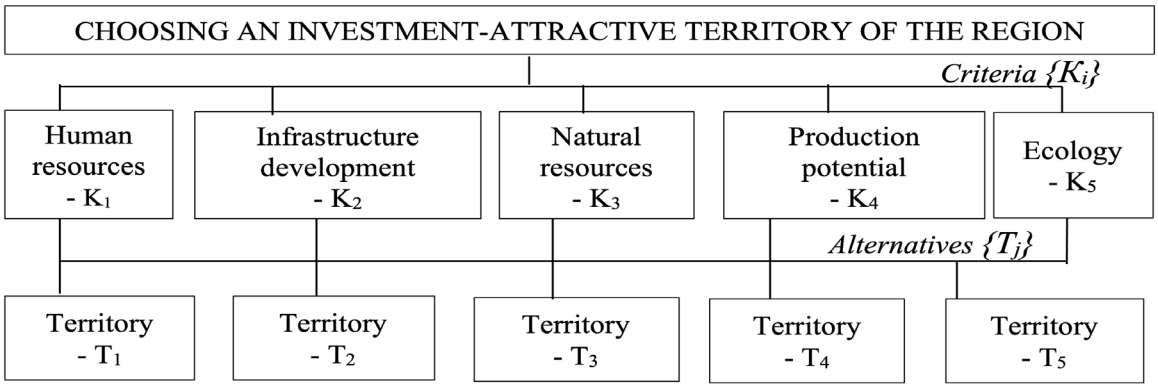

Figure 1. Decision tree of territories choosing

Source: composed by the authors

Stage 5. Development of expert matrices of binary criterion-alternative relationships.

5.1 Calculating the weight (significance) of the territory assessment criteria.

Method of hierarchy theory by T. Saaty suggests using a 9-point scale of relative importance:

$$T = \begin{cases} 1, \text{if the relationships are equal: } T_i = T_j; \\ 3 \text{ or } \frac{1}{3}, \text{if } T_i \text{ is marginally better (worse) } T_j; \\ 5 \text{ or } 1/5, \text{if } T_i \text{ significantly better (worse) } T_j; \\ 7 \text{ or } \frac{1}{7}, \text{if } T_i \text{ significantly better (worse) } T_j; \\ 9 \text{ or } 1/9, \text{if } T_i \text{ is best in the most (the worst) } T_j. \end{cases}$$

The interval scale can contain also intermediate scores: 2, 4, 6, 8.

5.2 Calculation of the significance (weight) of the territory assessment criteria.

Each of the criteria $\{K_i\}$ adopted in the problem can have an ambiguous impact on the evaluation of the territory due to the specificity of the investment attractiveness selection task, so they must be defined before deciding on the selection of area T_i.

Expert research conducted by the authors with a group of potential investors enabled the creation of an M1 matrix of pairwise comparisons of the weights of the assigned criteria $\{K_i, i=1, 2, 3, 4, 5\}$:

$$M1 = \begin{array}{c} \\ K_1 \\ K_2 \\ K_3 \\ K_4 \\ K_5 \end{array} \begin{array}{c} \begin{array}{ccccc} K_1 & K_2 & K_3 & K_4 & K_5 \end{array} \\ \begin{pmatrix} 1 & 2 & 0.333 & 3 & 4 \\ 0.5 & 1 & 3 & 2 & 3 \\ 3 & 0.2 & 1 & 3 & 5 \\ 0.333 & 0.333 & 0.333 & 1 & 3 \\ 0.25 & 0.333 & 0.2 & 0.333 & 1 \end{pmatrix} \end{array}; \quad M11 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.263 \\ 0.242 \\ 0.311 \\ 0.127 \\ 0.054 \end{bmatrix} \end{array}$$

We add data to the resulting matrix M1. Sum up the values of the criteria by rows: $S_{ij} = \sum K_{ij}$ and similarly by columns: S_{ji}. We determine a weighted value for each line by the formula: $C_{ji} = \sum\sum S_{ji}/\sum S_{ij}$, which will characterize the "weight" of the criterion (factor) of the territory attractiveness assessment, which can be written in the form of matrix-column M11 of the importance of the named factors.

There is a need to do a check on the values of $\{K_i\}$ by the opinion consistency index $Ic=(\lambda_{max}-n)/(n-1)$, where n is the matrix size; λmax is the intermediate parameter: $\lambda_{max} = \sum S_i C_i = 5.083*0.263+3.866*0.242+$ $+4.866*0.311+9.333*\ 0.127+16*0.054 = 5.835$. This way $Ic=(5{,}835-5)/4=0{,}209$. For n=5, the value of the random inconsistency Ri is 1.12 (Saaty, 2014). For the correct matrix the consistency ratio is $Cr=Ic/Ri=0.209/1.12=0.187$. Method requirement is Cr<0.2. We met the requirement.

By the M2 criterion matrix, the most weighted factor is "Natural Resources" with a share of 0.311, followed by "Quality of Workforce" with a weight of 0.263, followed by "Infrastructure Development" (0.242) and "Productive Capacity" (0.124). The factor "Environment" has the lowest weighting factor of 0.054.

5.3 We develop the M2 matrix of expert assessment of pairwise comparisons of territories $\{T_i$ i=1, 2, 3, 4, 5} according to the criterion "Human resources - K1".

Proceeding with the numerical field of matrix M2 at the same way as with field M1, we obtain a new matrix-column M21 of significance of territories according to criterion K1.

$$M2 = \begin{array}{c} K_1 \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} T_1 & T_2 & T_3 & T_4 & T_5 \end{array} \\ \begin{pmatrix} 1 & 3 & 5 & 0.333 & 0.111 \\ 0.333 & 1 & 1 & 3 & 0.143 \\ 0.2 & 1 & 1 & 0.143 & 0.111 \\ 3 & 0.333 & 7 & 1 & 0.333 \\ 9 & 7 & 9 & 3 & 1 \end{pmatrix} \end{array} \quad M21 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.165 \\ 0.096 \\ 0.043 \\ 0.204 \\ 0.508 \end{bmatrix} \end{array}$$

For the criterion "Human Resources", based on the data in Column C_i – "Criterion Weight", the most attractive territory is T_5 with a significance of 0.508, followed by T_4 (0.204), T_1 (0.165) and T_2 (0.096), respectively. The T_3 territory has a minimum significance of 0.043. A ranking scale can be developed by the M21 matrix as a tool to assess, compare and make investment decisions using only the "Human Resources" criterion.

5.4 The M3 matrix of the expert assessment of the territory $\{T_i\}$ according to the criterion "Infrastructure development - K2" and its derivative M31 will be as follows:

$$M3 = \begin{array}{c} K_2 \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} T_1 & T_2 & T_3 & T_4 & T_5 \end{array} \\ \begin{pmatrix} 1 & 1 & 3 & 0.2 & 0.333 \\ 1 & 1 & 3 & 0.333 & 1 \\ 0.333 & 0.333 & 1 & 0.333 & 0.333 \\ 5 & 3 & 3 & 1 & 0.333 \\ 3 & 1 & 3 & 3 & 1 \end{pmatrix} \end{array} \quad M31 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.127 \\ 0.177 \\ 0.068 \\ 0.301 \\ 0.326 \end{bmatrix} \end{array}$$

By the matrix-column M31 of the significance of territories according to the criterion "Infrastructure Development - K2", the most significant territory is T_5 with a weight of 0.326, followed by T_4 (0.301), T_2 (0.177) and T_1 (0.127), respectively. Territory T_3 has the lowest significance at 0.068.

5.5 The M4 matrix of expert assessment of territories $\{T_i\}$ according to the criterion "Natural Resources - K3" and its derivative M41 will be as follows:

$$M4 = \begin{array}{c} K_3 \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} T_1 & T_2 & T_3 & T_4 & T_5 \end{array} \\ \begin{pmatrix} 1 & 0.333 & 1 & 0.2 & 1 \\ 3 & 1 & 0.333 & 0.333 & 1 \\ 1 & 3 & 1 & 0.333 & 5 \\ 5 & 3 & 3 & 1 & 1 \\ 1 & 1 & 0.2 & 1 & 1 \end{pmatrix} \end{array} \quad M41 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.098 \\ 0.136 \\ 0.261 \\ 0.363 \\ 0.141 \end{bmatrix} \end{array}$$

By the matrix-column M41 for "Natural Resources" criterion, the most significant is T_4 with a weight of 0.363, followed by T_3 (0.261), T_5 (0.141) and T_2 (0.136), respectively. The T_1 territory has the lowest weighting factor of -0.098.

5.6 The M5 matrix of expert evaluation of territories $\{T_i\}$ according to the criterion "Productive potential - K4" and its derivative M51 will be as follows:

$$M5 = \begin{array}{c} K_4 \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} T_1 & T_2 & T_3 & T_4 & T_5 \end{array} \\ \begin{pmatrix} 1 & 3 & 3 & 0.2 & 0.143 \\ 0.333 & 1 & 1 & 3 & 0.2 \\ 0.333 & 1 & 1 & 0.333 & 0.333 \\ 5 & 0.333 & 3 & 1 & 3 \\ 7 & 5 & 3 & 0.333 & 1 \end{pmatrix} \end{array} \quad M51 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.141 \\ 0.174 \\ 0.070 \\ 0.303 \\ 0.310 \end{bmatrix} \end{array}$$

By the matrix-column M51, the territory T_5 (0.31) is the most weighted in terms of "Productive Potential", followed by the territory T_4 (0.303), T_2 (0.174%) and T_1 (0.141), respectively. Territory T_3 has the lowest significance at 0.07.

5.7 The M6 matrix of expert assessment of territories $\{T_i\}$ according to the criterion "Ecology - K5" and its derivative M61 will be as follows:

$$M6 = \begin{array}{c} K_5 \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} T_1 & T_2 & T_3 & T_4 & T_5 \end{array} \\ \begin{pmatrix} 1 & 0.333 & 1 & 1 & 3 \\ 3 & 1 & 3 & 3 & 5 \\ 1 & 0.333 & 1 & 1 & 1 \\ 1 & 0.333 & 1 & 1 & 1 \\ 0.333 & 0.2 & 1 & 1 & 1 \end{pmatrix} \end{array}; \quad M61 = \begin{array}{c} C_i \\ \begin{bmatrix} 0.173 \\ 0.448 \\ 0.137 \\ 0.137 \\ 0.104 \end{bmatrix} \end{array}$$

By the matrix-column M61 for the criterion "Environment - K5", the most weighted territory is T_2 (0.448%), followed by T_1 (0.173), T_3 and T4 at 0.137. The T_5 territory has the lowest weighting factor of -0.104.

Stage 6. Development of a combined M7 matrix of territory alternative weights for each criterion from the previously obtained columns C_i, i=1, 2, 3, 4, 5:

$$M7 = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \end{array} \begin{array}{c} \begin{array}{ccccc} K_1 & K_2 & K_3 & K_4 & K_5 \end{array} \\ \begin{pmatrix} 0.165 & 0.127 & 0.098 & 0.141 & 0.173 \\ 0.096 & 0.177 & 0.136 & 0.174 & 0.448 \\ 0.043 & 0.068 & 0.261 & 0.070 & 0.137 \\ 0.204 & 0.301 & 0.363 & 0.303 & 0.137 \\ 0.508 & 0.326 & 0.141 & 0.310 & 0.104 \end{pmatrix} \end{array}$$

Stage 7. Determining the significance of territories alternatives.

The values of the territory alternatives can be determined by multiplying the matrix-column M11 by the criterion weight column of the matrix M7. The resulting M8 matrix-column will act as an integrated assessment vector of the significance of the territory alternatives in terms of the objective and the assigned criteria:

$$M8 = M7 \cdot M11 = \begin{pmatrix} 0.132 \\ 0.156 \\ 0.125 \\ 0.285 \\ 0.301 \end{pmatrix}$$

According to the column of the M8 matrix, the priority ranking of the territories from the position of investment attractiveness would be as follows: $T_5 > T_4 > T_2 > T_1 > T_3$. This ranking result allows us to develop a ranking scale R for the priority of territories in terms of the region's investment attractiveness (Figure 2):

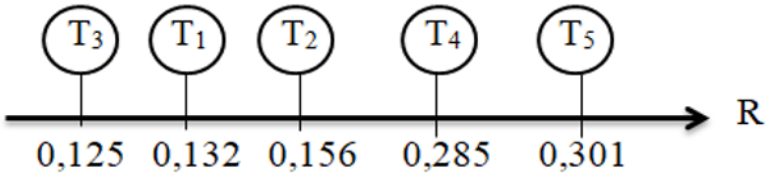

Figure 2 Rating scale for the attractiveness of territories of the region

Source: composed by the authors

By the data of the M8 matrix and Figure 2, it is possible to make a quantitative comparison of the assessments of the attractiveness of territories according to the assigned criteria. For instance, territory T5 is 1.38 times more attractive than territory T_4 or by 38% (0.396/0.287), leader territory T_5 is more attractive than outsider territory T_3 by 3.63 times (0.396/0.108).

A ranking scale allows a qualitative comparison of territories. The range of rating scale ΔR=Rmax - Rmin, where Rmax is the maximum value of assessment of territories on the rating scale, Rmin is the minimum value, should be divided, for example, into three verbal rate intervals with the step ΔR/3=(0.301 - 0.125)/3=0.059: high attractiveness (0.301 - 0.242), medium (0.241 - 0.182) and moderate (0.181 - 0.122). A comparison of the Ti value with a specific hit range will determine a verbal rate of the attractiveness of the territory.

Proceeding from the previously accepted thesis of absence the single methodology for the territories competitiveness assessing due to the multitude of objectives and assessment criteria, the methodology of competitiveness assessment based on T. Saaty's hierarchy theory can be trusted poorly.

In order to benchmark the solutions obtained, we consider the results of the assessment based on the competitiveness polygon method, which is able to rapidly assess the competitiveness of territories, identifying strong and weak factors. Each face of the polygon of the compared territory (Figure 3) is located along the

rating axes Ri, where Ri (KJ) is the value of the factor KJ on the ranking scale Ri of the evaluation of the i-th territory; j=1, 2, ..., n; n - number of criteria; m – number of compared territories. All {KJ} values are taken in accordance with the factor matrices discussed earlier: M21, M31, M41, M51, M61.

By this model, the total area of the polygon Si of the territory under study TI, acts as an integral indicator of its competitiveness and is calculated in the axes of the adopted factors according to the formula:

$$Si=0,5*\sin(360/n)[Ri(K1)* Ri(K2)+ Ri(K2)* Ri(K3)+ Ri(K3)* Ri(K4)+ Ri(K4)* Ri(K5)]$$

where Ri(KJ) is the value of the factor KJ on the ranking scale Ri of the assessment of the i-th territory; j=1, 2, ..., n; n is the number of criteria; m is the number of territories being compared.

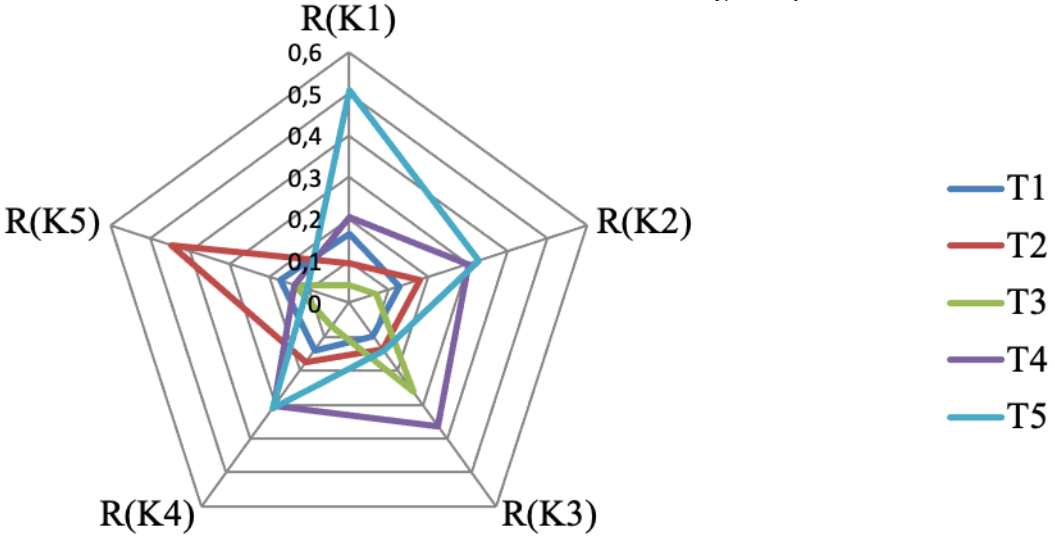

Figure 3. Territorial competitiveness polygon model

Source: composed by the authors

Based on the calculated data of the areas of each polygon, a competitiveness ranking scale of the analyzed territories is developed (Figure 4).

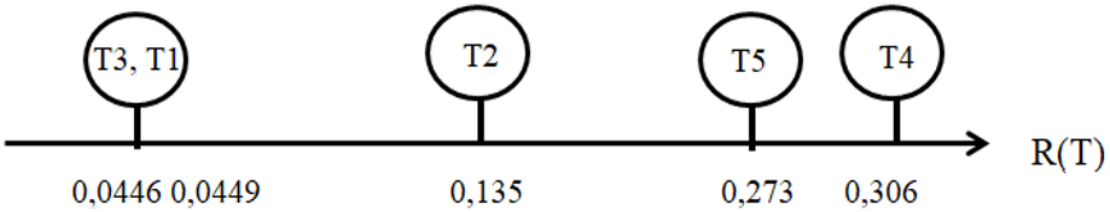

Figure 4. Polygon competitiveness rating scale for territories

Source: composed by the authors

The ranks of the territories in the figures are almost identical and should be taken into account, but the values on the rating scales cannot be compared because of the different dimensionality: in Figure 3 the system is dimensionless and in Figure 4 in square units.

For a more objective assessment of the competitiveness of territories, consider also the 'ideal point' method. In the multi-criteria space of rating scales, we represent the i-th territory as a point with the coordinate $T_i = T(R_i(K1), R_i(K2), \ldots, Ri(K5))$.

We establish the coordinates of the virtual territory as an "ideal point" (Ti) in the multi-criteria space of rating scales: $T_i = T(Rmax(K1), Rmax(K2), ..., Rmax(K5))$, where Rmax(KJ) is the maximum value of factor KJ from matrices M21, M31, M41, M51, M61.

In the proposed model, the integral indicator of communication competitiveness: Kr will be the shortest distance L(Ti, Ti) between the coordinates of points Ti and Ti in multi-criteria space.

$$Kr= L(Ti, Ти)= (\Sigma(R\ imax(KJ)- Ri(KJ))2)^{1/2} \rightarrow min,\ i=1, 2,\ldots,m..$$

By the formalized length criterion: the lower the value of Kr, the closer the analyzed territory is to the ideal (virtual) project, the higher its level of competitiveness. The Kr criterion serves as a tool for selecting

reasonable solutions, allows the ranking of the analyzed projects, and determines their relative strength/weakness in terms of ratio.

The rating scale according to the 'ideal point' method in Figure 5.

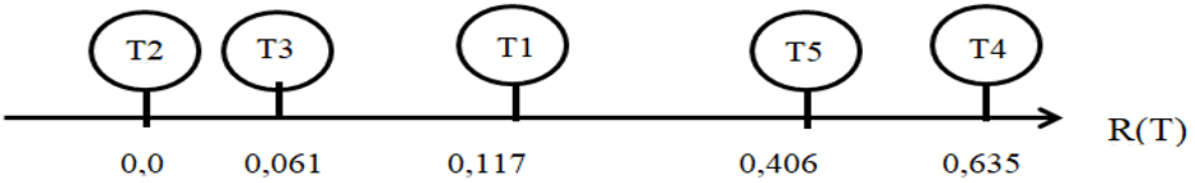

Figure 5. 'Ideal point' competitiveness rating scale for comparison territories

Source: composed by the authors

When analyzing the competitiveness rating scales, it can be concluded the presence of unity of comparing ranks. They are dimensionless. Table 1 shows the values of the ranking method for assessing the competitiveness of territories.

Table 1 – Distribution of territories by competitiveness ranking

Territory	Ranks of territories			Average value of ranks	Ratings of territories
	Hierarchy method	Polygon method	The "ideal point" method		
T1	4	4	3	3.667	4
T2	3	3	5	3.667	4
T3	5	5	4	4.667	5
T4	2	1	1	1.334	1
T5	1	2	2	1.667	2

Source: composed by the authors

By the column "Average rank of the territory" in Table 1, a ranking scale of competitiveness (attractiveness) of the territories of the region can be constructed and their numerical comparison can be made.

It is appropriate to consider the final assessment of territories in accordance with a rating scale for the qualitative assessment of the investment attractiveness of a region, for example, according to the methodology of the National Rating Agency. The interval scale, proposed by the authors, will be a refining scale in assessing the attractiveness of the analyzed territories of the region.

Conclusions

The methodology is both original and simple; the technology of the hierarchy method is necessary for operational research in comparing the alternatives of territories, the choice of the best option for the object of investment, making management decisions.

The methodology of express assessment of competitiveness of territories allows us to make objective territories assessment based on the use of the instrumental method of analysis of hierarchies T. Saaty

The methodology allows us to develop an integral assessment of the attractiveness of territories for investment based on the significance of macroeconomic factors, which making a well-founded choice of management decisions possible.

The proposed comparative scale for rating the attractiveness of territories in a region will provide quantitative and qualitative differences in the attractiveness of territories in the region and can act as a tool for assessing their competitiveness.

The results of the methodology for assessing the investment attractiveness of a territory are documents, administrative acts, guidelines or regulations, which not only allow a numerical assessment of the competitiveness of territories in the region, but also increase the reliability of managerial decisions when deciding on investment.

References

1. Ataeva, N. Y. (2015). Research in the investment attractiveness of municipalities. *Voprosy territorial'nogo razvitiya*, (3), 1-12. Retrieved from http://vtr.isert-ran.ru/article/1485 (accessed 10.05.2022) (in Russian).

2. Baronov, G. O. (2017). The impact of a project management system on the investment attractiveness of a region. *Ekonomika i socium*, *1-1*(32), 168-175 (in Russian).

3. Valinurova, L. S. (2017). Developing a system of controlling the investment attractiveness of a municipality. *Ekonomika i upravlenie*, (4), 132-135 (in Russian).

4. Vologdin, E. V. (2017). *Evaluation of the region's investment attractiveness: theory and practice (on the example of Altai Krai).* Barnaul: Izd-vo AltGU. Retrieved from https://docplayer.com/78836966-E-v-vologdin-ocenka-investicionnoy-privlekatelnosti-regiona-teoriya-i-praktika-na-primere-altayskogo-kraya.html (accessed 01.05.2022) (in Russian).

5. Glazyrin, M. V. (2014). On Creating a System of Integrated Municipal Development. *Ekonomist*, (3), 79-84 (in Russian).

6. Emelyanov, Y. S., & Leonova, Y. Y. (2016). On Indicators of Assessing Investment Attractiveness of Russian Regions. *Upravlencheskie nauki v sovremennom mire*, *2*(2), 501-506 (in Russian).

7. Zhukov, R. A., Vasina, M. V., Soboleva, D. V., & Polyakov, V. A. (2018). Formation of a system of views on the process of managing the sustainable development of the region. *Nauchnye issledovaniya i razrabotki. Ekonomika*, *6*(6), 48-53 (in Russian).

8. Zhukov, R. A., Vasina, M. V., Soboleva, D. V., & Polyakov, V. A. (2018). Optimal management as a factor of sustainable development of industrial socio-economic systems. *Samoupravlenie*, (S1), 64-66 (in Russian).

9. Zhukov, R. A., Vasina, M. V., Soboleva, D. V., & Polyakov, V. A. (2018). Some aspects of economic evaluation of sustainable development of the regions of the Central Federal District and Tula Region. *Izvestiya Tul'skogo gosudarstvennogo universiteta. Ekonomicheskie i yuridicheskie nauki*, (3-1), 3-11 (in Russian).

10. Ivanov, D. V., & Sokolitsyn, A. S. (2018). Assessing the investment attractiveness of municipalities. *Ekonomika i upravlenie narodnym hozyajstvom*, (2), 43-49 (in Russian).

11. Kosobutskaya, A. Y., & Ravuanjirina, A. V. (2019). Investment attractiveness of the region: assessment methods. *Vestnik VGU. Seriya: Ekonomika i upravlenie*, (1), 32-37 (in Russian).

12. Litvinova, V. V. (2013). *Investment attractiveness and investment climate of the region*. M.: Finansovyi universitet (in Russian).

13. Narolina, Y. V. (2009). Investment potential and investment risk as the main components of the region's investment attractiveness. *Vestnik TGU*, (12), 137-143 (in Russian).

14. Nagaev, S., & Woergoetter, A. (1995). *Regional Risk Rating in Russia*. Vienna: Bank Austria AG. Econ. dep.

15. National Rating Agency. (2021). *Rating of investment attractiveness of Russian regions.* Retrieved from http://www.ra-national.ru/ru/ratings/provinces?type=rating (accessed 01.05.2022).

16. Panaseikina, V. S. (2011). Formation of a methodology for assessing the investment attractiveness of municipalities. *Kontury global'nykh transformatsii: politika, ekonomika, pravo*, (4), 45-54 (in Russian).

17. Petrov, I. V. (2017). Review of methods for assessing the investment attractiveness of regions. *Molodoi uchenyi*, (23), 57-61 (in Russian).

18. Polyakov, V. A., Fomicheva, I. V., & Yudina, O. V. (2021). The choice of commercial real estate for business according to the technology of the hierarchy analysis method. *Nauchnye issledovaniya i razrabotki. Ekonomika*, (1), 12-16 (in Russian).

19. Saaty, T. (1993). *Decision Making. The method of hierarchy analysis*. M.: Radio i svyaz' (in Russian).

20. Sandu, I. S., Bogoviz, A. V., Ryzhenkova, N. E., & Troshin, A. S. (2016). Methodological provisions for assessing the innovation and investment attractiveness of regions. *Gosudarstvennyi audit. Pravo. Ekonomika*, (4), 78-85 (in Russian).

21. Suglobov, A. E., & Morozov, I. A. (2016). Methodological support for assessing the investment at-

tractiveness of the production potential of depressed regions. *Vestnik Moskovskogo universiteta MVD Rossii*, (1), 200-205 (in Russian).

22. Trachenko, M. B., & Dzhioev, V. A. (2018). Express analysis of investment attractiveness of regions. *Financy i kredit*, *24*(9), 2151-2165 (in Russian).

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The impact of the level of economic freedom on the socio-economic development of national economies: the Eurasian economic union countries

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Abstract. The study assesses the impact of the level of economic freedom on the dynamics of socio-economic indicators of the four Eurasian Economic Union countries in the long time-span (2012-2021). This paper uses econometric modelling techniques to verify the hypothesis of existence of a direct statistically significant relationship between the level of economic freedom and Gross Domestic Product per capita, Gross Domestic Product itself, foreign direct investment in the economy, the Human Development Index; and an inverse relationship with the Corruption Perception Index. The study reveals the confirmation of a substantial part of the hypotheses put forward for economies of the Eurasian Economic Union countries. However, there is no statistically significant relationship between the level of economic freedom and Gross Domestic product capita or foreign direct investment in all of the economies studied.

Keywords: socio-economic development, Eurasian Economic Union (EAEU), economic freedom index, correlation analysis, The Heritage Foundation.

JEL codes: C12; C10; O17

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Introduction

The consensus in the economic literature concerns the economic freedom is a key factor in the development of a national economy.

Publishing its annual report on the state of economic freedom worldwide, The Heritage Foundation defines it as "the absence of government interference or obstruction in the production, distribution and consumption of goods and services, except for the protection and support of freedom as such that citizens need" (The Heritage Foundation, 2022).

In terms of the theoretical perspective, the relevance of economic freedom to the national economy is defined by a number of postulates:

- according to the Foundation's experts, there is a positive correlation between economic freedom and the success of economic development -- countries with a freer economy have much higher levels of well-being, and economic freedom brings relatively quick and tangible results in contrast to government regulation of the economy (The Heritage Foundation, 2022);

- there is also a direct correlation between the degree of regulation of the economy and the level of corruption (e.g. experience of India shows the corrupt officials, instead of trying to facilitate their duties, actually create administrative barriers to receive bribes) (Hellman et al., 2000);

- Economic Freedom Rating (The Heritage Foundation) is one of the indicators of a country's attractiveness to institutional investors in the global economy (reducing the economic functions of the state and transferring responsibility for economic decision-making to entrepreneurs generally results in a significant increasing of public prosperity. Countries with economic freedom policies provide positive conditions for trade and

entrepreneurship generating their own economic growth.

Moreover, applied works investigating the socio-economic aspects of economic freedom establish a correlation of this phenomenon with:

- Human Development Index (Staufer & Brockmann, 2018);
- level of corruption of the State (Malanski & Póvoa, 2021);
- Gross Domestic Product (GDP) per capita (Cebula, Clark & Mixon, 2013);
- direct foreign investment (Sayari, Sari & Hammoudeh, 2018);
- value of GDP (Ivanova & Vojtovic, 2016).

Meanwhile, the issue of country-specific aspects of the impact of economic freedom on the socio-economic development of economies is of considerable academic interest - how similar are the country-specific manifestations of this phenomenon?

Our previous work (Shkiotov, Markin & Shcherbakova, 2022) identified a strong direct correlation between the level of economic freedom and the Human Development Index in Russia.

The challenge is the results of the study may be affected both by the limitations of the model used and by the unprecedented external shocks to which the Russian economy has been subjected in recent years.

The purpose of this paper is to assess the impact of the level of economic freedom on the dynamics of socio-economic processes in the four EAEU countries.

Table 1 presents a number of hypotheses describing the impact of economic freedom on the dynamics of a country's socio-economic indicators.

Table 1 – Socio-economic aspects of economic freedom in economic studies.

The authors	The hypothesis	Identifies the dependence between...
Staufer & Brockmann (2018)	economic freedom affects people's quality of life	the level of economic freedom and the Human Development Index
Cebula, Clark & Mixon (2013)	economic freedom affects per capita income	level of economic freedom and GDP per capita
Sayari, Sari & Hammoudeh (2018)	economic freedom affects the flow of FDI	the level of economic freedom and amount of FDI
Ivanova & Vojtovic (2016)	economic freedom affects the dynamics of economic growth	the level of economic freedom and the value of GDP

Source: composed by author

Methods

The research methodology is described in detail in our previous study (Shkiotov, Markin & Shcherbakova, 2022).

Study hypothesis:

1. We possess a direct (statistically significant) correlation between the level of economic freedom and GDP per capita, GDP, foreign direct investment in the economy and the Human Development Index.

2. That meant there should be an inverse (statistically significant) relationship between the level of economic freedom and the Corruption Perceptions Index.

Selected countries: Kazakhstan, Belarus, Kyrgyzstan, Armenia.

Research method is correlation analysis. During this study, a significance level of 5% was assigned to test the validity of the correlation coefficient.

Table 2 provides the background of the analysis.

Table 2 – Data for correlation analysis for EAEU countries, 2012-2021

	Data Set	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belarus	Corruption Perception Index	31	29	31	32	40	44	44	45	47	41
	Index of Economic Freedom	49.0	48.0	50.1	49.8	48.8	58.6	58.1	57.9	61.7	61.0
	GDP per capita (current US$)	6953. 132515	7998. 125239	8341. 399679	5967. 052204	5039. 681886	5785. 670673	6360. 062473	6837. 717826	6424. 152176	N/A
	Current account balance (BoP, current US$)	-1308 100000	-19839 00000	-17886 00000	-15457 00000	-11240 00000	-12085 00000	-13713 00000	-12771 00000	-13146 00000	-13178 68223
	GDP (current US$)	6568 5102555	75527 984234	78813 839984	56454 734397	477226 57821	54726 595249	60031 262269	64409 647194	6025 8239056	N/A
	Human Development Index (HDI)	0.806	0.811	0.814	0.814	0.815	0.819	0.823	0.823	N/A	N/A
Kazakhstan	Corruption Perception Index	28	26	29	28	29	31	31	34	38	37
	Index of Economic Freedom	63.6	63.0	63.7	63.3	63.6	69.0	69.1	65.4	69.6	71.1
	GDP per capita (current US$)	12386. 69927	13890. 63096	12807. 26069	10510. 77189	7714. 841844	9247. 581331	9812. 626371	9812. 595808	9122. 23343	N/A
	Current account balance (BoP, current US$)	-11855 850310	-80343 78287	-46745 70616	-32614 47512	-137463 81891	-375612 9608	-472268 6549	-58954 89124	-60559 99984	N/A
	GDP (current US$)	2,079 99E+11	2,366 35E+11	2,2141 6E+11	1,843 88E+11	1,3727 8E+11	1,6680 6E+11	1,793 4E+11	1,8166 7E+11	1,7108 2E+11	N/A
	Human Development Index (HDI)	0.782	0.791	0.798	0.806	0.808	0.815	0.819	0.825	N/A	N/A
Armenia	Corruption Perception Index	34	36	37	35	33	35	35	42	49	49
	Index of Economic Freedom	68.8	69.4	68.9	67.1	67.0	70.3	68.7	67.7	70.6	71.9
	GDP per capita (current US$)	3681. 844691	3838. 17388	3986. 231624	3607. 289299	3591 .828052	3914. 527854	4220. 540321	4604. 646324	4266 .018074	N/A
	Current account balance (BoP, current US$)	-4732 10732.1	-31582 9524.3	-3777 74324	-1553 76062	-26321 3931.7	-22187 8286.3	-25981 2449.7	-2339 41145	-74462 449.07	N/A
	GDP (current US$)	10619 320049	11121 465767	116095 12940	105533 37673	10546 135160	115274 58566	124579 41907	13619 291361	12641 209802	N/A

	Human Development Index (HDI)	0.756	0.762	0.764	0.768	0.766	0.769	0.771	0.776	N/A	N/A
Kyrgyzstan	Corruption Perception Index	17	24	24	27	28	28	29	29	31	27
	Index of Economic Freedom	60.2	59.6	61.1	61.3	59.6	61.1	62.8	62.3	62.9	63.7
	GDP per capita (current US$)	1177.974735	1282.437162	1279.769783	1121.082835	1120.666513	1242.769643	1308.140165	1374.032105	1175.698152	N/A
	Current account balance (BoP, current US$)	-2770 59600	-61906 2900	-23043 5500	-10090 94000	-57896 8800	7814 3900	-1392 67900	-3366 59800	5824 05200	N/A
	GDP (current US$)	6605 139933	73350 27592	74680 96567	66781 78340	68130 92066	77029 34800	82711 08638	88710 26074	7735 976273	N/A
	Human Development Index (HDI)	0.674	0.680	0.686	0.690	0.691	0.694	0.696	0.697	N/A	N/A

Source: https://www.heritage.org/index/pdf/2021/book/2021_IndexofEconomicFreedom_Highlights.pdf;

https://databank.worldbank.org/indicator/NY.GDP.PCAP.CD/1ff4a498/Popular-Indicators#

https://hdr.undp.org/en/indicators/137506#

Results

The results of the correlation analysis and their visual interpretation are presented in Table 3 and Figures 1-4.

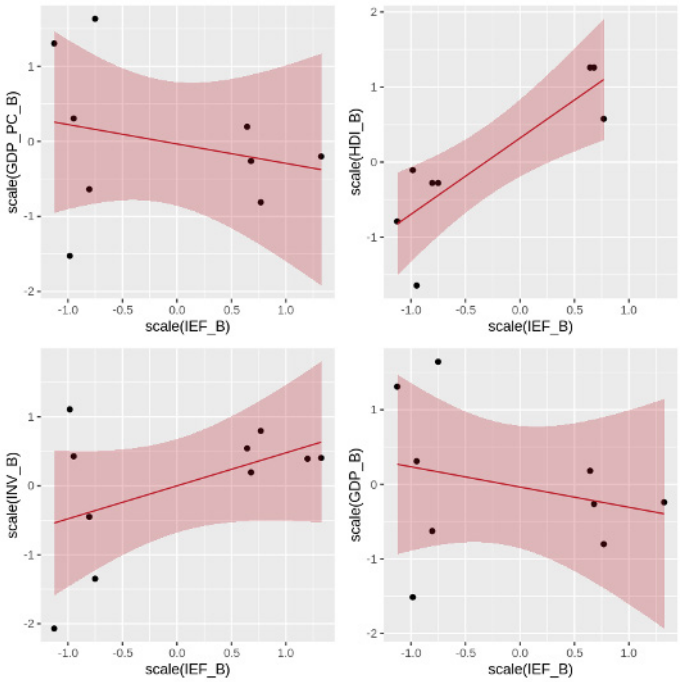

Figure 1. Scatter chart between Index of Economic Freedom (IEF_R) and GDP per capita (GDP_PC_R), Foreign Direct Investment (INV_R), GDP (GDP_R), Human Development Index (HDI_R) for the Belarusian economy

Source: composed by author

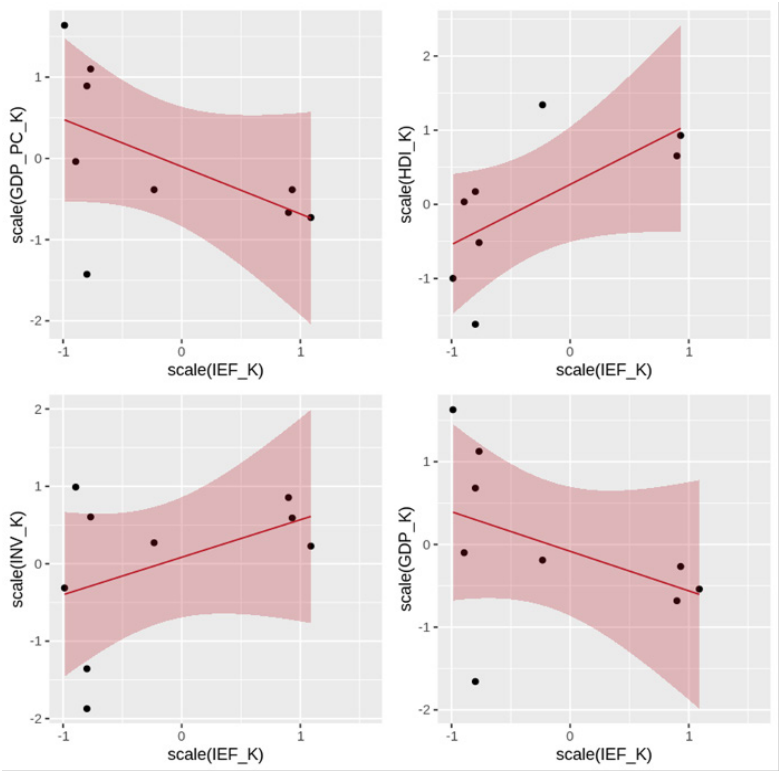

Figure 2. Scatter chart between Index of Economic Freedom (IEF_R) and GDP per capita (GDP_PC_R), Foreign Direct Investment (INV_R), GDP (GDP_R), Human Development Index (HDI_R) for the economy of Kazakhstan

Source: composed by author

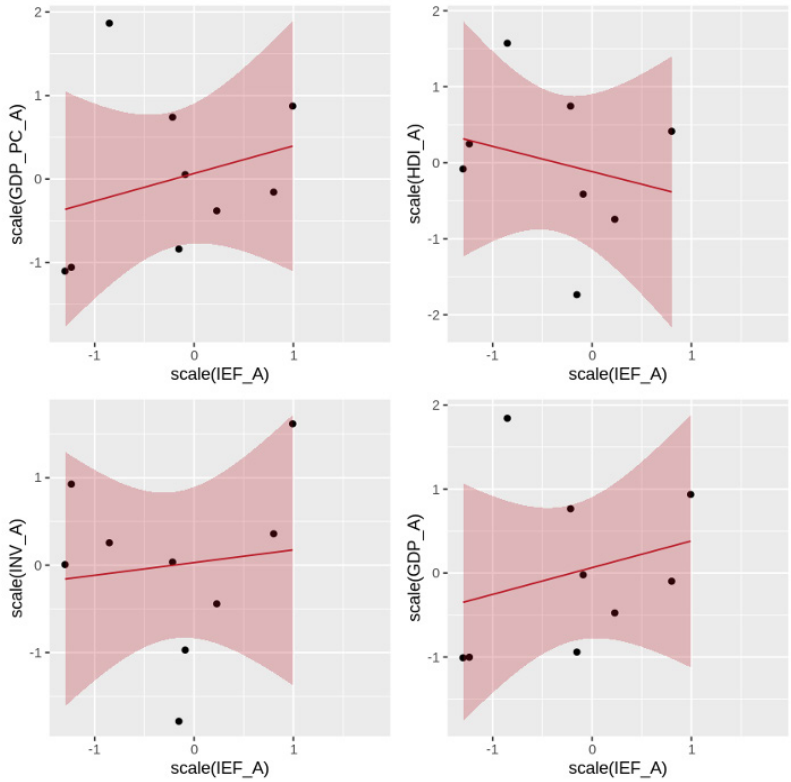

Figure 3. Scatter chart between Index of Economic Freedom (IEF_R) and GDP per capita (GDP_PC_R), Foreign Direct Investment (INV_R), GDP (GDP_R), Human Development Index (HDI_R) for the economy of Armenia

Source: compiled by author

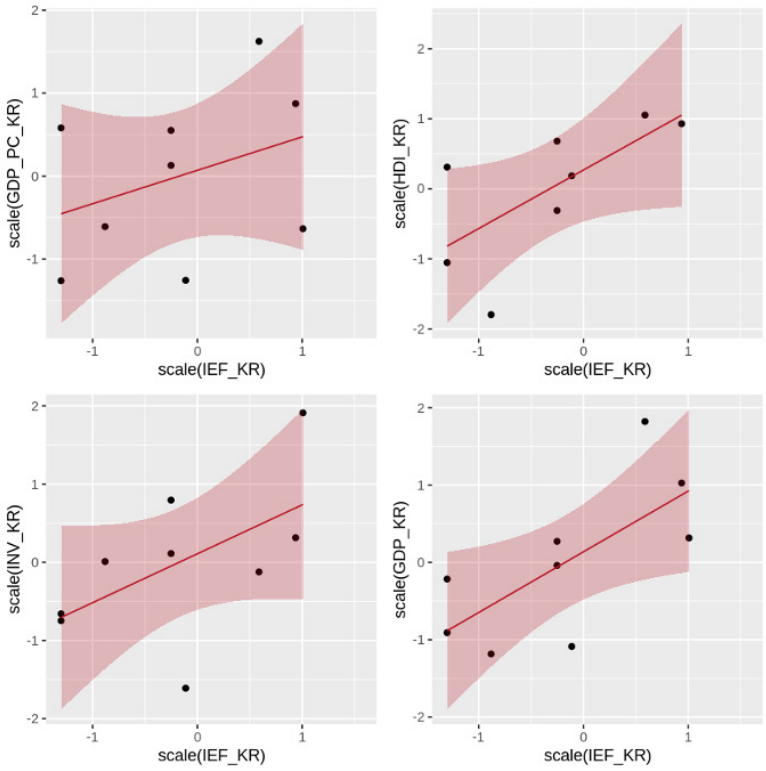

Figure 4. Scatter chart between Index of Economic Freedom (IEF_R) and GDP per capita (GDP_PC_R), Foreign Direct Investment (INV_R), GDP (GDP_R), Human Development Index (HDI_R) for the economy of Kyrgyzstan

Source: composed by author

Table 3 – Results of correlation analysis

		Corruption Perception Index	GDP per capita (current US$)	Current account balance (BoP, current US$)	GDP	Human Development Index (HDI)
Armenia	Index of Economic Freedom	Dependence average direct (0.665638)	No dependence	No dependence	No dependence	No dependence
Belarus		Dependence average direct (0.8630852)	No dependence	No dependence	No dependence	Dependence strong direct (0.8596929)
Kazakhstan		Dependence average direct (0.8154698)	No dependence	No dependence	No dependence	Dependence average direct (0.6502255)
Kyrgyzstan		No dependence	No dependence	No dependence	Dependence average direct (0.6946909)	Dependence average direct (0.6846682)

Source: composed by author

Discussion

The results obtained for the EAEU countries confirm the research results:

- Staufer & Brockmann (2018) on the correlation between the level of economic freedom and the Human Development Index (for Belarus, Kazakhstan, Kyrgyzstan);
- Malanski & Póvoa (2021) on the correlation between the level of economic freedom and the level of corruption (for Armenia, Belarus, Kazakhstan);
- Ivanova & Vojtovic (2016) on the correlation between the level of economic freedom and GDP (for Kyrgyzstan).
- The results for the EAEU countries are inconsistent with the results of the studies:
- Cebula, Clark & Mixon (2013) on the correlation between economic freedom and GDP per capita;
- Sayari, Sari & Hammoudeh (2018) on the correlation between the level of economic freedom and foreign direct investment in the economy.

Conclusions

Table 3 shows:

- average direct correlation (statistically significant) between the level of economic freedom and the level of perception of corruption for the Armenian economy. However, the level of economic freedom has no influence (statistically) on GDP per capita, total foreign direct investment, GDP volume and the Human Development Index for that economy.
- strong direct correlation (statistically significant) between the level of economic freedom and the level of perception of corruption, as well as the Human Development Index for the Belarusian economy. However, the level of economic freedom has no influence (statistically) on GDP per capita, total foreign direct investment, GDP volume and the Human Development Index for that economy.
- strong direct correlation (statistically significant) between the level of economic freedom and the level of perception of corruption, as well as the Human Development Index for the economy of Kazakhstan. However, the level of economic freedom has no influence (statistically) on GDP per capita, total foreign direct investment, GDP volume and the Human Development Index for that economy.
- average direct relationship (statistically significant) between the level of economic freedom and the Human Development Index as well as the value of GDP for the economy of Kyrgyzstan. However, the level of economic freedom has no influence (statistically) on GDP per capita, total foreign direct investment, GDP volume and the Human Development Index for that economy.

The results of the study can be explained by the limitations of the model used (insufficient sample to conduct correlation analysis; changes in the methodology of data collection and evaluation of complex indicators such as HDI and CPI; uncertainty in the conceptual framework (differences in understanding of corruption, quality of life); indirect influence of economic freedom on the indicators examined.

Therefore, the hypotheses and results derived will stimulate a new wave of applied research on economic freedom for the EAEU countries.

References

1. The Heritage Foundation. (2022). *Index of Economic Freedom*. Retrieved from https://www.heritage.org/index/download# (accessed 10.04.2022).
2. Shkiotov, S. V., Markin, M. I., & Shcherbakova, A. A. (2022). Assessing the impact of the level of corruption on the socio-economic development of the national economy: Russian Federation. *Teoreticheskaya ekonomika*, *88*(4), 82. Retrieved from https://doi.org/10.52957/22213260_2022_4_82 (in Russian).
3. Hellman, J. S., Jones, G., Kaufmann, D., & Schankerman, M. (2000). Measuring Governance, Corruption, and State Capture. *The World Bank Policy Research WP*, 2444.
4. Malanski, L. K., & Póvoa, A. C. S. (2021). Economic growth and corruption in emerging markets: Does economic freedom matter? *International Economics*, *166*, 58-70. Retrieved from https://doi.org/10.1016/j.inteco.2021.02.001
5. Cebula, R. J., Clark, J. R., & Mixon, F. G. (2013). The impact of economic freedom on per capita real GDP: A study of OECD nations. *Journal of Regional Analysis and Policy*, *43*(2), 34-41.

6. Sayari, N., Sari, R., & Hammoudeh, S. (2018). The impact of value added components of GDP and FDI on economic freedom in Europe. *Economic Systems*, *42*(2), 282-294. Retrieved from https://doi.org/10.1016/j.ecosys.2017.03.003

7. Ivanova, E., & Vojtovic, S. (2016). Macroeconomic analysis of indicators of economic freedom, economic sentiment and GDP: Slovakia case study. *Actual Problems of Economics*, *184*(10), 68-78.

8. Staufer, J., & Brockmann, P. (2018). Forecasting macroeconomical indices with machine learning: impartial analysis of the relation between economic freedom and quality of life. *International Journal on Soft Computing, Artificial Intelligence and Applications*, *7*(4), 21-35. Retrieved from https://doi.org/10.5121/ijscai.2018.7402

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Network core-periphery model in the EU automotive manufacturing: properties and specifics

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Abstract. The article dwells on the study of network 'core-periphery' production structure as a firm pattern of EU automotive manufacturing. The Visegrad countries integration into the sector of EU economy is dissected with multiscalar approach. The first section of the paper deals with the complex analysis of geographical, structural, and topological foundations of the network 'core-periphery' model. In the second section the quantitative assessments are elaborated to demonstrate the relevant properties of the EU automotive core-periphery pattern. As a result, two of four empirical hypotheses have been proved. It has also been suggested that EU automotive core-periphery dynamics follows the introduced 'factor price equalization cycle'. The results obtained allow for the further forecasting of the European network core-periphery model evolution. The insufficiency of regional-level data is a limitation of the study conducted.

Keywords: Visegrad countries, automotive manufacturing, firm-level integration, New Economic Geography, Global Production Networks, trade in intermediates, node centrality, factor prices.

JEL codes: C18; F15; F17; F23

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Introduction

The 'core-periphery' interactions pattern encompassing geographical regions of different socio-economic level is on the limelight in the literature owing to its practical applicability. The well-known Krugman's (1991) concept of spatial interconnections between regions within the country or transborder region is one of the most frequently referred to. According to him, there are three variables responsible for regional spatial differentiation, namely transportation costs, economies of scale, and manufacturing share in the regional output. In Krugman's assumption, international trade cannot solely ensure factor price equalization as an optimum condition in Heckscher-Ohlin model. It has to be backed by capital mobility and unconstrained value flows.

In the literature, there are several modifications of this model. The core-periphery model with trade in intermediates (Brakman & van Marrewijk, 2016) deserves particular attention. It suggests that manufacturing is largely stimulated by international trade through the access to necessary parts and equipment. In its turn, the core-periphery production convergence is accelerated.

The model analyzed is a subject to centrifugal and centripetal forces which lead to its economic structure polarization with the core diversifying its output increasing the market volume on the one hand and the periphery taking root in primitive production on the other (Kolomak, 2013). Eventually, peripheral economies close the gap with core ones which spurs factor price equalization and spatio-temporal fix (Jessop, 2005).

In essence, the studies bridging international production and economic geography are required to explicitly portray the modern core-periphery phenomena.

Literature review

In order to holistically perceive modern production cooperation systems of regions the relevant theoretical and methodological elaborations have to be taken into consideration. Conceptually, the literature suggests three critical attributes of core-periphery model: flexibility, mutability, and multi-vector dynamics. Practically speaking, the model represents its characteristics on divergent regional levels (be that macroregion or transborder region), thus unveiling its multiscalar essence.

For instance, Great Lakes cluster situated on the US-Canada border symbolizes the cooperation between transborder region as a periphery with a pool of large productive centers in the USA as a core (Rutherford & Holmes, 2014). Core-periphery pattern can be discerned in a more aggregate level while analyzing offshoring and production relocation to Southeast Asia. With a factor price equalization (namely, wages in China became comparable with those in the USA) the opposite reshoring trend came into being. Hence, now one can contemplate two separate centers of global economic system.

In regard to the EU, it is worth referring to the Visegrad group entry into the Union in 2004. Historically, its members specialize in transport production and manufacturing in general.

On the one hand, automotive manufacturing is currently notable for its dynamism and technological transformation (specifically, in commodity supplies and original equipment manufacturing) (Kondrat'ev et al., 2020). On the other, integratory prerequisites for EU core-periphery structural shifts deserve particular attention. With respect to the abovementioned point on goods and production factors high mobility significance, the Single Market Act (2011) can be addressed. The Act promotes the entrepreneurial and investing potential calibration between EU founders and the newcomers.

In "Geography and Trade" (MacPherson & Krugman, 1992) P. Krugman highlights two reasons for the international trade and localization theories dialogue. First, the interregional trade is as important for large economies as the international one. Second, the diffusion of interregional and international trade occurs due to integration activity as in the EU. R. Baldwin and P. Martin developing Krugman's ideas draw on interlinkages between agglomeration and regional growth (Baldwin & Martin, 2003). As J. Gaspar points out, economic geography should incorporate spatial topologies analysis in its subject to conceivably depict the geographical space (Gaspar, 2020).

The network paradigm of relational analysis is punctuated in economic, social, and other studies. E. Wallerstein and his successors (Wuthnow, 1979) in the World-System theory emphasized that decentralization and multicentricity properties established the foundation of the unique European capitalistic model which stands it apart from the foregone empire formations. Within the interstitial position between the core and the periphery economies favor the options to both downgrade to peripheral status (as it has been with Spain in the XVII-XVIII centuries) or acquire the core attributes (as with Japan in the XX century) (Chirot & Hall, 1982). De Lombaerde et al. (2019) point out that international trade has gone beyond trade in goods involving trade in services and "trade in tasks" under globalization. Consequently, world trade network is a highly modular structure which implies greater interlinkages accordance within the continents, not between them. Thus, geographical patterns still play a critical role in determining modern trade networks, despite the gains from globalization (i.e., transportation costs reduction).

Visegrad countries share several properties with another integrated periphery economies in Europe (Klier et al., 2018). These are relatively cheap labor force, geographical proximity to large markets, membership in regional trade agreements, and some investment stimulus for international agents. Besides, European integrated periphery is characterized by a low share of assembly employment in the total workforce in automobile industry (for example, Central and Eastern Europe countries has a share of 18%, while Germany – 58,5% respectively) (Klier & Rubenstein, 2017). Core-periphery relations in European automotive manufacturing in recent decades demonstrate the dependence of local producers from the lead firms and original equipment manufacturers commercial strategies. FDI flows to the integrated periphery have not contributed greatly to their industrial upgrading (Simonazzi et al., 2020).

With regard to transport manufacturing, one can state that regional specialization is inextricably bound with product and technological fragmentation. As a production process gets more technologically complex, export specialization becomes narrower which is a precondition for empirical analysis of a highly

disaggregated product basket. The fragmentation itself is motivated by the fact that consequential production unbundling based on comparative advantages exploitation can flatten the curve of production and commercial costs while adding to the constant costs related to distributed system coordination (Jones et al., 2005).

Concerning the upgrading of integrated periphery production complex, it is reasonable to study the proportions of technological subsectors in employment, value-added, and labor productivity (i.e., such an analysis is elaborated in I.V. Izvorski et al. (2008)). Additionally, product specialization of separate regions should be dissected. This way, specialization-diversification dilemma can be analyzed both within the sector and between the sectors in integrated peripheries.

Apart from theoretical assumptions, methodological foundations for these studies have also gained popularity.

'World trade network' term resonates with 'international production network' of I. Cingolani et al. (2018). that is conceived as analytical structure with nodes as separate countries and linkages as revealed trade preference indices. Relational aspect displaces the geographical dimension in the analysis of such networks. Hence, we shall particularly rely on that model in our paper.

Whilst studying global production networks, P. Dicken (2004) distinguishes three analytical dimensions: macrostructures of capitalistic system (institutes, conventions), relational networks mediated by global production and social networks, and uneven distribution of benefits among individual localities and regions. The fundamental mechanism of GPN functioning is transformation of inputs to outputs in a functional and material circulation (Coe et al., 2008). In its turn, GPN 2.0 paradigm is aimed at better explanation of interconnections between global production networks and uneven territorial development (Coe et al., 2019).

At the same time, a survey is widely used as an alternative to customs statistics to determine both relations of economic entities and production integration effects on industrial upgrading (Pavlínek, 2018).

The research into specialization shifts of Central and Eastern Europe countries resulting from their integration to regional production systems has earlier been carried out with gravity modelling separately for extensive (specialization on new products) and intensive (existing specialization reinforcement) trade margins (Martínez-Zanzoso et al., 2011). The study suggests that over 1999-2009 trade costs reduced notably which allowed for a better local advantages exploitation, as well as export profile diversification.

A separate branch in the European regional systems studies is research into technological specialization and local industrial and academic systems relations with the calculation of revealed technological advantage index as an extension of RCA (Caviggioli et al., 2022). Undoubtedly, technological specialization can act as an anticipatory or supportive indicator in the estimation of the sectoral development.

In an attempt to solve the specialization-diversification dilemma O. Farhauer and A. Kröll (2012) introduce the concept of "diversified specialization" implying specialization of individual localities on a limited number of sectors. According to the authors, that type of specialization is favorable for regions to gain from both Marshall-Arrow-Romer clusterization externalities (due to the presence of specific labor force and infrastructure) and Jacobs' externalities of diversification (knowledge flows and cross-fertilization between sectors).

Under new patterns of international production cooperation core-periphery model exceeds dualistic collaboration of regions with pronounced structural disproportions. Taking account of the global production networks prominence, it is more correct to articulate the network core-periphery model as a concept containing both structural and geographical prerequisites, as well as topological patterns of regional embeddedness into global production systems.

Overall, our study is devoted to formulization of the attributes of network core-periphery model and to empirical verification of hypo

Concept

Topological structures of the independent regional entities' collaboration are network models whereby they trade in intermediates upscaling the final good value. The linkages pattern unveils peculiar aspects of the network structure formation, as well as good and value flows efficiency and resilience under external

shocks.

It is worth mentioning that economic globalization covering Europe and other regions has been tightly bound with production factors, intangible assets, and technology flows liberalization which encouraged the network structures formation based on the principle of the contribution of every single node to the whole network creation. In that sense, the conjoint account of geographical and topological foundations of the network core-periphery model is required.

The statement concerning the 'pendulum' nature of core-periphery interactions and convergence is critically important for our study. As it was pointed out, economic integration with trade and factor flows liberalization stimulates factor prices equalization. However, it is differences in factor prices that spurs on the fragmentation of production (Deardorff, 1998). In its turn, this encourages the peripheral economies' specialization on high-tech products empowering them with a higher competitiveness and allowing for closer integration with the core. Hence, the process of factor price equalization and non-equalization in the core and in the periphery is endogenously cyclical (Figure 1), which determines fragmentation and production cointegration, in essence.

At bottom, this analytical layout suggests the intersection between New Economic Geography (in core-periphery model and factor price equalization), Global Production Networks (in terms of local producers' integration into macroregional production structures), and Fragmentation Theory (detailed specialization in the production of knowledge-intensive goods).

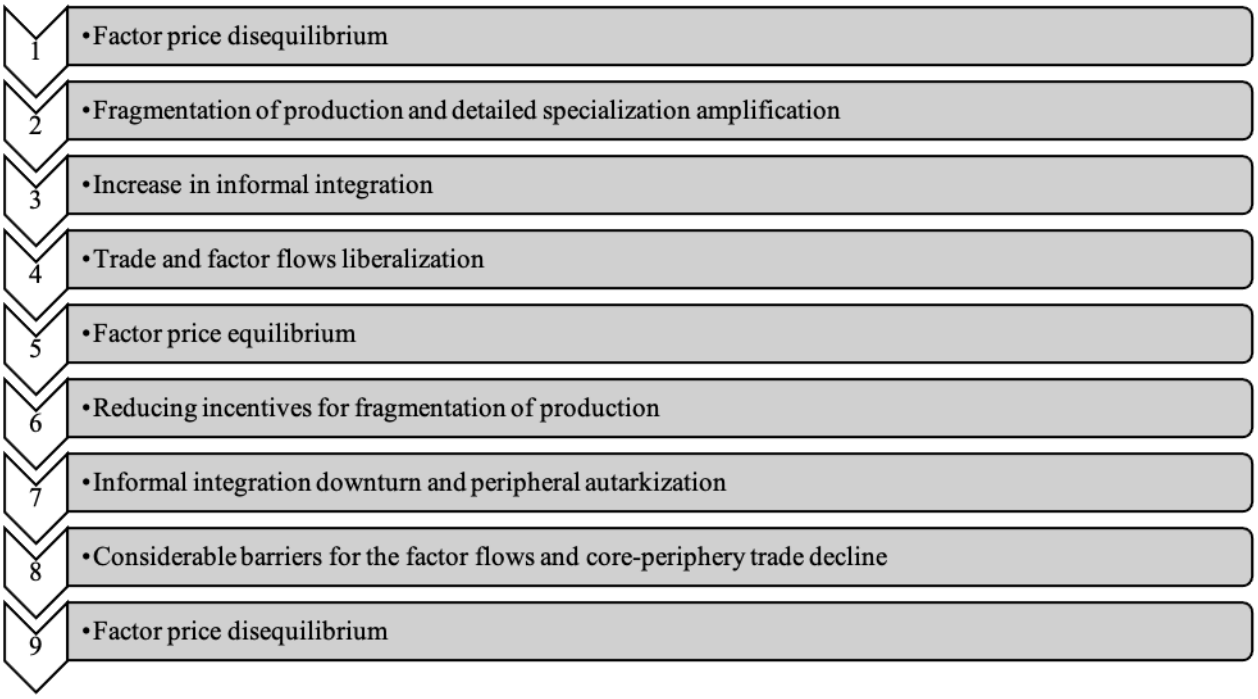

Figure 1. Dynamic cycle of the network core-periphery model
Source: composed by author

One can see that the aforementioned cyclical stages subsequently characterize the system from the point of the three analytical dimensions (Figure 2): geographical (evenness of production distribution in core and periphery, as well as between them), structural (namely, dominance of a given sector for the economy), and topological (here, local producers embeddedness in macroregional production systems).

Geographical and structural degrees of analysis portray the traditional core-periphery model attributes. Topological degree is of particular significance for this study as it paths the way for geographical and spatio-network approaches to core-periphery analysis bridging.

The 'dominance' degree is analyzed in terms of specialization and diversification categories. Specialization is perceived dually in the study, namely as an absolute specialization (the industry's dominance in the economy) and as a relative specialization (i.e., international specialization). Diversification, respectively,

is understood as a situation when the economic structure is balanced, and the country does not demonstrate a pronounced specialization in some particular exports.

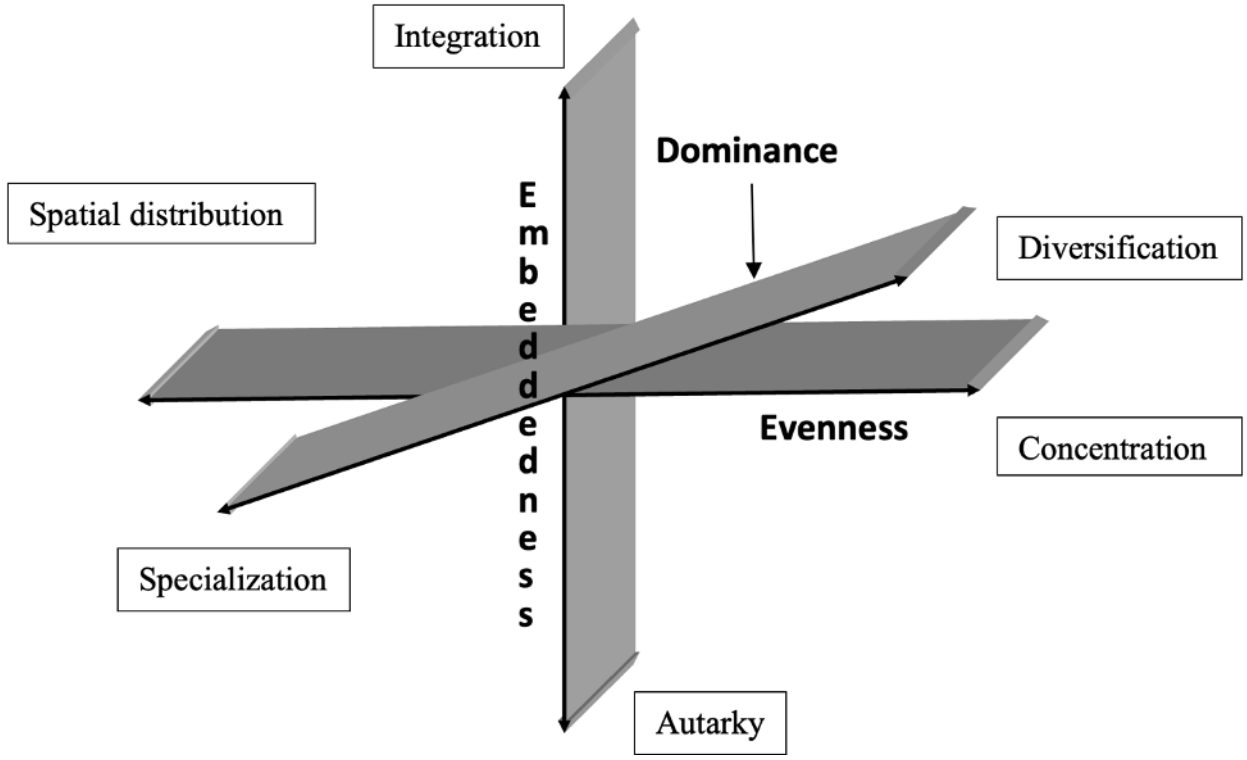

Figure 2. Analytical framework for the network core-periphery model specification
Source: composed by author

In turn, the 'evenness' degree is responsible for the spatial distribution of manufacturing production among core (or periphery) regions. Two extremal states here are spatial distribution (even distribution of production capacities) and concentration (conglomeration of production in a few, or the only, regions). With respect to the periphery as an object of our research, these two analytical degrees depict the properties of transport manufacturing development within the periphery itself.

The 'embeddedness' degree represents the peripheral integration into European automotive manufacturing networks. Thus, peripheral position is derived analytically between integration (dependence on and mediatory importance in production networks) and autarky (namely, production self-sufficiency and external cooperation denial) extreme states.

Methods

The relative periphery position in that three-dimensional structure is determined whereby multiscalarity principle, i.e., matching and interconnection of empirical assessments implemented on regional level, as well as on country level for the core and the periphery at large.

'Evenness' degree analysis is elaborated on NUTS 2 data and for the core-periphery in general. 'Dominance' degree related to specialization metrics is studied on both regional and country levels. 'Embeddedness' degree is characterized on the country-level statistics.

In the final empirical section regression analysis of factors impacted on labor productivity in periphery transport manufacturing is carried out. Taking the analyzed object specifics into consideration, the regression is based on fixed-effects panel data model.

A Dominance degree analysis

In order to specify the significance of transport manufacturing in EU periphery economies Herfindahl and revealed comparative advantage indices are calculated. The first one is assumed to reflect industrial diversification in peripheral economies (the higher the index, the more diverse is an economy) (Kolomak, 2013). RCA is designed to shed light on relative specialization degree of peripheral economies on transport

manufacturing in comparison with the world (the value higher the unity suggests the country's relative specialization on a given production).

Herfindahl index is calculated according to the Formula 1,

$$HH_{it} = \sum_{s=1}^{S} SEMP_{sri}^2 \quad (1)$$

Where SEMP is the the share of sector s employment (s=1, …, S) in an overall employment in i economy in period t.

Revealed comparative advantage index is calculated in the study according to B. Balassa (Formula 2),

$$RCA = \frac{X_{i,j} \Big/ X_{i,w}}{X_j \Big/ X_w} \quad (2)$$

Where $X_{i,j}$ is the country j exports of i good for a specified period of time, $X_{i,w}$ is the world exports of i good for the same period, X_j is an overall country j exports for the period, X_w is an overall world exports for the period specified.

For the purpose of a proper characterization of comparative advantage shifts, RCAs of HS 6-digit level are also calculated. Therefore, detailed specialization is studied, which allows for the sectoral and firm-level analysis cohesion. The estimations obtained are compared with product complexity indices (Higaldo, 2021) revealing technological sophistication and profitability of a given good. In essence, 'product complexity' term stands for a specific degree of the knowledge acquired in a society that is embodied in products manufactured there (Higaldo & Hausmann, 2009).

Juxtaposing RCA dynamics with product complexity one can conclude qualitatively on the changes occurring in a country's specialization profile.

BEvenness degree analysis

The specific properties of transport manufacturing spatial distribution among the EU periphery regions are portrayed whereby Theil index calculation (Formula 3),

$$T = \sum_{r=1}^{R} \left(\frac{GVA_r}{GVA} ln \frac{GVA_r}{GVA/R}\right) \quad (3)$$

Where GVA_r is gross value-added in a region r (r = 1, …, R), GVA is aggregated gross value-added, R is a number of regions.

Separability of Theil index (Formula 4) allows one to estimate sigma-convergence both within the periphery and between the core and the periphery of production system.

$$T = T_{inter} + T_{intra} \quad (4)$$

$$T_{inter} = \sum_{m=1}^{M} \frac{GVA_m}{GVA} ln \frac{GVA_m/R_m}{GVA/R}$$

$$T_{intra} = \sum_{m=1}^{M} \frac{GVA_m}{GVA} T_m$$

Where GVA_m is gross value-added of a macroregion (be that core or periphery), R_m is a number of regions within the macroregion. T_m is the Theil index calculated for the macroregion m according to Formula 5.

$$T_m = \sum_{}^{R_m} \frac{GVA_r}{GVA_m} ln \frac{GVA_r}{GVA_m/R_m} \quad (5)$$

C Embeddedness degree analysis

According to several studies (Vičková, 2018), EU peripheral economies reinforced their positions after the entry into the European Union. However, for us the comparative integration is of an interest. Hence, integration in our study is perceived as core-periphery inequality reduction, whereas autarkization, accordingly, is understood as an increase of the disproportions in favor of the core.

The patterns described are supposed to be indicated whereby the calculation of the variance coefficient (Formula 6),

$$K_{var}\frac{\sigma_B}{\overline{B}} \tag{6}$$

where σ_B is a standard deviation of betweenness centrality indicator among the countries analyzed, B is an average betweenness centrality for the given countries. Supposedly, as a result of an increase in embeddedness of peripheral economies into the European automotive manufacturing network the absolute difference in betweenness centralities for the core and the periphery becomes lower. Thus, variance coefficient dynamics shall be downgrading.

Betweenness centrality index which is a relative significance of the node as an intermediary indicator is calculated in a following way (Formula 7):

$$B_i = \sum_{s \neq v \neq t} \frac{\sigma_{st}(i)}{\sigma_{st}} \tag{7}$$

Here σ_{st} is a number of shortest paths from s node to t node, while σ_{st} (i) is an overall number of paths which pass through i node when i is not a final destination.

The 'embeddedness' degree analysis is elaborated on OECD input-output tables where intermediate flows between the sectors of different economies are presented. For every analyzed country betweenness centrality metrics in the EU-27 transport manufacturing (ISIC 29-30) are calculated.

The final stage of the empirical elaboration is econometric modelling of the factors determining the relative position of peripheral economies in each of the three degrees impact on the labor productivity in automotive manufacturing. The fixed-effects panel data model is specified where gross capital formation and export quota have been chosen for as controls. Since the base function is Cobb-Douglas production function, two obligatory variables are labor and capital.

Results

The general empirical hypothesis is that informal integration on the firm-level impedes core-periphery industrial profile convergence under trade liberalization (Fedyunina, 2016) and overall centripetal and centrifugal forces dynamism .

To prove the general hypothesis four specific hypotheses have been tested.

H1: the modern profile of EU automotive industry periphery is peculiar for a high level of specialization of these economies in automotive production, as well as for a trend towards an increase in spatial distribution of productive capacities within peripheral economies and for a deepening integration into the European automotive manufacturing.

H2: the deepening of peripheral economies integration into European transport manufacturing proceeds simultaneously with an increase in product complexity of goods which these countries specialize on.

H3: disproportions in gross value-added between the core and the periphery decrease.

H4: labor productivity in transport manufacturing of peripheral countries is determined largely by the embeddedness of these economies in the European production.

A Dominance degree analysis

he index (Figure 3) possible variation is in the region of 0.05-1. The figures in the interval of 0.08-0.14 testify about a considerable degree of industrial diversification of these economies. However, peripheral economies demonstrate a sustained trend for manufacturing dominance over other sectors.

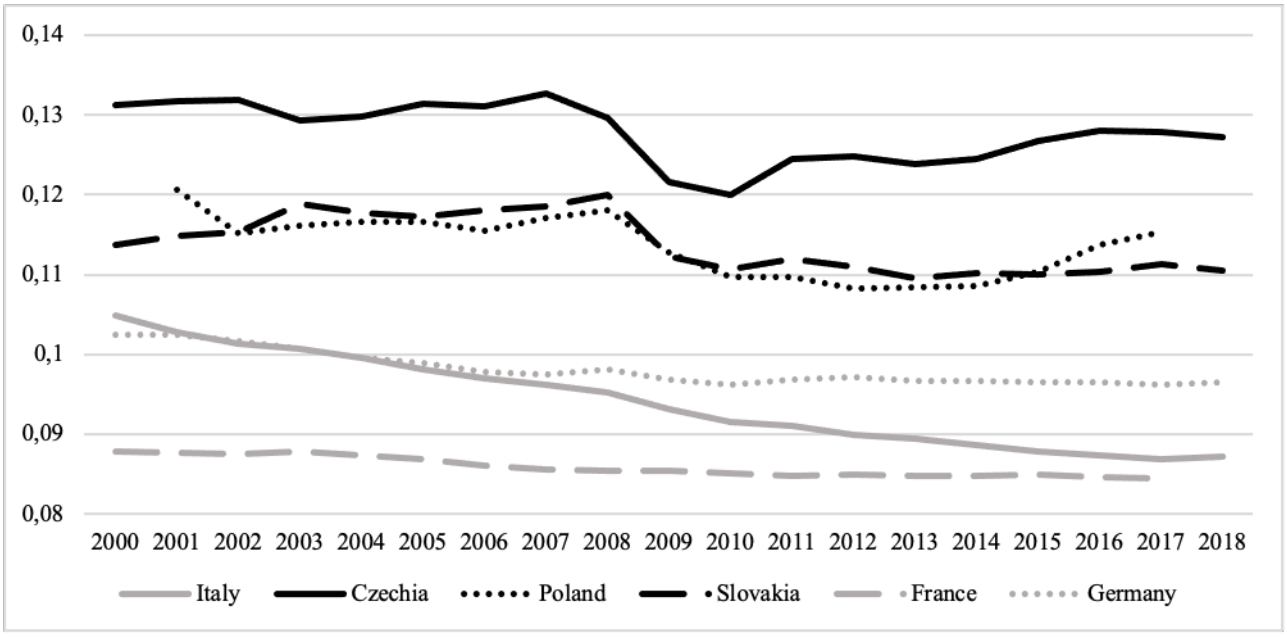

Figure 3. Herfindahl index of industrial diversification

Source: composed by author

Patterns of the relative international specialization of the core and the periphery on manufacturing exports have been dissected (Figure 4).

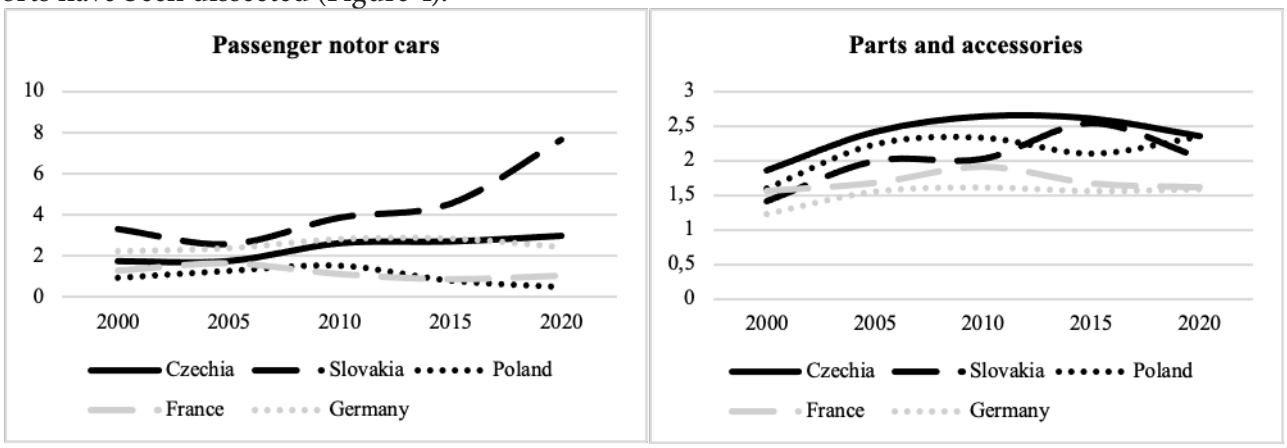

Figure 4. RCA indices for passenger motor cars and automobile parts and accessories, 2000-2020

Source: composed by author

According to the data, Visegrad countries are specialized on parts and accessories production higher than core economies. At the same time, Slovakia (and to a smaller extent Czechia) sustain the trend towards higher specialization in exports of passenger motor cars which symbolizes a new chapter in peripheral economies participation in global production networks.

It is beneficial to study the patterns of peripheral economies specialization on intermediate exports on a disaggregated level (Table 1).

Table 1 – Revealed comparative advantage and product complexity indices for Slovakia (HS 6-digit nomenclature)

Product	Product complexity index (2020)	RCA 2001	RCA 2010	RCA 2020
870600 (motor vehicle classis)	0.67	0.069	0.134	1.549
870790 (bodies for tractors, buses, trucks)	0.92	0.239	0.171	1.057

Product	Product complexity index (2020)	RCA 2001	RCA 2010	RCA 2020
870870 (wheels including parts/accessories)	0.47	0.420	1.165	1.318
870880 (shock absorbers)	1.27	0.132	2.533	4.886
870891 (radiators)	0.42	0.053	3.041	9.621
870710 (bodies for passenger vehicles)	0.63	3.343	89.571	0.080
870821 (safety seat belts)	1.04	1.926	0.567	0.080
871496 (bicycle peals/crank gear)	0.86	12.641	0.969	0.171

Source: composed by author

The table contains the positions for which there have been the most notable specialization shifts in Slovakia. This way, as a result of structural convergence with the core of transport manufacturing Slovak firms gained a relative specialization on the production of high-end goods, such as bodies and shock absorbers. At the same time, it has lost the specialization on the exports of several products (safety seat belts and peals) which are also technologically complex. Overall, the effect of production integration is ambiguous. However, up to a point, the second hypothesis is still confirmed.

B Evenness degree analysis

After the analysis of data (Figure 5), one can conclude that the third empirical hypothesis received confirmation. The differences in manufacturing gross value-added (black color) decreased over the period. While it should be noted that intraperipheral interregional disproportions in manufacturing GVA, at least, have not shrunk remaining high enough. This suggests that conglomeration trends in manufacturing are persistent in the EU periphery.

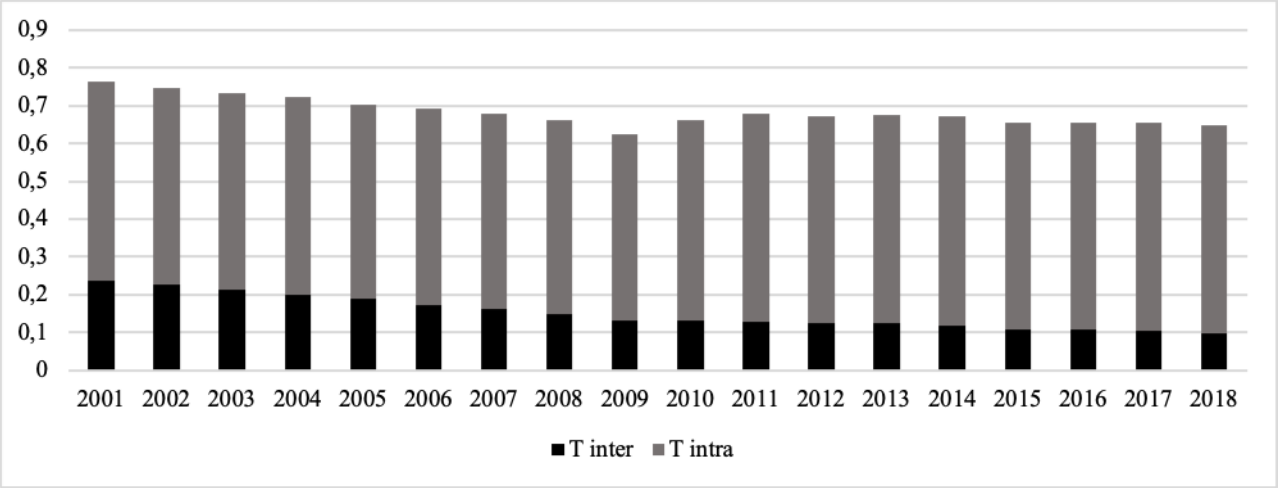

Figure 5. The Theil index calculated on manufacturing gross value-added generated in the EU core and periphery

Source: composed by author

C Embeddedness degree analysis

As one can see (Figure 6), over the whole period of the study the variance coefficient downgraded both for vehicle production (ISIC 29) and for other automotive production (ISIC 30). Thus, this can be a justification for a deepening of peripheral economies integration into macroregional production structures and for their convergence with the core countries.

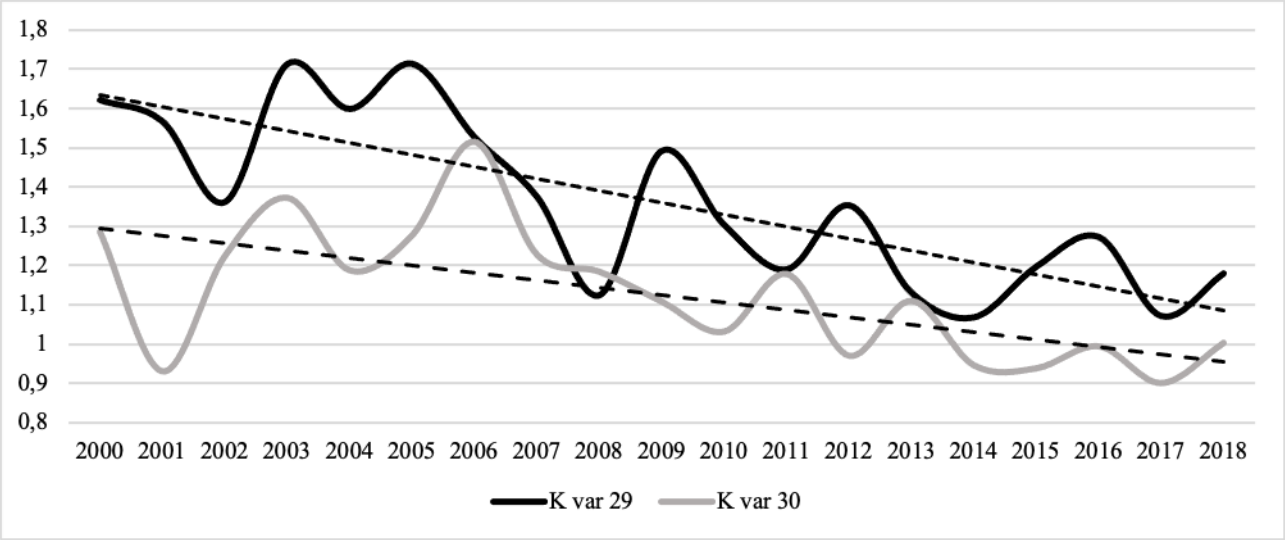

Figure 6. Variance coefficient calculated on betweenness centralities of Visegrad countries and the core European economies
Source: composed by author

D Synthesis

Conceptualizing, there has been a 'triple convergence' in the transport manufacturing between the EU core and periphery: structural convergence (higher extent of core-periphery industrial structure similarity), geographical convergence (reduction in production capacities distribution disparities), and topological convergence (the increase in likeness of the mode of integration into the European production structures).

Sectoral labor productivity upgrading, as well as the rationalization of transport manufacturing as a source of regional and national economic growth has long been a subject of research. According to the latest McKinsey report (Cornet et al., 2019), automotive sector demonstrates one of the highest employment levels in the EU totaling 13,3 million working places. Besides, this sector grants around 7% of total taxation in the Union. At the same time, European automobile semiconductors sells tripled over the last 20 years, whilst automobile software contributes largely to the sector's economic sophistication and supports the entry to the more beneficial GVC stages. Automotive manufacturing cooperation implies heavy intermediates imports on every production phase. In this regard, according to studies (Veeramani, 2009), the positive role of intermediate supplies for the overall economic development is grasped.

With respect to the EU regional convergence policy, it is assumed that the growth of European regions is 'cascading' in line with the Growth Poles Theory (Rauhut & Humer, 2020). Polycentrism, as it is seen under convergence activity in Europe, is an underlying principle for closing the gap between economically developed and peripheral regions in the EU.

Table 2 – FE-model factors estimations (value equivalent of annual output per worker as a dependent variable)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Consumption of fixed capital	0.06 (0.05)	0.04 (0.05)	-0.00 (0.07)	0.03 (0.05)	0.09* (0.04)	0.07 (0.05)	0.06 (0.08)
Labor costs (compensation of employees)	0.80*** (0.08)	0.82*** (0.09)	0.77*** (0.08)	0.78*** (0.08)	0.70*** (0.07)	0.73*** (0.10)	0.72*** (0.07)
Gross capital formation	0.28* (0.13)	0.25 (0.13)	0.38** (0.13)	0.30* (0.12)	0.44*** (0.11)	0.43*** (0.13)	0.39** (0.12)
Export quota	0.54*** (0.14)	0.56*** (0.15)	0.60*** (0.14)	0.53*** (0.14)	0.48*** (0.12)	0.47*** (0.13)	0.49** (0.15)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Betweenness centrality	-	-0.02 (0.02)	-	-	-	-	-0.02 (0.02)
Herfindahl index	-	-	-0.36 (0.52)	-	-	-	0.38 (0.54)
RCA (BEC 51)	-	-	-	0.08 (0.04)	-	-	0.07 (0.04)
RCA (BEC 53)	-	-	-	-	0.57*** (0.11)	0.59*** (0.11)	0.58*** (0.11)
Theil index (intra)	-	-	-	-	-	-0.01 (0.12)	0.19 (0.42)
R2	0.94	0.94	0.94	0.94	0.96	0.96	0.96
Adj. R2	0.93	0.93	0.94	0.94	0.95	0.95	0.95
Num. obs.	76	76	74	76	76	72	71

Source: composed by author

An important takeaway of the empirical study conducted (Table 2) is that labor productivity growth in the EU periphery automotive manufacturing is dependent on average compensation of employees and the relative international specialization on the exports of automotive parts and equipment.

All in all, in spite of 'triple convergence', structural convergence and higher participation in transport manufacturing cooperation are of the significance for peripheral economies in Europe. Hence, the fourth hypothesis has not been proved.

Discussion

To recap, through the empirical analysis the second and the third hypotheses have been confirmed. EU transport manufacturing periphery has reinforced its specialization on high-end intermediate exports. At the same time, a notable reduction in gross value-added distribution between the core and the periphery disproportions was registered. Partially, the first hypothesis has also been confirmed (despite an increase in specialization, there was no positive shifts towards production spatial distribution). Anyway, there is no proof for the fourth hypothesis (the degree of peripheral economies integration into macroregional production pays no contribution to labor productivity in transport manufacturing of the EU periphery).

In sum, the results obtained follow the core-periphery factor price equalization cycle. Visegrad countries have already proceeded through the four stages of the cycle if one begins it with the entry of automotive MNEs into these economies.

The research method applied is considered to be relevant for the majority of questions. Network indicators characterizing spatial topologies depict relational integration aspects concerning peripheral economies in the European systems in an effective way. Although several indicators (in particular, Herfindahl index of industrial concentration) have been calculated on the more aggregated (industry-level) data. Possibly, the raw data amelioration would allow one to get clearer and more precise findings.

Followingly, our results can be verified with the two propositions. At first, network metrics should be calculated on firm-level survey data of international production agents. At second, an estimation of geographical concentration of production capacities can be implemented with a greater precision (for instance, whereby Moran I-statistics calculation).

Conclusions

In this article an approach for the analysis of network core-periphery model development has been formulated and empirically challenged. This model shows a resilient EU automotive manufacturing organizational structure capturing the relevant trends in the sector's evolution.

The theoretical review has allowed for the punctuation of the attributes of the conventional core-

periphery model. First, it is crucial to take trade in intermediates as a factor price equalization driver into consideration. Second, the dual core-periphery model perception should be substituted with a multidimensional conceptualization of topological patterns of interregional cooperation. Third, concerning core-periphery analysis, the debates arise around the question of how to correctly apply multiscalarity principle for both the micro- and macro-level indicators assessment.

Based on theoretical assumptions, the conceptual framework for the network core-periphery model analysis has been suggested. Its foundation is the synthesis of economic-geographical and spatio-network concepts. In the new framework three analytical degrees are studied, namely structural (industry dominance), geographical (spatial distribution of production), and topological (core and periphery embeddedness into macroregional production). Network core-periphery model evolution has been framed in the introduced factor price equalization cycle.

Empirical testing has been elaborated on the automotive manufacturing. Revealed comparative advantage, Theil index, as well as betweenness centrality have been analyzed. Eventually, there was the evidence in favor of the core-periphery convergence in the all three analytical degrees. Apart from that, it has been unveiled that the increase in the sectoral labor productivity was mainly determined by the peripheral economies' specialization on intermediate products exports. This notion positively resembles with the theoretical assumptions.

In our opinion, the empirical results follow factor price equalization cycle. Hence, there is an opportunity to furtherly forecast the trends in European automotive production with the application of the introduced model.

References

1. Baldwin, R. E., & Martin, P. (2003). Agglomeration and Regional Growth. *CEPR Discussion Paper*, 3960. Retrieved from https://ssrn.com/abstract=436996

2. Brakman, S., & van Marrewijk, C. (2015). Factor prices and geographical economics. In C. Karlsson, M. Andersson, & T. Norman (Eds.), *Handbook of Research Methods and Applications in Economic Geography* (pp. 67–82). Edward Elgar Publishing.

3. Caviggioli, F., Colombelli, A., De Marco, A., Scelato, G., & Ughetto, E. (2022). Co-evolution patterns of university patenting and technological specialization in European regions. *The Journal of Technology Transfer*. Retrieved from https://doi.org/10.1007/s10961-021-09910-0

4. Chirot, D., & Hall, T. D. (1982). World-System Theory. *Annual Revew of Sociology*, *8*, 81-106.

5. Cingolani, I., Iapadre, L., & Tajoli, L. (2018). International production networks and the world trade structure. *International Economics*, *153*, 11–33. Retrieved from https://doi.org/10.1016/j.inteco.2017.10.002

6. McKinsey & Company. (2019). *RACE 2050 – A vision for the European automotive industry*. Retrieved from https://www.mckinsey.de/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/Deutschland/News/Presse/2019/2019-01-08%20Race%202050/Report_Race2050_A%20Vision%20for%20the%20European%20 automotive%20industry.ashx

7. De Lombaerde, P., Iapadre, L., McCranie, A., & Tajoli, L. (2019). Using network analysis to study globalization, regionalization, and multi-polarity. *Network Science*, *6*(4), 494-516. DOI: 10.1017/nws.2018.25

8. Deardorff, A. V. (1998). Fragmentation in Simple Trade Models. *The North American Journal of Economics and Finance*, *12*, 121-137.

9. Dicken, P. (2004). Geographers and 'globalization': (yet) another missed boat? *Transactions of the Institute of British Geographers*, (29), 5–26.

10. Farhauer, O., & Kröll, A. (2012). Diversified specialisation – going one step beyond regional economics' specialisation-diversification concept. *Jahrb Reg wiss*, *32*, 63-84 Retrieved from https://doi.org/10.1007/s10037-011-0063-9

11. Fedyunina, A. (2016). Trade liberalisation and its impact on regional development: theoretical and experimental studies. *Baltic Region*, *8*(3), 70-83.

12. Gaspar, J. M. (2020). New Economic Geography: Economic Integration and Spatial Imbalances. In

S. Colombo (Ed.), *Spatial Economics* (pp. 79-110). Cham.: Palgrave Macmillan. Retrieved from https://doi.org/10.1007/978-3-030-40098-9_4

13. Hidalgo, C. A. (2021). Economic complexity theory and applications. *Nature Reviews Physics*, *3*(2), 92-113. Retrieved from https://doi.org/10.1038/s42254-020-00275-1

14. Hidalgo, C.A., & Hausmann, R. (2009). The building blocks of economic complexity. *Proceedings of the National Academy of Sciences*, *106*, 10570-10575.

15. Jakubiak, M., Kolesar, P. J., Izvorski, I. V., & Kureková, L. M. (2008). *The automotive industry in the Slovak Republic: recent developments and impact on growth*. Washington, DC: The International Bank for Reconstruction and Development.

16. Jessop, B. (2005). The Political Economy of Scale and European Governance. Journal of Economic and Human Geography, *96*(2), 225–230. Retrieved from https://doi.org/10.1111/j.1467-9663.2005.00453.x

17. Jones, R., Kierzkowski, H., & Lurong, C. (2005). What does evidence tell us about fragmentation and outsourcing? *International Review of Economics & Finance*, *14*(3), 305-316. Retrieved from https://doi.org/10.1016/j.iref.2004.12.010

18. Klier, T. H., & Rubenstein, J. M. (2017). Mexico's growing role in the auto industry under NAFTA: Who makes what and what goes where. *Economic Perspectives*, *41*(6), 1-29.

19. Brincks, C., Domański, B., Klier, T., & Rubenstein, J. M. (2018). Integrated peripheral markets in the auto industries of Europe and North America. *International Journal of Automotive Technology and Management*, *18*(1), 1-28. Retrieved from https://doi.org/10.1504/ijatm.2018.10011325

20. Kolomak, E. (2013). Uneven Spatial Development in Russia: Explanations of New Economic Geography. *Voprosy Ekonomiki*, (2), 132-150. Retrieved from https://doi.org/10.32609/0042-8736-2013-2-132-150 (in Russian).

21. Kondrat'ev V., Popov V., & Kedrova, G. (2020). Global Value Chains Transformation: Three Industries' Cases. *World Economy and International Relations*, *64*(3), 68-79. Retrieved from https://doi.org/10.20542/0131-2227-2020-64-3-68-79

22. Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, *99*(3), 483-499. Retrieved from https://doi.org/10.1086/261763

23. MacPherson, A., & Krugman, P. (1992). Geography and Trade. *Economic Geography*, *68*(2), 216-218. Retrieved from https://doi.org/10.2307/144207

24. Martínez-Zarzoso, I., Voicu, A. M., & Vidović, M. (2011). CEECs Integration into Regional and Global Production Networks. *Econometrics: Applied Econometrics & Modeling eJournal*, 125.

25. Coe, N. M., Dicken, P., & Hess, M. (2008). Global production networks: realizing the potential. *Journal of Economic Geography*, *8*(3), 271-295. DOI: 10.1093/jeg/lbn002

26. Coe, N. M., & Wai-chung Yeung, H. (2019). Global production networks: mapping recent conceptual developments. *Journal of Economic Geography*, *19*(4), 775-801. DOI: 10.1093/jeg/lbz018

27. Pavlínek, P. (2018). Global Production Networks, Foreign Direct Investment, and Supplier Linkages in the Integrated Peripheries of the Automotive Industry. *Economic Geography*, *94*(2), 141-165.

28. Rauhut, D., & Humer, A. (2020) EU Cohesion Policy and spatial economic growth: trajectories in economic thought. *European Planning Studies*, *28*(11), 2116-2133, DOI: 10.1080/09654313.2019.1709416

29. Rutherford, T. D., & Holmes, J. (2014). Manufacturing resiliency: economic restructuring and automotive manufacturing in the Great Lakes region. *Cambridge Journal of Regions, Economy and Society*, *7*(3), 359–378. Retrieved from https://doi.org/10.1093/cjres/rsu014

30. Simonazzi, A., Jorge Carreto Sanginés, J., & Russo, M. (2020). The Future of the Automotive Industry: Dangerous Challenges or New Life for a Saturated Market? *Institute for New Economic Thinking Working Paper Series*, 141.

31. European Commission (2022). *Internal Market, Industry, Entrepreneurship and SMEs*. *Single Market Act.* Retrieved from https://ec.europa.eu/growth/single-market/single-market-act_en

32. Veeramani, C. (2009). Impact of Imported Intermediate and Capital Goods on Economic Growth: A Cross Country Analysis. *Econometrics: Data Collection & Data Estimation Methodology eJournal.*

33. Vlčková, J. (2018). Visegrad countries in global production networks: Value creation, control and capture. *Geographia Polonica*, *91*(4), 427–448. Retrieved from https://doi.org/10.7163/gpol.0129

34. Wuthnow, R. (1979). The emergence of modern science and world system theory. *Theory and Society*, *8*(2), 215-243. Retrieved from https://doi.org/10.1007/bf00171365

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Analysis of the problems of import substitution in the national economy

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Abstract. The paper analyzes the issues and prospects of solving the problems of import substitution in the national economy through the prism of modern trends of growing sanctions pressure on Russia, which significantly affects the technological sphere. Also paper analyzes the plans by sectoral import substitution of the Ministry of Industry and Trade. The work proposes the potential ways of solving import substitution problems of domestic processing industries.

Keywords: problem analysis, import substitution, national economy.

JEL codes: A10

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Introduction

The permanent increase of Western pressure on the national economy, as a part of the hybrid warfare against Russia that has been underway for years, requires significant mobilisation of the domestic economy in order to ensure its self-sufficiency and independence.

It should not be assumed that Western sanctions boomerang on Western economie, nor that Western partners are being replaced by Eastern ones. Only a strong national economy with globally competitive products will allow Russia to feel sustainable and independent in a wide range of geopolitical and economic changes.

At the same time, the cornerstone of the effective development of the domestic economy is solving the problem of import substitution, which predetermined the relevance of the topic of this study.

The purpose of this research is to analyze the issues and prospects of import substitution of the domestic economy in the current geopolitical and economic environment.

The methodological basis of the presented research was formed by well-known publications on the problems and prospects of import substitution of the domestic economy by Gribov (2022), Gustova (2022), Krivenko (2020), Reshetilo (2016), Ryabko (2022), Timoshenko (2022), Chromova (2022), Tsuhlo (2019), Tsygankov (2022), Shcherbina (2016) and many others, as well as the authors' developments in this research (Tebekin, 2015; 2016; 2020).

The plans by sectoral import substitution of the Russian Ministry of Industry and Trade provided the research theoretical base.

Main part

When analyzing the issues and prospects for solving the problem of import substitution in the domestic economy in the current geopolitical and economic conditions, at the first stage we analyzed the import substitution plans of the Russian Ministry of Industry and Trade for such industries as:

- Automotive Industry
- Civil Aircraft Construction
- Railway Machiner
- Consumer Goods Industry
- Forest-Industry Complex

- Engineering for Food and Processing Industry
- Medical Industry
- Oil-and-Gas Machine Building
- Waste Management
- Production of Construction, Road, Communal, Forestry and Ground Aerodrome Equipment
- Building Materials Industry of Composite Materials (Composites) and Products
- Construction Materials Producing Industry (Products) and Construction Structures
- Manufacturing of Conventional Arms, Munitions and Special Chemicals
- Radio Electronic Industry
- Agricultural Engineering
- Socially Important Industries
- Machine Tool Industry
- Shipbuilding
- Heavy Machine Building
- Pharmaceutical Industry
- Chemical Industry
- Non-Ferrous Metallurgy
- Iron and Steel Metallurgy
- Power Engineering, Electrical and Cable Industry.

The results of the Russian Ministry of Industry and Trade's import substitution plans assessment for the industries above are presented in Table 1.

Table 1 – Results of substitution indicators assessment according to the Russian Ministry of Industry and Trade of the Russian Federation

Branch	Number of items in the import substitution plan, percentage (%)	Average share of domestic products before implementation of import substitution plans, %	Average share of domestic products expected as a result of the import substitution plan until 2024, %	Average growth rate of import substitution by domestic products, % per year
Automotive Industry	103	39%	61%	8.8%
Civil Aircraft Construction	32	2%	96.7%	37.9%
Railway Machinery	8	47%	62%	6%
Consumer Goods Industry	1	17%	25%	3.2%
Forest-Industry Complex	4	41%	49%	3.2%
Engineering for Food and Processing Industry	17	23%	47.5%	9.8%
Medical Industry	24	25.5%	44.7%	7.7%
Oil-and-Gas Machine Building	139	14.9%	33.6%	7.5%
Waste Management	16	9.7%	46.2%	24.3%

Branch	Number of items in the import substitution plan, percentage (%)	Average share of domestic products before implementation of import substitution plans, %	Average share of domestic products expected as a result of the import substitution plan until 2024, %	Average growth rate of import substitution by domestic products, % per year
Production of Construction, Road, Communal, Forestry and Ground Aerodrome Equipment	37	20.9%	32.4%	4.6%
Building Materials Industry of Composite Materials (Composites) and Products	20	21.1%	66.1%	18%
industry of construction materials (products) and construction structures	8	42.3%	85.6%	17.3%
Construction Materials Producing Industry (Products) and Construction Structures	2	72.5%	97.5%	10%
Radio Electronic Industry	61	7.9%	49.0%	8.2%
Agricultural Engineering	57	10.1%	26.2%	6.0%
Socially Important Industries	10	28.2%	49.8%	8.6%
Machine Tool Industry	26	18.2%	28.9%	4.3%
Shipbuilding	86	28.7%	44.7%	6.4%
Heavy Machine Building	36	25.7%	49.7%	9.6%
Pharmaceutical Industry	65	1.9%	67.3%	26.2%
Chemical Industry	89	12.4%	58.4%	18.4%

Branch	Number of items in the import substitution plan, percentage (%)	Average share of domestic products before implementation of import substitution plans, %	Average share of domestic products expected as a result of the import substitution plan until 2024, %	Average growth rate of import substitution by domestic products, % per year
Non-Ferrous Metallurgy	26	29.4%	66.1%	14.7%
Iron and Steel Metallurgy	11	50.0%	66.0%	6.4%
Power Engineering, Electrical and Cable Industry	61	20.8%	56.3%	14.2%
Total	39.1	25%	54.5%	11.7%

Source: Sectoral import substitution plans of the Ministry of Industry and Trade of the Russian Federation, 2022

The analysis of the results of the import substitution indicators assessment according to the Russian Ministry of Industry and Trade (Table 1) allows to conclude the following.

Firstly, the largest number of items in the Russian Ministry of Industry and Trade's import substitution plans is in the Oil and Gas Engineering sector, indicating the previous focus of the domestic industry on the extractive industries.

Secondly, the Russian Ministry of Industry and Trade's import substitution plans do not actually include sectors of the sixth technological paradigm, including those based on nanotechnology, which obviously indicates these domestic industry sectors have not yet met the critical establishment parameters.

Thirdly, there should be noted the fairly low level of import substitution for the items in the plans of the Russian Ministry of Industry and Trade at the start of implementation of these plans – an average of 25% (see Table 1). At the same time, the lowest indicators in terms of the share of domestic products in the plans are demonstrated by such sectors as:

- Pharmaceutical Industry - 1.9%,
- Civil Aircraft Construction - 2.0%.

Fourthly, the average expected level of import substitution by 2024 by industry, as projected by the Russian Ministry of Industry and Trade, will be 54.5% (see Table 1), which means that import dependence issues will remain outstanding at 45.5%.

Fifth, the annual growth rate of import substitution in a number of sectors exceeds the initial one (before the implementation of the plans), including:

- Civil Aircraft Construction by 19 times;
- Pharmaceutical Industry by 13.8 time;
- Waste Management by 2.5 times,
- Chemical Industry by 1.5%;
- Radio Electronic Industry by 1.04 times.

Such indicators highlight certain questions for the organization and planning of import substitution processes for these industries. They include:

- if import substitution processes by industry can be implemented so quickly so that the annual growth rate of the import substitution rate exceeds the initial one (before the implementation of the plans), why has this challenge not been met in previous decades?

- If the import substitution issues by industries are indeed difficult to solve, how reasonable are the plans for an annual growth rate of import substitution higher than the initial one?

Sixth, serious concerns about the ability of the Russian Ministry of Industry and Trade's sectoral import substitution plans to achieve their targets by 2024 are caused by the absence of sufficient institutional and

market conditions in the domestic economy, including:

- improving the system of state management of industry;
- improving financial management conditions for industrial sectors (including direct and indirect levers of financial support);
- creating a favourable investment climate for domestic industries;
- stimulation of the development of domestic competition;
- etc.

Seventh, the most effective tool for increasing the efficiency of the issues of import substitution in the industries is the development and implementation of mechanisms for intensive stimulation of domestic competition development processes in the current challenging geopolitical and economic conditions of national economic.

Conclusions

Thus, the analysis of issues and prospects of solving the problem of import substitution in the domestic economy in the current geopolitical economic conditions was carried out for such sectors as: Automotive Industry, Civil Aircraft Construction, Railway Machinery, Consumer Goods Industry, Forest-Industry Complex, Engineering for Food and Processing Industry, Medical Industry, Oil-and-Gas Machine Building, Waste Management, Production of Construction, Road, Communal, Forestry and Ground Aerodrome Equipment, Building Materials Industry of Composite Materials (composites) and Products, Construction Materials Producing Industry (products) and Construction Structures, Manufacturing of Conventional Arms, Munitions and Special Chemicals, Radio Electronic Industry, Agricultural Engineering, Socially Important Industries, Machine Tool Industry, Shipbuilding, Heavy Machine Building, Pharmaceutical Industry, Chemical Industry, Non-ferrous Metallurgy, Iron and Steel Industry, Power Engineering, Electrical and Cable Industry.

The analysis of the results of the import substitution indicators' assessment by industry according to the sectoral import substitution plans of the Ministry of Industry and Trade of the Russian Federation (Table 1) allows us to conclude the following.

Firstly, the largest number of items in the Russian Ministry of Industry and Trade's import substitution plans is in the Oil and Gas Engineering sector, which indicates the previous focus of the domestic industry on the extractive industries.

Secondly, the Russian Ministry of Industry and Trade's import substitution plans do not actually include sectors of the sixth technological paradigm, including those based on nanotechnology, which obviously indicates these domestic industry sectors have not yet met the critical establishment parameters.

Thirdly, there should be noted the fairly low level of import substitution for the items in the plans of the Russian Ministry of Industry and Trade at the start of implementation of these plans – an average of 25%.

Fourthly, the average expected level of import substitution by 2024 by industry, as projected by the Russian Ministry of Industry and Trade, will be 54.5%, which means that import dependence issues will remain outstanding at 45.5%.

Fifth, the annual growth rate of import substitution in a number of sectors exceeds the initial one (before the implementation of the plans). Such indicators highlight certain questions for the organization and planning of import substitution processes for these industries.

Sixth, serious concerns about the ability of the Russian Ministry of Industry and Trade's sectoral import substitution plans to achieve their targets by 2024 are caused by the absence of sufficient institutional and market conditions in the domestic economy, including: improving the system of state management of industry; improving the financial management conditions for industrial sectors (including direct and indirect levers of financial support); creating a favourable investment climate for domestic industries; stimulation of the development of domestic competition; etc.

Seventh, the most effective tool for increasing the efficiency of the issues of import substitution in the industries is the development and implementation of mechanisms for intensive stimulation of domestic

competition development processes in the current challenging geopolitical and economic conditions of national economic.

References

1. Regnum. (2022). *Eastern Companies Are Already Coming to Russia Instead of Western Companies - Expert*. Retrieved from https://regnum.ru/news/3568145.html? (in Russian).

2. Voronin, Yu. (2022). *Only an Economic Mobilisation Can Keep Russia Safe from the West.* Retrieved from https://newizv.ru/article/general/11-05-2022/yuriy-voronin-tolko-mobilizatsiya-ekonomiki-sposobna-uberech-rossiyu-ot-zapada? (in Russian).

3. Gribov, M. (2022). *Import Substitution in IT: Digital Transformation in Russian Software.* Retrieved from https://rb.ru/opinion/importozameshenie-v-it/?ysclid=l3aewq0f5k (in Russian).

4. Gustova, N. (2022) *How Import Substitution Will Affect the Timing and Cost of Housing.* Retrieved from https://realty.rbc.ru/news/627ca82a9a7947e7150513b6? (in Russian).

5. Krivenko, N. V. (2020). Problems of Import Substitution in the Russian Economy. *Rossiya: tendencii i perspektivy razvitiya. Materialy XIX Nacional'noj nauchnoj konferencii s mezhdunarodnym uchastiem «Modernizaciya Rossii: prioritety, problemy, resheniya, Moskva, 18–19 dekabrya 2019 goda*». M.: Izdatel'stvo INION RAN, 286-290 (in Russian).

6. FRPRF. (2022). *Sectoral import substitution plans of the Ministry of Industry and Trade of the Russian Federation.* Retrieved from https://frprf.ru/zaymy/prioritetnye-proekty/?docs=334 (in Russian).

7. FRPRF. (2021). *Plan of measures for import substitution in the automotive industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 6th July 2021. N 2468.* Retrieved from https://frprf.ru/download/plan-importozameshcheniya-v-atomobiilnoy-promyshlennosti.pdf (in Russian).

8. FRPRF. (2021). *Plan of measures for import substitution in the forest-industry complex of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 23rd July 2021. N 2746.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-lesopromyshlennom-komplekse.pdf (in Russian).

9. FRPRF. (2021) *Plan of measures for import substitution in the medical industry of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 20th August 2021. N 3273.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-meditsinskoy-promyshlennosti.pdf (in Russian).

10. FRPRF. (2022). *Plan of measures for import substitution in waste management in the russian federation, which includes equipment, including that applicable to eco-technoparks, for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 31st March 2022. N 1163.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-otrasli-obrashcheniya-s-otkhodami.pdf (in Russian).

11. FRPRF. (2021). *Plan of measures for import substitution in the civil aircraft construction of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 2nd August 2021. N 2914.* Retrieved from https://frprf.ru/download/plan-importozameshcheniya-v-otrasli-grazhdanskogo-aviastroeniya.pdf (in Russian).

12. FRPRF. (2021). *Plan of measures for import substitution in the railway machinery of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 6th July 2021. N 2469*. Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-transportnom-mashinostroenii.pdf (in Russian).

13. FRPRF. (2021). *Plan of measures for import substitution in the engineering for food and processing industry of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 30th July 2021. N 2882.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-mashinostroenii-dlya-pishchevoy-i-pererabatyvayushchey-promyshlennost.pdf (in Russian).

14. FRPRF. (2021). *Plan of measures for import substitution in the oil-and-gas machine building of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 30th June 2021. N 2362.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-neftegazovom-mashinostroenii.pdf (in Russian).

15. FRPRF. (2021). *Plan of measures for import substitution in the industry of construction, road, communal, forestry and ground aerodrome equipment of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 29th July 2021. N 2852.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-proizvodstve-stroitelno-dorozhnoy-kommunalnoy-i-nazemnoy-aerodromnoy-.pdf?ysclid=l4sbau5osl178852437 (in Russian).

16. FRPRF. (2021). *Plan of measures for import substitution in the manufacturing of conventional arms, munitions and special chemicals of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 6th July 2021. N 2472.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-promyshlennosti-obychnykh-vooruzheniy.pdf?ysclid=l4sbeynr5r48132056 (in Russian).

17. FRPRF. (2018). *Plan of measures for import substitution in the radio electronic industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation* of *31st May 2018. N 2102.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-radioelektronnoy-promyshlennosti.pdf?ysclid=l4sbgzlc9l630073825 (in Russian).

18. FRPRF. (2021). *Plan of measures for import substitution in the agricultural engineering of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 30th July 2021. N 2881.* Retrieved from https://frprf.ru/download/plan-importozameshcheniya-v-otrasli-lesnoy-i-selkhoz-tekhniki.pdf?ysclid=l4sbjlkupe812331163 (in Russian).

19. FRPRF. (2021). *Plan of measures for import substitution in the heavy machine building of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 7th July 2021. N 2486.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-otrasli-tyazhelogo-mashinostroeniya.pdf?ysclid=l4sblmw33j91479996 (in Russian).

20. FRPRF. (2021). *Plan of measures for import substitution in the pharmaceutical industry of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 20th July 2021. N 2681.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-farmatsevticheskoy-promyshlennosti.pdf?ysclid=l4sbnfvn1u619193140 (in Russian).

21. FRPRF. (2021). *Plan of measures for import substitution in the chemical industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 6th July 2021. N 2471.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-khimicheskoy-promyshlennosti.pdf?ysclid=l4sbp395h1858714885 (in Russian).

22. FRPRF. (2021). *Plan of measures for import substitution in the non-ferrous metallurgy of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 21st October 2021. N 4191.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-tsvetnoy-metallurgii.pdf?ysclid=l4sbqx0mr8973741500 (in Russian).

23. FRPRF. (2021). *Plan of measures for import substitution in the iron and steel industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 15th July 2021. N 2611.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-chernoy-metallurgii.pdf (in Russian).

24. FRPRF. (2021). *Plan of measures for import substitution in the power engineering, electrical and cable industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 02nd July 2021. N 2442.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-energeticheskom-mashinostroenii-elektrotekhnicheskoy-i-kabelnoy-promy.pdf (in Russian).

25. FRPRF. (2021). *Plan of measures for import substitution in the industry of composite materials (composites) and their products of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 2nd July 2021. N 2423.* Retrieved from https://frprf.ru/

download/plan-po-importozameshcheniyu-v-otrasli-kompozitnykh-materialov.pdf (in Russian).

26. FRPRF. (2021). *Plan of measures for import substitution in the industry of construction materials (products) and construction structures of the Russian Federation for the period up to 2025. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 4th June 2021. N 2039.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-otrasli-stroitelnykh-materialov-izdeliy-i-stroitelnykh-konstruktsiy.pdf (in Russian).

27. FRPRF. (2021). *Plan of measures for import substitution in the socially important industry of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 2nd August 2021. N 2915.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-industrii-detskikh-tovarov.pdf (in Russian).

28. FRPRF. (2021). *Plan of measures for import substitution in the machine tool industry of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 28th June 2021. N 2332.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-stankoinstrumentalnoy-promyshlennosti.pdf (in Russian).

29. FRPRF. (2021). *Plan of measures for import substitution in the shipbuilding of the Russian Federation for the period up to 2024. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 2nd August 2021. N 2916.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-sudostroitelnoy-promyshlennosti.pdf (in Russian).

30. FRPRF. (2021). *Plan of measures for import substitution in the customer goods industry of the Russian Federation. Approved by Order of the Ministry of Industry and Trade of the Russian Federation of 2nd August 2021. N 2913.* Retrieved from https://frprf.ru/download/plan-po-importozameshcheniyu-v-legkoy-promyshlennosti.pdf?ysclid=l3adm4zv8 (in Russian).

31. Reshetilo, T. V. (2016). Import substitution in Russia: problems and prospects. *Vestnik Taganrogskogo instituta upravleniya i ekonomiki,* (2), pp. 3-5. (in Russian).

32. Ryabko, S. (2020). *Import Substitution Problems in High-Tech Areas.* Retrieved from https://eos.ru/eos_delopr/eos_delopr_intesting/111/16442/? (in Russian).

33. Samofalova, O. (2022). *The Consequences of the West's Strike on the Russian Economy Were Unexpected.* Retrieved from https://vz.ru/economy/2022/4/18/1154347.html? (in Russian).

34. Tebekin, A. V. (2017). Analysis of options for national economic development strategies. *Vestnik Moskovskogo finansovo-yuridicheskogo universiteta*, (4), 60-73 (in Russian).

35. Tebekin, A. V. (2021). Geographical, political and economical aspects of moving towards a new quality of technology, economy and society. *Vestnik Tverskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravlenie,* (3), 38-54 (in Russian).

36. Tebekin, A. V. Import substitution failures. Article in the public archive № 4059 20.05.2015 (in Russian).

37. Tebekin, A. V. & Anisimov, E. G. (2020). On the fronts of a hybrid war in the economic and geopolitical space. *Zhurnal issledovanii po upravleniyu, 6*(5), 60-74 (in Russian).

38. Tebekin, A. V. & Zhigulin, V. G. (2016). Scientific and practical problems of import substitution in the field of information and communication technologies. *O problemakh importozameshcheniya v tamozhennykh organakh i novykh razrabotkakh v sfere informatsionno-kommunikatsionnykh tekhnologii. Sbornik materialov Mezhvedomstvennoi nauchnoi konferentsii.* (pp. 81-91). Lyubercy: Rossijskaya tamozhennaya akademiya (in Russian).

39. Timoshenko, V. (2015). *Import substitution policy in Russia: from words to deedsImport substitution policy in Russia: from words to deeds.* Retrieved from https://www.garant.ru/article/630000/? (in Russian).

40. Khromova, O. (2022). *Import substitution in the current realities: how domestic companies get out of the situation.* Retrieved from https://rb.ru/opinion/it-startups/?ysclid=l3af9rviub (in Russian).

41. Tsukhlo, S. V. (2019). Problems of import dependence of Russian industry and import substitution in 2014-2018. *Delovoj zhurnal NEFTEGAZ.RU,* (4), 98-103 (in Russian).

42. Tsygankov, V. (2022). *"Effective managers" versus engineers – who will take it?* Retrieved from https://

svpressa.ru/economy/article/333836/? (in Russian).

43. Shelest, A. (2022). *The sixth package of sanctions: Russia cannot give up.* Retrieved from https://www.pravda.ru/economics/1707594-sanctions/ (in Russian).

44. Shcherbina, T. A. (2016). The import substitution policy: financial, economic and managerial aspects of its implementation. *Ekonomika. Nalogi. Pravo,* (1), 52-58 (in Russian).

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Justice vs. efficiency: which is more competitive in the socio-economic model of the digital society?

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Abstract. The paper analyses the impact of the emerging digital society on the evolution of the role played by efficiency and fairness in the competitiveness of contemporary socio-economic models and highlights the reasons provide this evolution. The author dwells on developing of economical society, the confrontation of efficiency and justice. This confrontation is traditional one and recently is replaced by their equal coexistence, growing into the priority of justice as a major condition for modern progress in the future. It allows us to consider incomplete socio-economic reforms in modern Russia. It is generally associating with the disregard of society's usual understanding of justice, which automatically failed any social reforms.

Keywords: competitiveness, justice, efficiency, socio-economic model, digital society, social innovation, worldview matrix, socio-cultural foundations of society.

JEL codes: A13; F01; O35; P50

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Introduction

We are living at the moment of the failure of economic science: it has not warned the world about the impending financial catastrophe spreading to the real sector; it cannot follow to the concepts of K. Marx or J.M. Keynes and propose effective competitive measures to adjust economic behaviour; it cannot provide necessary changes in the socioeconomic model as a whole neither in terms of the globalization path nor in accordance with the globalization track. Science is stagnant and is in the need of the new ideologues, such as Keynes, who will force the development of effective concepts appropriate to an emerging digital society in an age of instability.

The current global crisis can be defined as a symptom of the exhaustion of the existing world economic model based on a liberal conception (Subbeto, 2017; Tolkachev & Teplyakov, 2019). The world economy is entering a kind of «transition period» (Khubiev, 2022). Science is facing a difficult task. It needs to find a new, competitive, model of the world economic order and determine the main directions of its further development (Belyaev & Koshkin, 2020; Bodrunov, 2018; Kretov, 2019). At such turning points, it is fundamentally impossible to predict the direction of further development, whether the system will become chaotic or move to a higher level of order (Korolev, 2003).

Every new regime, especially one claiming to establish a new world order, begins its own historical time with some radical and sometimes strange innovations. For example, the laws of Bolshevik Russia in 1918 on nationalization of women (authors were Krupskaya & Kollontay), the 36-hour day and 10-day week, or the change of names of months during the Great French Revolution, or the change of furniture in the White House when the US administration changed.

The concept of «innovation» (from Latin novatio – renewal, change) is an example of homonymy, where one single word has several different meanings. The concept of 'innovation' is often confused with 'invention', referring to the creation of a new technical development or the improvement of an old one. Many improvements to goods and services would be more appropriately described simply by the word «improvement». Sometimes the term 'innovation' is associated with 'change' and 'creativity'.

Today the most common meaning is to identify innovation with an innovation in production,

management, organization of work, based on the application of science and technology. Linguists consider innovation to be equal to «a new creation». The lawyers make their own sense, defining it as an agreement between the parties to replace one obligation with another. However, innovation is an economic product providing a prosperous future. The term «innovation», meanwhile, was introduced by culturologists to denote the process of penetration of elements of one culture into another in the nineteenth century.

We believe the term «innovation» is more appropriate than the term «a new creation».

We concern the «innovation» is the investment brings it to fruition, i.e. to a new or improved product being marketed, or to a new or improved technological process being used in practice (in a market economy, to commercial success). I. Schumpeter introduced the concept of innovator as an inventor who has gained economic recognition; he associated innovation with a new combination of factors of production, i.e. innovation is associated with a marketable creative product (Schumpeter, 2008). In the context of globalization, it means:

1. at the microeconomic level, the production of goods and services matching, or better, surpassing the quality of similar world-class products;
2. at the macroeconomic level – the implementation of economic policies adequate to the challenges of the current moment, determined by internal as by external circumstances of the country;
3. at the global level – expansion of the national economy's share in the world economy;
4. at the socio-economic context, reforms/revolutions at bifurcation points set the trajectory of societal development until the next bifurcation point matures. These reforms may be of a purely technical nature – a kind of imitation of a socio-economic breakthrough. But there is a different level of novelty – when these techniques establish the new values, lead the society to new levels of development.

While the first three items strongly associated with the positive concept of innovation, with a certain progress, the fourth item allows the implementation of different signs to be applied to the result obtained. This particular item is the subject of our analysis.

This analysis is conducted in the system of coordinates «efficiency – justice», although only efficiency is considered as economic phenomenon. However, the economic justice depends on the type of economic system. Social efficiency depends on the scale of its failure, determining by the size and forms of outside influence.

Thus, our aim is to rank the two fundamental principles of any socio-economic model – efficiency and justice – in an emerging digital society, entering the age of instability and to determine their distribution/reallocation in terms of different social models.

Main part

'Efficiency' refers to the rational use of scarce resources. A simple and understandable criterion for the efficiency of market-oriented economies was described more than a century ago by A. Marshall and is defined by a market balance point. In this respect, social innovation has a very clear reference point: the more it make society closer to the market optimum, the more effective are these efforts (Marshall, 1993). By Marshall A., efficiency, at the enterprise and industry level, and social efficiency are not equal due to the presence of externalities.

The second concept – «justice» – is not unambiguous one. Liberal economic theory recognises any distribution of income as a result of the economic activity of market players. In turn, this result is determined by the contribution of production factors gaining market recognition. As a result, the market automatically considers efficient as justice one. However, the reality of the modern economy shows, on the one hand, distribution in proportion to the factors of production does not correspond to notions of justice, and on the other hand, «input indicators have no longer been seen as objective measures of real processes» (Volkonski & Kuzovkin, 2008) due to the impact of non-economic factors and manipulation on the market. Therefore, monetary estimates of performance cannot be used as criteria for equitable distribution. Notions of justice have been shaped over the centuries in other spheres of life: culture, religion, historical traditions – and form the core of the civilizational matrix.

At the beginning of the 21 century the world realized that humanity, regardless of the results of his

economic activity – simply by his birth as a human being – deserves human existence, which in the case of his market fiasco must be provided by society at the expense of market-successful citizens. We do not believe this interpretation of justice as objective reality. It is not subject of economic analysis. Later we will consider justice as sustainable effective development of the modern economy. Also, in addition to the positive approach, there is a normative one to economic research which creates subjective judgements about economic realities in a positive-negative frame of reference.

In this respect, social innovation also has a clear reference point, which can be reduced to the possibility of avoiding degradation of population in case of unemployment or other usual source of income, against the background of an improvement in the quality of human capital of society as a whole.

The problem is that both criteria rarely similar; more often their vectors are multi-directional, although each has a defined area of implementation. The current world economic model is built on liberalised efficiency, i.e. in accordance with Ricardo's theory of relative advantages in international exchange.

Efficiency and justice are commonly contrasted because investment in improving the welfare of the people, leading to a decline of the difference between the rich and poor people. It traditionally perceived as justice enhancing. This spending, on the other hand, did not increase the efficiency of production because it did not directly affect unit costs or the volume of output, which determined the scale of economical production. The growth of economic efficiency is usually associated with equipment modernization and technical innovation.

In the one hand, there is a simple solution: to create conditions for competition in order to distribute the national income and increase the budget payments. In the other hand other, it would not be a burden on the rich part of the population. It is a social market economy model. It could more properly be called a market-based social economy model, given the sequence of actions: first produce, then distribute (we do not take into account issue of the primacy of production in a post-industrial society). L. Erhard defined quite adequately the evolutionary path of European countries in the post-war period (Erhard, 2001); and at the beginning of the 21st century, the all countries post-industrial development led to enter into «golden billion» – wealthy part of world's population.

However, the success of this model is quite questionable one. Poor countries cannot achieve the required quantity of qualified, educated and creative workers, even if they are educated at the expense of international institutions and grants. Globalization provides the long-standing theory of the vicious circle of poverty (Nureyev, 2008).

Efficiency and justice: how compatible are they in contemporary social innovation, in the transition to a digital society? Or is movement only possible in a one-sided way, at the expense of sacrificing either one or the other?

Case study on global experience, the modern well-being of many countries required in the past a kind of ascetic period involving either a country's customary standard of living as was typical in the Eastern Hemisphere; or a nationwide acceptance of lowering traditional living standards due to force-majeure circumstances, as in post-war Germany.

The exhaustion of extensive development resources raises questions about the validity of the contrast between economic efficiency and social justice. Indeed, if land was the main factor of production in an agrarian society and capital in an industrial one, the efficiency of these economies was determined by the introduction of the material components of their respective resources. The transfer of funds from, for example, building a new factory to reducing the Gini coefficient in society could be seen as an increase in justice at the expense of efficiency; conversely, tax breaks for business could be seen as an increase in economic efficiency against a widening gap between the rich and the poor.

The transition to a predominantly intensive development path in a post-industrial digital economy has moved investments in education, health and cultural enhancement from being a «cost» that reduces development opportunities to being an «investment in human capital». The latter has become (for emerging economies, which include Russia, it is becoming) the determining factor in the development of modern society. It is therefore strategically the most effective investment.

Moreover, for developed society social world becomes one of the most important factors of economic efficiency, because the price of social instability is the disruption of complex economic organization.

Nowadays there is social new ideal of justice matures, the realization of which simultaneously ensures the formation of conditions for maintaining a highly efficient complex organized economy, the type of society itself changes: awareness and willingness to bear responsibility for this realization increases. The establishment and development of a civil society concerned with the redistribution of economic benefits. In parallel, there is a process of redistribution of authority by delegating their part to the public structures, allowing part of the responsibility for management decisions to be shifted from the official authorities to institutions of sitizens self-governance.

The axiom of the mutually exclusive nature of efficiency and justice, which originated in the ancient world, is becoming increasingly controversial. Business aims for big profits (at least in the long term), but not by any means. There has been highlighted role of moral values, appealing to the idea of justice, in building a successful business. According to Weber M., since the formation of the second type of capitalist, the productive capitalist, as opposed to the first type of capitalist, the commercial capitalist, who is guided by the principle «no cheat, no sell» (Weber, 2017). Today, a good reputation, the brand of a trusted partner is an intangible asset which is not legislative one but it is an informal institution serves to saving the transactional costs.

Transactional costs include the costs associated with finding partners, making business contacts, preparing the deal, and establishing a dialogue with the local government. Moral factors can either increase or decrease these costs. If, for example, you have to do business in a country with a high level of corruption and a non-transparent economy, the amount of transaction costs may even absorb the economic benefits of the proposed transaction. A company that has not yet established an impeccable reputation will have to spend a lot of money on image enhancement, i.e. PR, advertising and marketing, if it wants to enter a new market. Therefore, mechanisms are needed that can form the image of the enterprise. Successful businesses will soon be as much in need of business reputation as they are of credit, which is already starting to work in developed countries.

Morality is becoming a kind of supplementary resource on both micro and macro levels. At the micro level, academics and practical experience research show the moral values work effectively for Western economies by making their enterprises more competitive in a globalised world (provided that moral values have not been levelled down to the point where they are no longer perceived by society).

For example, in the area of human resource management, the use of economic, financial incentives alone is no longer sufficient in a globally competitive environment. To keep the enterprise up to date with modern information and communication technologies, the company needs to learn how to influence its staff through cultural and moral values. These values also play an increasingly important role in relationships with partners, customers, intermediaries, and finally society itself.

For those who still believe that «the main factor in a company's success is money» rather than the human factor and its associated morals, underestimating business ethics in the 21-st century could be fatal.

Unfortunately, the quality of national business ethics is far from ideal. Russia has not yet become a market economy in the classical sense, because not all the relevant processes have been completed and brought to their logical conclusion. This also affects ethics, including the running a business. In Russia, for example, business practices such as the well-established links between entrepreneurs and officials are traditionally strong. Undoubtedly, corruption is an important, but not unique, feature of Russia – it is also found in other countries. Much more worrying is the low level of contractual culture that is so typical of the Russian business community. In other words, the rule of civilized business – contract the first – still does not work in Russia. The reason should be sought at the state level. If the criterion of a civilised country is the separation of authority, where the judiciary stands apart, then in the Russian Federation the judiciary has not yet emerged as a system that makes objective decisions. Since it is very much tied to finances, «might is right». As a result, the treaty system is not fully protected.

Looking at morality from a macro perspective, as a resource for contemporary social innovation, historical experience shows that strategic developments are not within the power of bare power, no matter

how much political will it possesses – they need to germinate in society, giving rise to a complex feedback system. Otherwise, all good intentions will degenerate into an inversion, a reaction, or even a restoration.

But still there is an issue in practical implementation of serious reform in transitional Russia. The reason is only theoretical work on them while present regime provides the blocking of special interest groups. These special interest groups have a very simple redistributive motivation. Therefore, only tactical decisions are made. However, how can these decisions be implemented in practice? For example, there could be the money division between these groups. But it is impossible to create new institutions, to carry out reforms. This kind of social innovation without societal feedback is poor attempt to implement. This limits the introducing of the reforms and instead of strategic solutions there has present only some kind of their imitation. Strategic decisions cannot be introduced by the government. They can only be made by mature society.

The numerous sociological surveys indicate that Russians, even in the prosperous, 2000 years of this century, have one desire – the renaissance or restoration of The Great Empire. This is the most unfortunate result of social innovation, because restoration is the recovery of forms and institutions that have already been rejected by the historical process. Unfortunately, this scenario will not materialize. And if it is not to be implemented, it should be replaced by another, which would solve a rather large set of problems in reforming our society. This scenario is called 'justice' (Auzan et al., 2017; Auzan, 2006).

By the sociological surveys, it should be made clear that the Empire as a territorial understanding, republics, fraternal nations, etc. is not present at the responses; a very small amount of respondents believe it this way. The most respondents wants to back for the Brezhnev era, the Stalinist period or anything that means a stability of life, the imperialism in general, because the Empire has a kind of internal order appealing to justice itself.

The concept of justice, on the one hand, is not present in every society part of the worldview matrix (for example, the people of India live out of this concept). On the other hand, different societies interpret justice differently. In other words, the criteria for justice are variable. We guess it necessary to focus on the justice in its historical development.

«Throughout the twentieth century, Russia lived in a force field of a large worldview construct called Russian communism as a synthesis of two large blocks,» – believes S. G. Kara-Murza, – The first block named «peasant communal communism» by Weber. M. According to Kara-Murza, «the second one is Russian socialist thought, which by the beginning of the twentieth century had taken Marxism as its ideology, but with it the legacy of all Russian modernisation projects, starting with Ivan the Fourth» (Kara-Murza, 2013; Kara-Murza, 2020). The ideal utopian model of community was the city of Kitezh. A unique synthesis of both ideals was introduced into Bolshevism in the form of Russian Communism. On its basis a project for the modernisation of Russia was developed and successfully implemented, without the confrontation with traditional Russian concepts and traditions, but on the basis of them.

These traditions were developed in the context of the «borderland» between Europe and Asia (West and East), between sedentarisation and nomadism. Western-style ideals of justice date back to the polis (city) organization of authority in ancient Greece, which mandated citizen participation in common affairs, and to Roman law, which affirmed individual civil sovereignty. The religious values of Christianity, above all the Protestant and Catholic branches of Christianity, also had a huge influence on their content. The specificity of oriental norms of justice is rooted in the peculiarities of life in the communal structures of agrarian Asian society, which were formed under the influence of the values of Arab-Muslim, Confucian and Indo-Buddhist cultures.

The «boundary» architectonics of Russian civilisation has resulted in binarity: a system of checks and balances, giving rise to a construction of «mutual support». The latter, by combining opposites into an «impossible unity», constantly keeps society on the edge of social catastrophe. Each intention in binary-type cultures is balanced by its opposite, without which it has no meaning, as Yu. Lotman has shown (Lotman, 2002).

Russia's socio-cultural foundations are communitarian (the values concern with communal collectivism and condition the priority of group justice over the principles of freedom of the individual and, ultimately, the

domination of the state in regulating social life over the mechanisms of self-organisation of society). A more detailed description we presented earlier (Rodina, 2021).

But ignoring of society's customary understanding of justice declines any social reforms, reducing it. At the best scenario, society starts to stagnate; at worst, it degenerates.

If «efficiency» defines the level and result of a society's progressive development, «justice» expresses the mechanisms of mastering this level and the result achieved. Justice can be defined as the maturity of the spirit, and efficiency is the civilized managing of our lives. Efficiency is material issue but justice is moral one. Efficiency makes our life comfortable and enjoyable. Justice is a constant dissatisfaction with the achieved results, a search for catharsis for the soul, not the body satisfaction (Grechko, 2015). The man of justice is a soul-spiritual matter, the man of efficiency is a purposive-rational matter.

Conclusions

We can conclude that the algorithm of modern economic development changes the relationship between the two majors of economic analysis – efficiency and justice: instead of opposition (vs), there is coexistence (and). Moreover, while the traditional tandem (efficiency – justice) prioritises efficiency, satisfying the need for justice on the residual principle, the post-industrial digital society is more adequate to the primacy of justice as an indispensable condition of efficiency. However, whereas in the past the sacrifice of justice for efficiency was made within a single country, today it has been transferred to the global economy, as evidenced by the widening of the gap between developed and underdeveloped countries. As a result, the relationship between efficiency and justice in today's world order seems too ambiguous. Firstly, for a smaller part of the countries classified by the UN in the first group, its essence is reduced to conjunction «and». The business strategy of «profit by no means necessary» germinates. Secondly, for tomorrow's leaders of social innovation, this conjunction «and» is complemented by the primacy of justice. Thirdly, for the vast majority of countries, the «vs» remains relevant, taking on additional stresses as a result of globalization pressures in its current form.

Of course, it is not the strong recommendation by ignoring of humans' alter ego, for efficiency without justice leads to degradation of the society. The same with justice.

Thus, we can point that the new model of the world order should use a social-democratic model not the liberal one being implemented in practice.

References

1. Subetto, A. I. (2017). One Hundred years after the Great October Revolution: the ecological finale of US imperialism and the noosphere-socialist revolution as an imperative for humanity's survival. *Teoretich-eskaya ekonomika,* (3), 28-40. Retrieved from https://www.ystu.ru/3-2017.pdf (in Russian).

2. Tolkachev, S. A., & Teplyakov, A. Y. (2019). The Concept of Cyclical Sequence of Basic Technology Diffusion in the Economy and Ontological Conditionality of Theories of Industrial Society. *Ekonomicheskoe vozrozhdenie* Rossii, (4), 19-36 (in Russian).

3. Khubiev, K. A. (2022). On the transitional forms of the "fading" of economic relations in the theoretical model of noonomy. *Noonomika I nooobshchestvo. Al'manah trudov INIR im. S.YU. Vitte*, *1*(1), 101-114. DOI: 10.37930/2782-618X-2022-1-1-101-114 (in Russian).

4. Belyaev, S., & Koshkin, V. (2020). Can an economy be solidary? *Ekspert,* (14), 1158 (in Russian).

5. Bodrunov, S. D. (2018). Noonomics. The future: the fourth technological revolution necessitates profound changes in economic and social life. *Ekonomicheskoe vozrozhdenie Rossii,* (2), 5-13 (in Russian).

6. Kretov, S. (2019). *The theory and practice of human coexistence with nature.* M.: Dobrotvorenie (in Russian).

7. Korolev, I. S. (Ed.). (2003). *The world economy: global trends over 100 years.* M.: Yurist (in Russian).

8. Schumpeter, J. A. (2008). *A theory of economic development. Capitalism, socialism and democracy.* M.: Eksmo (in Russian).

9. Marshall, A. (1993). *Principles of economic science.* M.: Progress (in Russian).

10. Volkonsky, V. A., & Kuzovkin, A. I. (2008). Problems of gaining perspective. Russia's strategic chal-

lenges in the context of global trends // *Ekonomicheskaya nauka sovremennoi Rossii,* (4), 7-27 (in Russian).

11. Erhard, L. (2001). *Prosperity for all.* M.: Delo (in Russian).

12. Nureyev, R.M. (2008). *Development economics: models for establishing a market economy.* M.: Norma (in Russian).

13. Weber, M. (2017). *Selected: An image of society. 3rd edition, revised and enlarged.* M.: Tsentr gumanitarnykh initsiativ (in Russian).

14. Polterovich, V., Dmitriev, M., Yakovlev, A., Gurvich, E., & Auzan, A. (2017). The fate of economic programs and reforms in Russia (Proceedings of the roundtable discussion at the XVIII April international academic conference on economic and social development). *Voprosy Ekonomiki,* (6), 22-44. Retrieved from https://doi.org/10.32609/0042-8736-2017-6-22-44 (in Russian).

15. Auzan, A. A. (2006). *Contract-2008. Part one. Who to negotiate with?* Retrieved from https://m.polit.ru/article/2006/02/26/auzan/ (Accessed 01.05.2022)

16. Kara-Murza, S. G. (2013). *Russian communism. Theory, Practice, Tasks.* M.: Algorithm (in Russian).

17. Kara-Murza, S. G. (2020). *Matrix. The history of Russian attitudes to the history of commodity-money relations.* M.: Alistorus (in Russian).

18. Lotman, Yu. M. (2002). *History and typology of Russian culture.* SPb.: Iskusstvo-SPb (in Russian).

19. Rodina, G. A. (2021). Old analogue normality vs new digital normality in a competitive coordinate system, *Journal of regional and international competitiveness*, 5(4), 4-12. Retrieved from http://jraic.com/index.php/tor

20. Grechko, P. K. (2015). *The Ontomethodological Discourse of Modernity: Historical Advancement and its Challenges*. M.: Lenand (in Russian).

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