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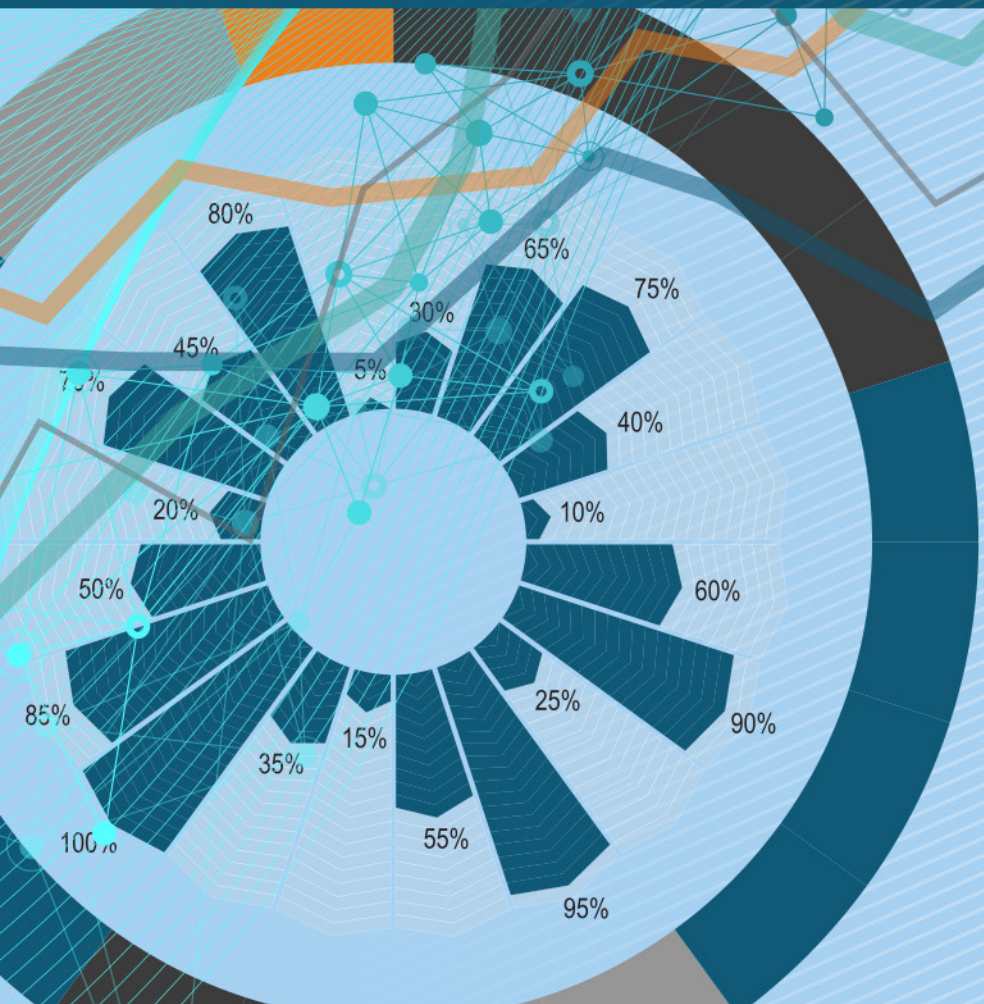

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Contents

Competitiveness and industrial progress: a political-economic analysis

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Abstract. The paper concerns with political and economic aspects of ensuring competitiveness in the conditions of forming a technocratic economy. Nowadays, the level of the applied technology ensures competitiveness. This level depends on both the innovation process cost, associated with R&D activities, and the result-oriented phase, determined by the industrialization of the national economy. This justifies the leading role of industrial progress in ensuring the technical and technological modernization of the national economy and, accordingly, increasing its competitiveness. The paper provides detailed political-economic and engineering characteristics of the main stages of industrialization. Therefore, the digital transformation of the economy and society is a modern stage of industrial progress associated with the introduction and use of technical devices with digital control. However, there is an underestimation of the importance in the modern domestic theory and practice of industrialization as the main driver of technical and technological progress. The authors propose a quantitative indicator which makes it possible to objectively evaluate and compare the levels of technological progressivity of various countries. On the basis of this indicator, we reveal a critical delay of Belarus and Russia from strategic competitors in the field of equipment and technology. Meanwhile, it is a serious threat to their economic and national security. Nowadays, formation and active implementation of the strategy of neo-industrialization (new digital industrialization) is the main direction of increasing the level of technological progressivity and competitiveness of socio-economic systems. Also we provide the general recommendations to improve the technical and technological equipment of the economy of the Union State of Russia and Belarus and, as a result, their economic and national security.

Keywords: competitiveness; technical and technological progress; research and development; industrialization; science intensity of GDP; the level of technological progressiveness of the national economy.

JEL codes: O25, O32

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Introduction

Evidently, one of the most effective ways of defeating competitors is the ability to steer them down a false path of development. The most obvious example of such a way of competitive struggle is the collapse of the USSR. Apparently, the country, an invincible superpower that possessed huge natural and human resources, a huge army, and powerful special services, collapsed during the so-called market democratic reforms, which were carried out according to the directives «kindly» provided by our Western «partners».

Another extremely dangerous, in our opinion, is the concept of post-industrialism (post-industrial society) imposed on the peripheral world. It emphasizes the key role of the service economy, and downplays the importance of the material sphere, in particular industrial production. By introducing the so-called «post-industrial doctrine» into the minds of local elites, technologically developed countries encourage their competitors to deindustrialize, deliberately reducing their industrial and technological potential. It ultimately leads to the reducing of the competitiveness.

However, historical facts (for instance, the Industrial Revolution of the 18th-19th centuries in Great Britain, which allowed it to create the global British Empire; the Soviet industrialization of 1928-1941; the ongoing industrialization of the new China; the current fourth industrial revolution in Western countries,

etc.) convincingly demonstrate the foundation of global competitiveness for a national economy is provided by the industrial progress. It associated with the production and widespread use of advanced civilian and military technologies. Considering this phenomenon through the political economy aspect substantiates the key role of industrialization in increasing the level of technological progress and, as a consequence, the global competitiveness of the national economy.

Hence, considering the unprecedented complexity of the geopolitical and economic situation in the Union State of Russia and Belarus, today for both our countries it is not the transition to the post-industrial economy, but new (digital) industrialization – neo-industrialization (Gubanov, 2012; 2023). In the conditions of the technological embargo of the West, only digital industrialization will allow saturating the Union economy with advanced domestic technologies with digital control and thereby not only increase its competitiveness, but also ensure technological, economic and national security of the Union State.

Main part

Today, the digital economy and the digital transformation of the economy and society is discussed broadly (Gordeev & Shkiotov, 2019; Makarov & Lugachev, 2019; Sklyar & Kudryavtseva, 2019). However, the phenomenon of digitalization is often discussed only superficially, without proper political and economic analysis and, as a rule, in isolation from the evolution of the technologies. In our opinion, many experts oversimplify digitalization, identifying it with the emergence of a post-industrial economy in which services are assumed to be completely dominant. Meanwhile, industrial production is relegated to the background and becomes practically an anachronism. Therefore, a certain «stereotype» has been formed. It claims the post-industrial society has «the priority has shifted from mainly the production of goods to the production of services, and information and knowledge become the dominant production resources» (Zakhodyakin, 2008).

We consider information and knowledge as indeed crucial for competitiveness, but only if they are implemented in advanced materials, technologies, production methods, etc. Therefore, information and knowledge have always been significant for ensuring competitiveness throughout the evolution of humanity. In fact, even in primitive tribes who managed to implement their knowledge and skills in better tools and weapons gained significant advantages over their competitors. The same refers to other historical periods - the ancient world, the Middle Ages, and the present. Obviously, at all times, however important information and valuable knowledge are, without practical and useful realization, any resources expended will be simply useless. The essence of the resource-utilitarian approach to the study of socio-economic processes that we are developing (Sklyar & Kudryavtseva, 2019) is based on this irrefutable fact. It is the basis of our research.

We believe the digital economy is simply another (modern) stage in the evolution of technology and technological progress, which is increasingly, realized through digital control devices. V.G. Gordeev and S.V. Shkiotov (2019) consider «the content of the category «digital economy», in political and economic terms, the manifestation of the objective law of the productive forces (tools and means of production, qualification of labour force, etc.) development at the modern stage and the peculiarity of this stage». Meanwhile, the essential characteristic of this period of the Earth civilization evolution is a large-scale process of integration of digitally controlled technical devices into all spheres of human life. However, the digital transformation of the economy and society should be considered as a modern stage of industrialization which began in the 18th century. In the most general sense, industrialization can be understood as an endless process of creating technical devices and widely equipping all spheres of human life with them (Table 1). Moreover, industrialization in China is also perceived as a continuous process, and its modern stage is called digital industrialization (Zhang & Baynev, 2021).

The enduring importance of industrialization is clearly demonstrated through the fact that Western economic philosophy also relies on the «industrial approach» as the basis for the human progress periodization. For example, within the framework of this approach, Western scientists distinguish the periods of the first, second, third, and fourth industrial (or industrial) revolutions (Schwab, 2016). Notably, Lenin-Stalin's industrialization played a crucial role in the fate of the pre-war USSR providing it with an industrial and technological base for the Great Victory, subsequent monumental scientific and technological achievements

(space exploration, laser technology, nuclear power, the second largest economy, the world's leading system of science and education, etc.) (Gordeev & Gordeev, 2012; Grishkov, 2023). Conversely, deindustrialization occurring during perestroika in the USSR and then in post-reform Russia became one of the most irrational phenomena of the 20th century. It eventually led to the collapse of the USSR and unprecedented complication of the geopolitical situation in some of its republics.

Table 1 – Political-economic and technical-technological analysis of the equipment and technologies evolution

Historical stage	Pre-industrial Era	Industrial Era			
		Heat Engineering Industrialization	Electrotechnical industrialization	Electronic technical industrialization	
				Analog stage	Digital stage
Basic type of energy	Non-converted energy (muscular energy of humans and animals, wind energy, water energy, etc.)	Thermal energy of the burned fuel	Power (energy) electricity used to transmit energy	Information electricity used for transmission, storage, transformation, etc. information	
Basic technical devices	Hand tools and simple mechanisms	Thermal engineering	Electrical engineering	Analog electronic technology	Digital electronic technology
Examples of technical devices	Shovel, axe, lever	Steam engine, gas lantern, steam hammer, kerosene lamp, etc.	Electric motor, electric lamp, electric heater, welding machine, electrolizer, etc.	Analog radio, TV, telephone, computer, etc.	Digital radio, TV, telephone, camera, computer (computer), etc.
Political and economic mission of technical devices	Chain hoist, horse-drawn transport, wind wheel, water mill	Partial replacement of human musculoskeletal energy, expansion of the production possibilities frontier	Massive replacement of human musculoskeletal energy, expansion of the production possibilities frontier	Total replacement of the of human musculoskeletal energy, the expansion of its production capabilities, the replacement of simple intellectual abilities of a person	Total replacement of the of human musculoskeletal energy, expansion of its production capabilities, large-scale replacement of human intellectual abilities

Source: composed by authors

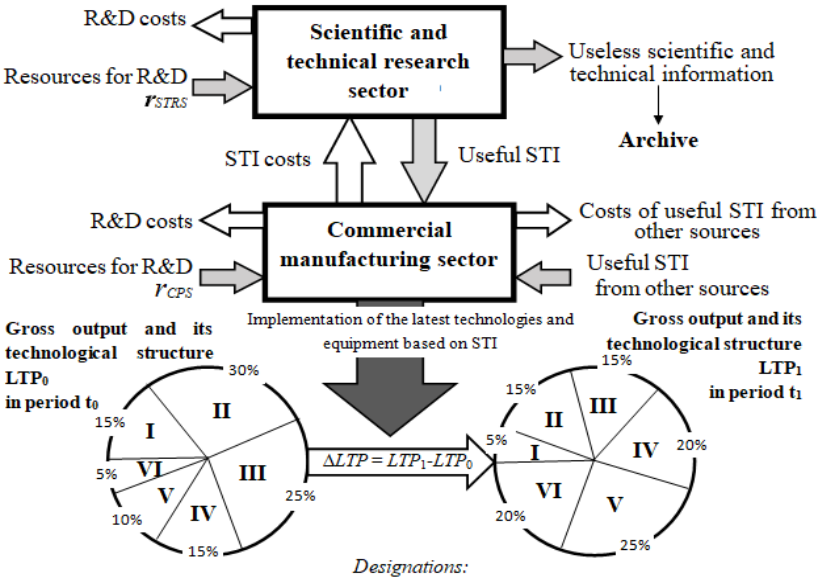
All mentioned above allows us to conclude that since the appearance of the first machines in the 18th century, the practical basis of competitiveness has been industrialization associated with their mass production and practical implementation. The essence of our resource-utilitarian approach is based on the assumption that any (biological, economic, social) system needs resources to maintain its integrity (i.e., to compensate entropy) and normal functioning. Indeed, there should be a fierce struggle for these resources. In this context, the competitiveness of an economic system is a state including active opposition of competitors even under unfavourable external conditions. It retains the ability to provide access to scarce (material, energy, financial, etc.) resources necessary for its self-preservation and performance of attributive functions within a specified life cycle.

Reasoning, we inevitably come to the following conclusion: the outcome of competition for limited resources has always and decisively depended on the technologies and techniques used by competitors, both civilian and military. An economic system's competitiveness, in other words, is to a large extent determined by the level of technology and engineering used in it. Since the production of technology is assigned to the industrial sector, the strategic directions for improving the competitiveness of the national economy are as follows:

- research and development (R&D), generating scientific and technological information (STI) and effectively translating it into advanced technologies and progressive machinery models realized by them;
- industrialization as a process of the mass production of advanced technologies with the aim of saturating all spheres of human life, increasing the level of technical and technological competence and, ultimately, improving the competitiveness of the domestic economy.

However, in the countries of the former USSR the attention of scientists is primarily focused on the sphere of research and development, assessed by R&D expenditures in it. Moreover, as a universal means of stimulating technical and technological progress of the national economy, a targeted increase in the science intensity of GDP, measured as the ratio of R&D expenditures to GDP, is prescribed (Bogdan, 2022; Goraeva, 2020). For example, in the Programme of Socio-Economic Development of the Republic of Belarus for 2021-2025, the main target indicator for the development of the scientific and technological sphere is a targeted «increase in R&D intensity in GDP to at least 1%» (currently this indicator is 0.47%)[1].

According to the resource-utilitarian approach to the study of socio-economic processes, R&D intensity is a typical cost indicator characterizing only the initial stage of the innovation process, namely the stage associated with costs. Nevertheless, the final useful result – increasing the overall level of technological development of the national economy – is a «product» of the industrial sector producing new technologies (fig. 1).



Designations:
STI - scientific and technical information; R&D - research and development work; LTP is the level of technological progress of the national economy;
I, II, III, IV, V, VI - contributions to the gross output of economic activities related to the first to sixth technological modes, respectively; ΔLTP is a change in the structure of gross output in favor of more high-tech types of economic activity (useful effect of scientific and technical activity);
r_{STRS} is the vector of resources spent on R&D in the scientific and technical research sector;
r_{CPS} is a vector of resources spent on R&D in the commercial (public and private) sector

Figure 1. The final useful result of scientific and technological activity

Source: composed by authors

As a quantitative measure of this level, we propose to use the indicator of the level of technological

[1] *The program of socio-economic development of the Republic of Belarus for 2021-2025. https://pravo.by/document/?guid=3871&p0=P32100292*

progressiveness of the national economy LTP («level of technological progress»), which represents the average level of technological progressiveness of economic activities forming the country's GDP. Academicians D. Lvov-S. Glazyev proposed the system of periodization of scientific and technological progress in accordance with the separation of the types of economic activities forming the country's GDP. Its value can be defined by the weighted average formula. By this formula, the ordinal numbers of technological patterns 1...6 act as options, and the weighting coefficients of these options are the shares in GDP of products belonging to the corresponding patterns. All required data for calculations can be easily found on the basis of domestic statistics. As a matter of fact, any other scale can be used, for example, from 1 to 4 – according to the number of industrial revolutions considered in Western economic philosophy. More detailed methodology for determining the level of technological progressiveness of the national economy, as well as the results presented in Figure 2, are described in our other publications (see, for example, Baynev & Goraeva, 2023).

In particular, these results show a significant difference between Belarus and Russia in terms of technological progressiveness of their economies and their strategic competitors. It poses a direct threat to the competitiveness of their national economies, especially in the current challenging environment.

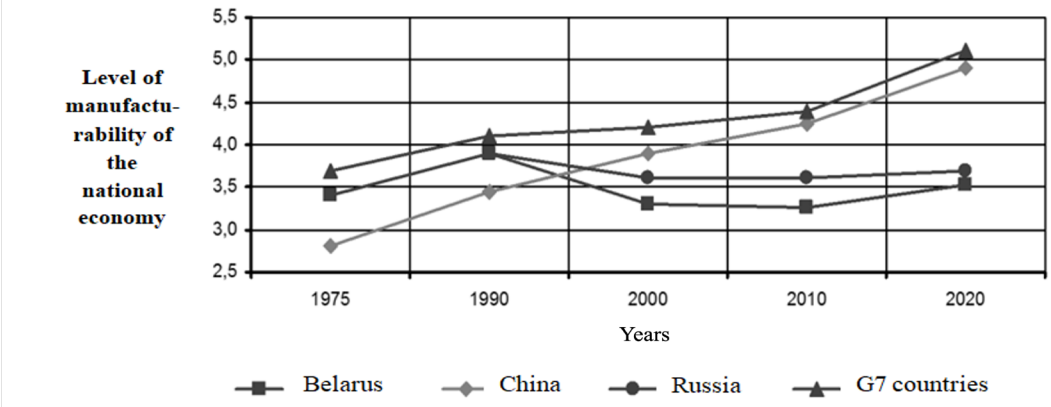


Figure 2. Dynamics of the indicator of technological progressiveness of national economies of some world countries, 1975-2020

Source: Baynev & Goraeva, 2023

Conclusions

In the context of intensified competition between countries and blocs for limited resources, improving competitiveness becomes the most urgent challenge. Under the conditions of technologically developed economy, the decisive factors of competitiveness are engineering and technologies. The paper reveals that technical and technological potential of the national economy is determined by two key phases of the innovation process. The first phase associated with research and development, which involves investment in R&D and the generation of new technological innovations. The second phase provides a real increase in the technical and technological level and, accordingly, the overall competitiveness of the national economy (or industrialization).

Evidently, competitiveness can be improved only if both phases – investment-intensive (R&D) and result-oriented (industrialization) – will be successfully implemented in the national economy. We propose to use the level of technological progressiveness of the national economy as an integral characteristic of the effective functioning of both phases. The distinctive feature of this indicator is the direct consideration of the final result of the innovation process – an increase in the share of high-tech economic activity in GDP. Its targeted increase will definitely indicate the growth of the technological level of production in the country and, as a consequence, an increase in its global competitiveness. Hence, our study allows us to substantiate two key trends in the current growth of domestic economic competitiveness:

1) intensification of domestic research and development, including increased investment in R&D and

stimulation of knowledge-intensive GDP (Shlychkov, 2022);

2) formation and active implementation of the neo-industrialization strategy (new digital industrialization) (Gursky et al., 2021), designed to become a practical mechanism for equipping all sectors and industries of the domestic economy with advanced technologies and digital management.

Finally, the results of our study have become particularly relevant when our countries faced severe restrictions in the acquisition of advanced technologies and products manufactured using them, or in the context of the current technological embargo imposed by Western countries against Belarus and Russia.

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The work was done on a personal initiative.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Tatyana Y. Goraeva – conceptualization, project administration, writing – original draft.
Valery F. Baynev – data curation, formal analysis, validation, writing – review & editing.

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Impact assessment of the mutual trade depth on the economic growth rates of the EAEU states

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Abstract. The record growth of mutual trade within the EAEU last year highlights the issue of the balance of benefits and costs for the countries of the Union in the context of the spillovers risks of macroeconomic shocks from the leading economy of the integration association to other members of the integration association. The purpose of the study is to assess the impact of the depth of mutual trade on the economic growth rates of the member states of the integration association. Hypothesis of the study: there should be a direct (statistically) significant relationship between the indicators characterizing the depth of mutual trade of the EAEU countries, and the rate of economic growth of the member states of the integration association. At the first stage of the study we determined the depth of mutual trade of the EAEU countries; at the second stage we verified the relationship between the indicators characterizing the depth of mutual trade of the EAEU countries, and the GDP growth rates of the EAEU member states using correlation analysis. The results of the study show the direct impact of the rate of mutual trade of the EAEU countries on the dynamics of their economic growth.

Keywords: EAEU, mutual trade, sanctions, correlation analysis, economic growth.

JEL codes: F02, F15, F16

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Introduction

According to the analysts at the Eurasian Development Bank (EDB), the volume of mutual trade of goods in the Eurasian Economic Union (EAEU) reached its maximum value in 2022, and totalled $80.6 billion (an increase of 10.3%), despite the intensification of unprecedented sanctions pressure on the Russian economy. This alltime high can be explained by the significantly increased exports of former Western partners to Russia's neighbouring countries against the background of a practical complete cessation of trade turnover with Russia. Moreover, the risks of secondary sanctions have not yet outweighed the possibility of benefiting from the established channels of parallel imports. Hence, Armenia, Belarus, Kazakhstan, and Kyrgyzstan increased their exports to the EAEU by $9.8 billion (1.4 times), including $9.5 billion to Russia. Therefore, Armenia's exports to the EAEU increased by $1.6 billion (2.8 times), Belarus – by $5.6 billion (1.3 times), Kazakhstan – by $1.9 billion (1.2 times), Kyrgyzstan – by $646 million (1.8 times)[1].

Meanwhile, the macroeconomic shocks associated with the Special Military Operation (SMO) affect both the Russian and other EAEU economies. In this regard, it is interesting to consider whether the benefits arising from the intensification of mutual trade outweigh the costs of macroeconomic shocks from the leading economy of the integration association.

Recent publications on this subject do not provide a conclusive explanation of this issue. However, Kot, Barsukova et al. (2023) in their research identified the strengths (institutional and legal structure of the EAEU single market, historical, cultural, and economic proximity of the EAEU member states, transit potential of the territory, high level of internal trade, and increase in the share of ruble transactions in trade turnover, etc.) and weaknesses (low efficiency of the institutional structure, gap in the socio-economic level of the member states development, unstable geopolitical situation in some of the member states, low level of the EAEU recognition on the global market, economic and political conflicts of the member states interests,

[1] *https://ilex.by/kak-strany-eaes-postavili-rekord-v-torgovle-na-fone-sanktsij/#:~:text=%D0%92%D0%B7%D0%B0%D0%B8%D0%BC%D0%BD%D0%B0%D1%8F%20%D1%82%D0%BE%D1%80%D0%B3%D0%BE%D0%B2%D0%BB%D1%8F%20%D0%95%D0%90%D0%AD%D0%A1%20%D0%B2%202022,%E2%80%94%20%D0%BD%D0%B0%209%2C5%20%D0%BC%D0%BB%D1%80%D0%B4%20%D0%B4%D0%BE%D0%BB%D0%BB%D0%B0%D1%80%D0%BE%D0%B2*

dependence on Western technologies in some key sectors, etc.) of the EAEU.

Andronova & Ryazantsev (2023) use correlation analysis to study the impact of educational and labour migration on the social-investment model of economic growth in the EAEU.

Cieślik & Gurshev (2023) assess the benefits of economic integration for the above-mentioned economies using a multiregional gravity model with interdependent trade flows as well as bilateral trade data for Tajikistan and Uzbekistan. The authors concluded the economies under study would benefit most from joining the EAEU (compared to integration with China or Iran).

Pizzolo (2023) proposes to examine the establishment and functioning of the EAEU through the prism of Carl Schmitt's concept of the "Great Space". According to the researcher, the EAEU resembles Schmitt's "Great Space" in four main aspects: the existence of a regional hegemon with spheres of interest outside its fixed borders; cultural and historical proximity of countries; overcoming the rigid Westphalian governmental model; and the occurrence of the Earth Nomos (as an ideological opponent of the Sea Nomos). The author believes the establishment of the EAEU is a confirmation of the ongoing global shift from rigid Westphalian Nation States to highly integrated political-economic blocs based on civilisational identity in a multipolar world.

Ivliev & Shakhnazarov (2023) emphasize parallel imports as a tool for the development of international trade and increasing the availability of goods in different countries. The researchers believe it, in some respects, an instrument of international competition giving rise to a number of legal issues on the solution of which depends the stability of trade relations, the availability of goods in the markets of different countries, and the observance of the intellectual property rights. The authors analyze the legal approaches to parallel imports and the issue of exhaustion of rights in the EAEU. The study revealed the absence of a normative definition of the "parallel import" concept at the international level. Moreover, there are no international legal grounds allowing the right holder to prevent the implementation of the international principle of the total rights exhaustion in a particular state. Indeed, the regional principle of the exclusive rights exhaustion within the EAEU can serve as an important mechanism for completing the markets of goods and services of the EAEU member states, replenishing the missing goods in their markets, increasing competition and optimizing prices for goods in the region.

Braun, Gromilova & Melnikovová (2023) consider the EAEU as an undemocratic regional organization. They possess the EAEU's activities aimed at eliminating non-tariff barriers are resisted by the EAEU member states which maintain that cooperation between the countries should be exclusively economic.

Makhmutova (2019) assumes the EAEU member states' political behaviour is based on political pragmatism, hence, while providing official support for Eurasian integration the countries of the Union are also interested in acceding to alternative projects strengthening their sovereignty. Therefore, the main challenge to the Union originates primarily from the political sphere, since the number of Eurasian integration alternatives is gradually increasing, disrupting relations between the EU members and Russia. In this regard, the correlation between Western sanctions and the EAEU's economic growth rate is very important. Moreover, the main purpose of sanctions is to limit Russia's ability to pursue an independent and active policy, including the development of foreign economic projects. Consequently, anti-Russian sanctions should have affected the EAEU and its key members. In 2016, Russia demonstrated a decrease in gross domestic product (GDP) which had an even greater negative impact on Belarus and Kazakhstan. Nevertheless, they have not only managed to regain lost ground on economic performance but also achieve some growth in GDP. Such dynamics confirms the author's hypothesis on the EAEU members have room for manoeuvre if an external player influences their political and economic development.

Abdykappar, Yuriy & Mukhit (2020) performed a study based on the developed dynamic multi-sector and multi-country computable general equilibrium model. The model describes the functioning of the economies of nine regions. It includes five countries of the Eurasian Economic Union (EAEU). The results demonstrate greater efficiency for each EAEU country using a coordinated economic policy to counter sanctions, compared with the implementation of such policy separately at the level of each country.

Spartak (2021) highlights the strong concentration of EAEU countries mutual trade on Russia, which

strongly depends on the state of the Russian domestic market and the terms of Russian energy supplies to its EAEU partners. Smaller EAEU countries-Belarus, Kyrgyzstan, and Armenia – are most focused on mutual trade, while for Russia the role of trading partners in the EAEU is much lower. For the Union as a whole, the share of intra-regional trade in total foreign trade turnover is still very low – 12-14 % in the last decade- but for the participating countries, the quality of this trade is very important as, in contrast to supplies to third countries, a significantly larger share belongs to manufacturing products and the nomenclature of trade is much wider. There is a slight but steady increase in the role of mutual trade in meeting the internal demand of the EAEU in agricultural and industrial products. The low level of competitive regional supplies of technological goods and services, the weak development of intra-industry trade, large trade imbalances in favor of Russia, violations of the Customs Union rules by the parties, and the deviation of trade flows in favor of major non-regional players, primarily China and the EU, are all factors which have a restraining effect on mutual trade. Calculations based on the CGE-model predict the possibility of a significant increase in mutual trade in the case of the complete elimination of non-tariff barriers, as well as the stimulating effect on intra-regional trade in the case of Uzbekistan's accession to the EAEU. The real prospects for a substantial expansion of trade within the EAEU are small, due to the existing restrictions and contradictions between partners, as well as due to the already existing phenomenon of overtrading in the EAEU region.

A special attention is drawn to the report "Assessment of the EAEU integration processes in trade" which has been published since 2020 as part of the Annual Yasin (April) International Scientific Conference on Problems of Development of Economy and Society of the Higher School of Economics. Currently, this is probably the most thorough study of the EAEU in the post-Soviet area: the report offers not only an original methodology for calculating integration indices in the goods and services trade, but also provides detailed analysis of various aspects of mutual investments, problems of small and medium-sized enterprises development, etc. Hence, the purpose of this study is to assess the impact of the depth of mutual trade on the economic growth rate of the integration association member states.

Methods

Hypothesis of the study: there should be a direct (statistically) significant relationship between the indicators characterizing the depth of mutual trade of the EAEU countries and the rate of economic growth of the integration association member states.

Explanation: intensification and complication of mutual trade in the EAEU area lead to an increase in trade turnover between countries, create new jobs and ultimately increase the GDP.

Research algorithm: at the first stage of the study we will determine the depth of mutual trade of the EAEU countries. At the second one, we will verify the relationship between the indicators characterizing the depth of mutual trade of the EAEU countries, and the GDP growth rates of the EAEU member countries using correlation analysis.

Research Methodology:

1. The research period is 7 years (long-term).

2. Indicators used: Trade Intensity index, GDP of EAEU countries (see Table 1), Import Penetration Index, volumes of mutual trade (see Table 2).

3. Sample: EAEU countries, 2015-2021.

4. Research Methods:

- the first stage: to assess the depth of mutual trade of the EAEU countries, we will use a number of indices proposed in the report "Assessment of EAEU integration processes in the sphere of trade" (2022). To calculate the Indices of Import Penetration (it shows the role of member states in satisfying each other's domestic demand) and Trade Intensity (it shows the level of mutual trade intensity compared to the level of participation in world trade, advantages on the markets of the states of the block compared to the position on the world market as a whole), data from the Eurasian Economic Commission were used[2].

- the second stage: we use correlation analysis to verify the hypothesis. In this study we set a significance

[2] *Foreign and mutual trade statistics of the EAEU. https://eec.eaeunion.org/comission/department/dep_stat/tradestat/*

level (p-value) of 5% to test the significance of the correlation coefficient.

Table 1 – Mutual trade of EAEU countries, 2015-2021, in $ USD, bn

Period	Armenia	Belarus	Kazakhstan	Kyrgyzstan	Russia
2015	0,256	11, 007	5, 120	0,410	28, 821
2016	0,393	11, 384	3, 930	0,447	26, 804
2017	0,570	13, 651	5, 262	0,541	34, 685
2018	0,688	13, 932	6, 046	0,640	38, 953
2019	0,767	14, 569	6, 406	0,641	39, 247
2020	0,709	14, 009	5, 671	0,554	34, 108
2021	0,888	17, 463	7, 648	0,803	45, 806

Source: composed by the author from: https://eec.eaeunion.org/comission/department/dep_stat/tradestat/

Table 2 – Annual GDP of the EEU countries at the exchange rate in current prices, 2015-21, in $ USD, bn

Period	Armenia	Belarus	Kazakhstan	Kyrgyzstan	Russia
2015	10,60	56,30	184,40	6,70	1356,70
2016	10,50	47,70	137,30	6,80	1280,60
2017	11,50	54,70	166,80	7,70	1575,10
2018	12,50	60,00	179,30	8,30	1653,00
2019	13,60	64,40	181,70	8,90	1695,70
2020	12,60	61,30	171,10	7,80	1488,10
2021	13,90	68,20	197,10	8,70	1836,60
2022	19,50	73,10	225,80	11,10	2215,30

Source: composed by the author from: https://eec.eaeunion.org/comission/department/dep_stat/tradestat/

Results

Hence, at the first stage of the study we will assess the depth of mutual trade of the EAEU countries using two indices.

Figure 1 shows the results of the Import Penetration index calculation for the EAEU countries.

The high value of the Import Penetration index for the Republic of Belarus and the Republic of Kyrgyzstan indicates a significant part of local demand is satisfied by external supplies. This can be explained in terms of re-export a large amount of goods to neighbouring countries due to their geographical location. The consistent growth of the Import Penetration index for the economies of Armenia and Kazakhstan can also be explained by the increase in re-exports of products to Russia as a result of the introduction of new sanctions against Russia. However, the low value of the Import Penetration index in the case of Russia indicates the presence of its technological advantages and a high degree of self-sufficiency.

Figure 2 shows the results of the Trade Intensity index calculation for the EAEU countries.

The high value of the Trade Intensity index for the Republic of Belarus, the Kyrgyz Republic, and Armenia indicates their trade flows orientation towards the internal market of the EAEU countries, while the trade flows of Russia and Kazakhstan are more oriented towards third countries, primarily China.

We will assess the impact of the depth of mutual trade of the EAEU countries on the dynamics of their economic growth at the second stage of the study.

Figures 3 and 4, Table 3 show visual interpretation of the data, and the results of the correlation analysis.

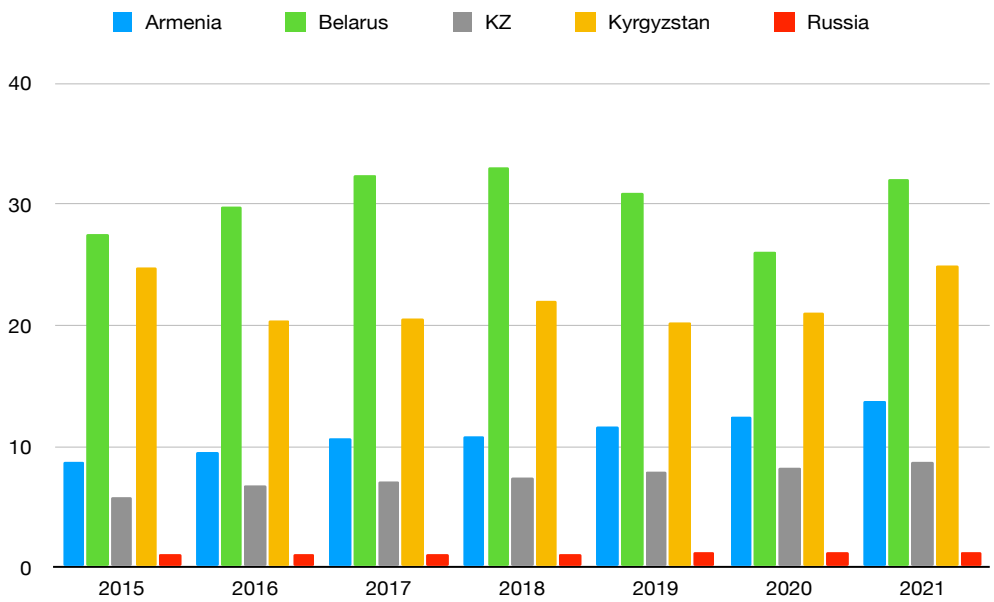


Figure 1. Import Penetration index for EAEU countries, 2015-21

Source: composed by author

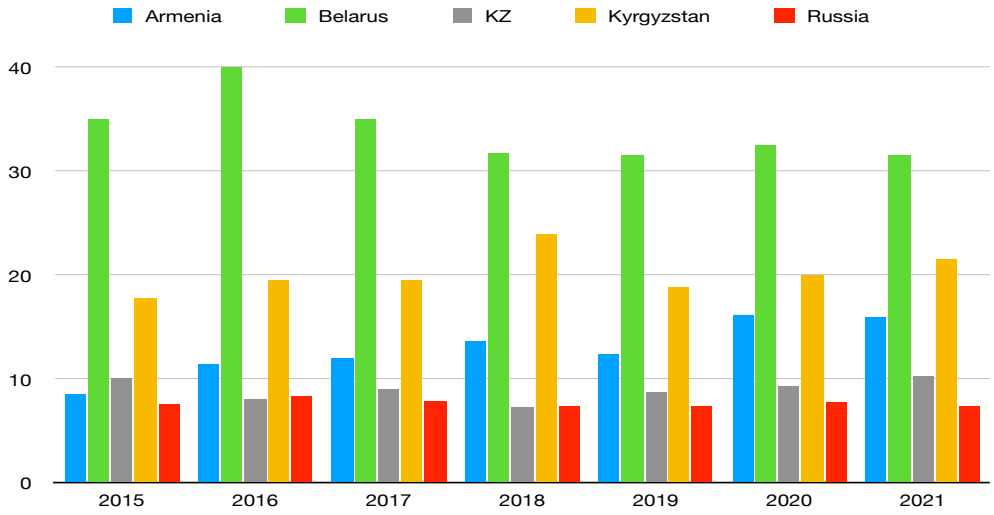
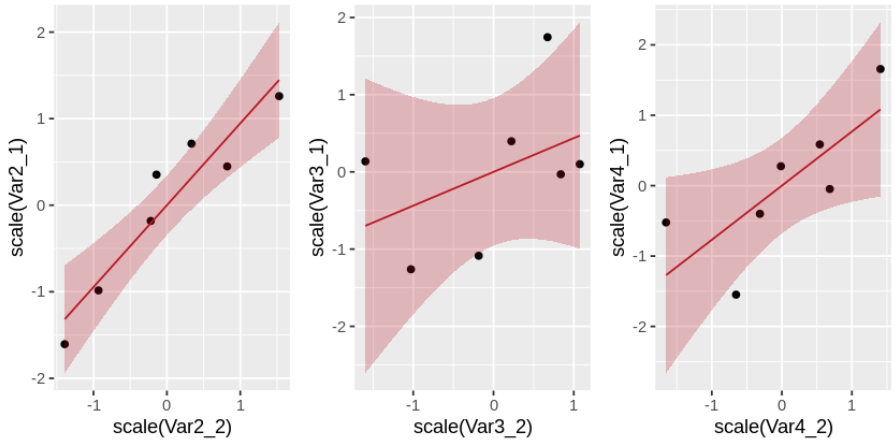


Figure 2. Trade Intensity index for the EAEU countries, 2015-21

Source: composed by author



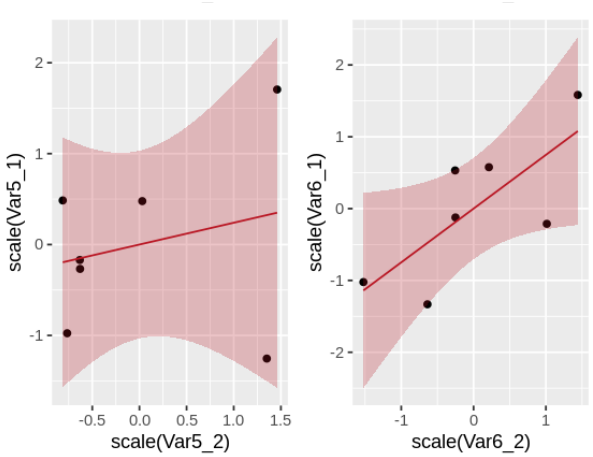


Figure 3. The scatter diagram on Import Penetration index and the rate of mutual trade of EAEU countries, 2015-2021

Source: composed by author

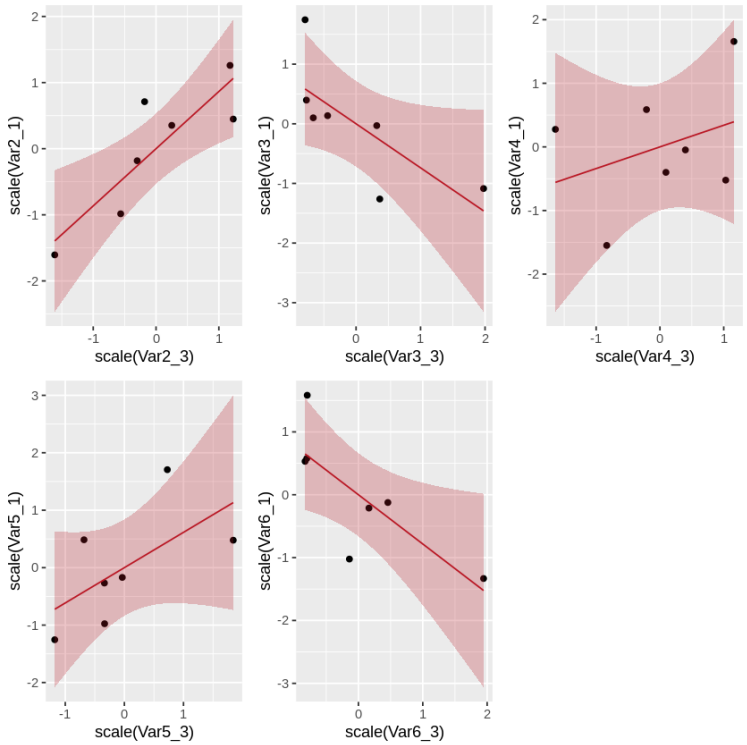


Figure 4. The scatter diagram on Trade Intensity index and GDP of EAEU countries, 2015-2021

Source: composed by author

Table 3 – Results of correlation analysis

Countries	Correlation between Import Penetration index and rates of mutual trade of EAEU countries	Correlation between Trade Intensity index and GDP of EAEU countries
Armenia	0.9459944 Very high direct correlation	0.8652796 High direct correlation
Belarus	Not significant	-0.7386099 Strong feedback
Kazakhstan	0.7692307 Strong direct correlation	Not significant

Countries	Correlation between Import Penetration index and rates of mutual trade of EAEU countries	Correlation between Trade Intensity index and GDP of EAEU countries
Kyrgyzstan	Not significant	Not significant
Russia	0.7484409 Strong direct correlation	-0.7832947 Strong feedback

Source: composed by author

Conclusions

The research revealed the following:

- there is a direct (statistically significant) correlation between the GDP and the rate of mutual trade of the EAEU countries;
- there is a direct (statistically significant) correlation between the Import Penetration index and the rates of mutual trade of the EAEU countries for a number of countries: Armenia, Kazakhstan, Russia;
- there is a direct (statistically significant) correlation between the Trade Intensity Index and GDP of the EAEU countries for a number of countries: Armenia, the Republic of Belarus, and inverse one for Russia.

Consequently, the results of the study demonstrate the direct impact of the rates of mutual trade of the EAEU countries on the dynamics of their economic growth.

Research limitations:

- data skewing the overall picture on the impact of the coronavirus pandemic and subsequent lockdown in 2020 and 2021;
- external shocks which have a significant impact on the dynamics of socio-economic development, primarily of the Russian economy;
- the possibility of non-optimality of correlation analysis application for solving the research problem (there are an approbation and search for an adequate research methodology).

However, the author hopes that the data obtained as a result of the study and the problems solved will activate a new wave of applied research on assessing the impact of sanctions shocks on the economies of the EAEU countries.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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The problem of poverty in developing countries: essence, criteria for distribution and ways to overcome it

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Abstract. The economic state of developing countries and their problems directly affect the vast majority of humanity. This subsystem includes all Asian countries, except Japan, South Korea, Taiwan, Singapore and Israel, all African countries, excluding South Africa, as well as Latin American countries. They are characterized by an extremely variegated appearance, different conditions and levels of social and economic development. At the same time, there are a number of characteristics that unite developing countries into a special group of states. One of the most important criteria for identifying developing countries as a separate world subsystem is their similar economic problems, in particular, underdevelopment, backwardness and massive poverty of the population. The relevance of this topic is determined by the fact that currently the problem of poverty in developing countries has become global in nature and is one of the main problems of humanity. Large scales of poverty in developing countries pose a serious danger not only to national but also to global sustainable development. Social tension generated by backwardness and poverty multiplies conflicts in the developing world and increases the danger of international terrorism. The purpose of the work is to study the essence of the problem of poverty in developing countries and find optimal ways to overcome it.

Keywords: economic state, developing countries, poverty, sustainable development, backwardness.

JEL codes: F63, I32, O55, P46

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Introduction

The group of developing countries includes more than 4/5 of all national economies in the world. About 80% of the world's population lives in them. The economic state of developing countries and their problems directly affect the vast majority of humanity. This subsystem includes all Asian countries, except Japan, South Korea, Taiwan, Singapore and Israel, all African countries, excluding South Africa, as well as Latin American countries. They are characterized by an extremely variegated appearance, different conditions and levels of social and economic development. At the same time, there are a number of characteristics that unite developing countries into a special group of states. One of the most important criteria for identifying developing countries as a separate world subsystem is their similar economic problems, in particular, underdevelopment, backwardness and massive poverty of the population.

The relevance of this topic is determined by the fact that currently the problem of poverty in developing countries has become global in nature and is one of the main problems of humanity. Large scales of poverty in developing countries pose a serious danger not only to national but also to global sustainable development. Social tension generated by backwardness and poverty multiplies conflicts in the developing world and increases the danger of international terrorism.

The purpose of the work is to study the essence of the problem of poverty in developing countries and find optimal ways to overcome it.

In accordance with the goal, the following tasks are formulated:

– identify the causes and consequences of poverty in developing countries;
– consider the relationship between globalization and poverty;
– identify ways and means to overcome poverty in developing countries.

The empirical basis of this work consists of: educational economic literature that reveals the essence, causes and consequences of the problem of poverty in developing countries, scientific economic articles that

examine poverty as a global problem for humanity, and also study ways to overcome poverty in developing countries. When writing the work, we actively used data from the World Bank Internet server, which provides statistical information that allows us to objectively assess the level of poverty in the world.

The work includes an introduction, a main part consisting of 3 chapters, a conclusion and a list of sources used. The introduction substantiates the relevance of the choice of topic and sets the goal and objectives of the study. Chapter one reveals the essence of poverty as a global problem for humanity. Chapter two examines in more detail the causes, criteria for determining and spreading poverty in developing countries; based on statistical data, an analysis of the current state of this problem in the world is performed. In Chapter Three, based on theoretical and practical data using the example of African countries, ways to overcome poverty in developing countries are formulated. In conclusion, conclusions are drawn on this issue.

Main Part

Poverty in developing countries as a global problem

Poverty is one of those global problems that the world community will have to search for answers to for decades to come. It is the root cause or accompanying, aggravating factor of many other global problems, which naturally complicates their solution. At the same time, it itself is the product of a number of factors operating at the global level.

In the era of globalization, the socio-economic polarization of humanity is intensifying at extreme points. At the beginning of the XXI century. The most developed countries account for less than 12% of the population and about 60% of world GDP. They play a leading role in such key international organizations as the IMF, the World Bank, the WTO and the OECD, which allows them, through these organizations, to determine the rules of the game on the "world chessboard". The group of world economic leaders includes approximately two dozen developing countries that have established fruitful cooperation with them. The share of least developed countries in the world's population is 12%, in world GDP – 1%. According to the Human Development Report, the richest 20% of the world's population accounts for 86% of global GDP, while the poorest quintile accounts for just 1% (Globalization, 2021). As a result, between the so-called "golden" and "hungry" billions there is a real gap in the level and lifestyle.

The inability of most of the poorest countries to escape poverty on their own has made the problem of poverty global, universal. There is a growing conviction in the world community that the gap between rich and poor countries and peoples cannot be bridged by relying on the natural course of events, without coordinated efforts at all levels – from local to global.

The concern that the problem of poverty in the world causes is explained not only and not so much by the fact that it restrains global development and diverts funds from more profitable, from the point of view of economic efficiency, areas of capital investment. In its current form, globalization, which gives the world unprecedented integrity, does not destroy or smooth out its internal contradictions. On the contrary, it strengthens and aggravates it. As a result, growing interdependence turns into increasing mutual vulnerability.

The main danger of dividing the world into zones of prosperity and poverty is that in the context of global transformations, the connection between poverty and other global threats and risks – illegal migration, terrorism, the growth of transnational crime, etc.

Social tension generated by backwardness, poverty and poverty pushes politicians and governments of the poorest countries to search for internal and external enemies, multiplies conflicts in the developing world, and increases the danger of international terrorism. All states, regardless of their size, wealth or location, become vulnerable to new and old threats in the era of globalization.

Global poverty poses a serious problem for developed countries in another respect. Poverty existence, unsanitary conditions, and health undermined as a result of malnutrition make the population of the poorest countries easy prey to various infectious and epidemic diseases that pose dangerous threats to rich countries.

The problem of poverty is aggravated by the development of demographic processes. Although population growth rates will slow down in most developing countries by 2030, a strong positive impact on poverty and poverty reduction is not expected. In the next 20 years, the world's population will increase by

almost 1.5 billion people. More than 97% of this growth will occur in developing countries. At the same time, the population in sub-Saharan Africa will increase by 320 million people, where poverty is stagnant and passed on from generation to generation (Ivanov & Goffe, 2010).

Today, three quarters of the world's poorest people live in rural areas. However, urbanization is fundamentally changing the incidence and nature of poverty. In 1950, the number of urban residents accounted for a third of the world's population, in the 2000s – half, and by the middle of the 21st century, according to forecasts, will reach two thirds. In 2005, 30% of the world's city dwellers – 1 billion people – lived in slums. The proportion of slum dwellers is highest in sub-Saharan Africa and South Asia, where in many cities it exceeds 70% of the population. If current urban population growth rates and income distribution patterns continue, the number of slum dwellers will reach 2 billion by the middle of the 21st century (UN-Habitat, 2010).

Life in slums means high levels of morbidity, infant mortality, crime and other manifestations of antisocial behavior. Closed life prospects create a breeding ground for instability and increase the potential for violence. "The world is sitting on a time bomb," is the conclusion of the authors of a study conducted by UN-Habitat (2010).

Thus, poverty in developing countries becomes a complex problem: economic, social, cultural, political, international with great destabilizing potential on a global scale. There is no doubt that in the coming decades it will be one of the most important problems of the world economy.

Causes and criteria for the spread of poverty in developing countries

Poverty has many faces and diversity, it changes over time and space. It is clear that in different countries and in different historical periods human needs are assessed differently. There are two main approaches to defining poverty. Within the economic approach, poverty is understood as a state of need associated with low levels of income and consumption of an individual or household. With an integrated approach, poverty is considered in a broad social context and is interpreted as the absence or extremely limited access to resources that determine the quality of life of an individual.

For the least developed countries, poverty is an absolute evil, a lack or absence of vital resources (food, clean drinking water, housing, clothing) that ensure biological survival, and basic human rights. Despite their importance, the intangible characteristics of poverty in these countries are still receding into the background. In general, poverty can be characterized as the inability to provide the simplest and most affordable living conditions for the majority of people in a given country.

The reasons for the existence of underdevelopment and poverty in developing countries are very different. Several internal and external circumstances should be highlighted.

First, in many developing countries, modern production is enclaved. The traditional economy often dominates, providing ineffective employment for the majority of the working population. Modernization of production is hampered by the lack of necessary investments.

Secondly, the existing education system is not able to provide the national economy with a qualified workforce. The situation is aggravated by the fact that skilled workers and even senior specialists often leave to work in developed countries of the world. A paradoxical picture emerges: developing countries spend their resources on the education, training and training of their workers, who then give back to the industrialized developed countries of the world, in fact helping them.

Thirdly, the countries of Asia, Africa and Latin America constantly record fairly high rates of population growth (2 times higher than the world average). This circumstance is not the cause of backwardness and poverty, but it does, to a certain extent, hinder the development of countries, especially those that have undergone a "demographic boom".

Finally, in the developing world with its still unformed civil society, inter-tribal (inter-clan) clashes, coups d'état and armed conflicts quite often occur, which sometimes drag on for decades (in Angola, Bolivia, Congo, Ethiopia, Libya, Egypt, etc.) These conflicts not only destroy material production, but also generate flows of refugees. And people deprived of the means of subsistence are often involved in the drug business, illegal arms trade, and piracy. And the conflicting parties themselves direct funds not to the development of

production, but to the purchase of weapons and modernization of the army.

External reasons are even more significant.

Firstly, this is an unequal exchange. TNCs that control world markets set inflated prices for their high-tech products and low prices for purchased raw materials. "Price scissors" cut off a significant portion of the income of developing countries in favor of developed countries.

Secondly, the current financial system provides for the provision of loans to developing countries at interest and for a certain period. If the loan is not repaid by the due date, then default or bankruptcy or debt restructuring at new interest follows. The loans and debts provided have become a powerful lever of influence on the national economy and, at the same time, a source of enrichment for industrial powers.

According to scientists, industrialized states that have created a consumer society accounted for 13.89% of the population in 2010. But they consume 40% of raw materials and almost 50% of fuel and energy resources, which are annually withdrawn from developing countries by $100-200 billion through "price scissors," loans, and so on. Countries that supply raw materials to the world market actually play the role of sponsors of the economies of developed countries (Shkvarya, 2011).

Thirdly, labor migration plays a controversial role. Workers who came from developing countries (initially from colonies) help rebuild and modernize the economies of developed countries. Of course, part of the income of migrants sent home contributed to the development of national economies, but the direct participation of workers not at home, but in industrial countries, was much more important for developed countries than remittances to donor countries.

These are the main causes of backwardness and poverty in developing countries. There are a number of smaller reasons, often of a country or regional nature.

There are national and international poverty levels. The national poverty rate is the proportion of the population living below the national poverty line. In most countries of the world, the national poverty line means income below the subsistence level, i.e. does not allow covering the cost of the consumer basket – a set of the most necessary goods and services by the standards of a given country in a given period of time. In many developed countries, people with an income of 40-50% of the average income in the country are considered poor.

The international poverty level is income that provides consumption of less than US$2 per day PPP (purchasing power parity). The international level of extreme poverty (or otherwise – ultra-poverty) is also determined – income that provides consumption of less than $1.25 per day according to PPP. This is essentially the extreme level of poverty in terms of human survival. These criteria were proposed by the World Bank.

According to World Bank estimates, the total number of poor, i.e. living on less than $2 a day, is 2.5-3 billion people in the world. Including the total number of people living in extreme poverty (less than $1.25 a day) – 1-1.2 billion people. In other words, 40-48% of the world's population are poor, and 16-19% are ultra-poor (Bulatova, 2011).

Since the 80s XX centuries to the beginning of the XXI century the number of people living in extreme poverty fell by about 200 million. This was mainly due to a decrease in the number of ultra-poor in China. Since the beginning of the 90s. There is a tendency towards a reduction in the number of ultra-poor in another populous state – India. At the same time, in sub-Saharan Africa over the past 20 years, on the contrary, there has been a constant increase in the number of ultra-poor.

The distribution of the poorest people by region of the world has not changed significantly since 1980. At the beginning of the 21st century, two thirds of the world's poor still live in East and South Asia and one quarter in sub-Saharan Africa. Most of the poor are concentrated in rural areas of developing countries.

If we compare the indicators presented in Table 1 with the results obtained in 2002, we can conclude that in the series of regions: Middle East and North Africa (9% of the ultra-poor in 2002), CEE and Central Asia (2%), Latin America (9%) – there has been a slight decrease in the level of ultra-poor. In other regions, on the contrary, there is a tendency to increase the share of the ultra-poor population.

In the current situation in the global economy, the task of identifying ways and means to overcome poverty in developing countries comes to the fore.

Ways to overcome poverty in developing countries (using the example of African countries)

The most important problem of the world economy at the end of the 20th and beginning of the 21st century was overcoming poverty and underdevelopment in developing countries. In some developing countries, the problem of poverty has long reached critical levels. For example, in 2010, 76% of the population of Zambia, 81.3% of Madagascar, 67.9% of Tanzania, 32.7% of India consumed goods and services for less than $1.25 per day (World Bank, 2020).

Table 1 – Poverty levels in regions of the world, 2009-2010

Region	Share of ultra-poor in the region's population, %	Share of poor people in the region's population, %
Sub-Saharan Africa	47.5	69.2
Middle East and North Africa	2.7	13.9
CEE and Central Asia	0.5	2.2
East Asia	14.3	33.2
Latin America	6.5	12.4
South Asia	36.0	70.9

Source: World Bank, 2020

As a result, about 800 million people suffer from malnutrition in the world. In addition, a significant portion of poor people are illiterate. Thus, the share of literate people among the population over 15 years of age according to the World Bank in 2007-2011 makes up approximately 18% of the population in Mali, Niger, and Chad (World Bank, 2022).

The huge scale of poverty and backwardness raises doubts about whether it is even possible to talk about normal development and progress of human society, when most of the planet's inhabitants find themselves below the line of a decent human existence. The problem is aggravated by the fact that the achievements of global scientific and technical progress are bypassed by many developing countries, their enormous labor resources are little used, and these countries themselves, for the most part, do not actively participate in the international division of labor.

It would be extremely unreasonable not to see the dangers that arise from the continuation of such a situation. Thus, it forms in the broad public consciousness of these countries a negative attitude towards the existing order in the world, which creates a threat to the stability of the world economy.

The most important factor in overcoming poverty is economic growth. A brief overview of the economic situation in a number of countries in Asia, Africa and Latin America shows that these countries have the necessary potential for "catch-up development". However, for its effective use, a new model of world development is needed, fragments of which have been repeatedly recorded in the documents of the UN and its committees.

Among the UN recommendations, the following can be highlighted (Shkvarya, 2011):

– Reorganization of the activities of the IMF, World Bank and WTO and the description of most of the debts of developing countries. Limiting the destructive activities of TNCs.

– Liberalization of trade in high technologies and their sale at affordable prices. The lifting of developed countries' sanctions against rogue countries.

– Increasing the role of the state in the development of countries in Asia, Africa and Latin America.

– Adoption of laws on the free movement of labor and equal pay for foreign workers.

– Preserving the possibility of original development without retreating into autarky.

Foreign capital and TNCs have a great influence on the socio-economic development of developing countries. TNC enterprises in Central America, the Caribbean, and Asia are connected to the domestic market and use local raw materials and semi-finished products. According to the World Bank, the distribution of private capital is represented by: 40% in East Asia, 37% in Latin America and the Caribbean, 18% in Central Asia, 3.5% in South Asia and 1% in the Middle East, East and North Africa (Kozak & Lebedeva, 2011).

The economic development of developing countries is conditioned by the implementation of the task of overcoming backwardness. The economic policy of developing countries is based on the privatization of previously created state-owned enterprises, the opening of the economy to the outside world, and the struggle to expand access to the markets of developed countries.

In the mid-1960s developing countries created the so-called group of "77" at the UN – according to the number of countries that formed it. Currently it includes 132 countries. The group sought to have developed countries transfer 1% of the value of total GDP annually to developing countries, including 0.7% in development aid. Developed countries have not officially accepted this requirement, but these figures have become a kind of yardstick for quantifying the resources flowing from developed to developing countries.

The influx of long-term investment into developing countries has increased and outpaced GDP growth. At the same time, the share of official resources in the total investment flow decreased to 27%, but the influx of private resources increased 4 times (up to 72%) (Kozak & Lebedeva, 2011).

Thus, private capital has become the main element of foreign income to countries in Asia, Africa and Latin America. It should be noted that foreign direct investment accounts for more than half of all funds coming from private sources. This was facilitated by the policy of openness of foreign economic relations, facilitating access of foreign capital to the national economy (large-scale privatization of state-owned enterprises was open to foreign investors), cheap labor and facilitating the entry of developing countries into the markets of developed countries.

However, as can be seen from the Figure 1, the distribution of foreign investment is extremely uneven.

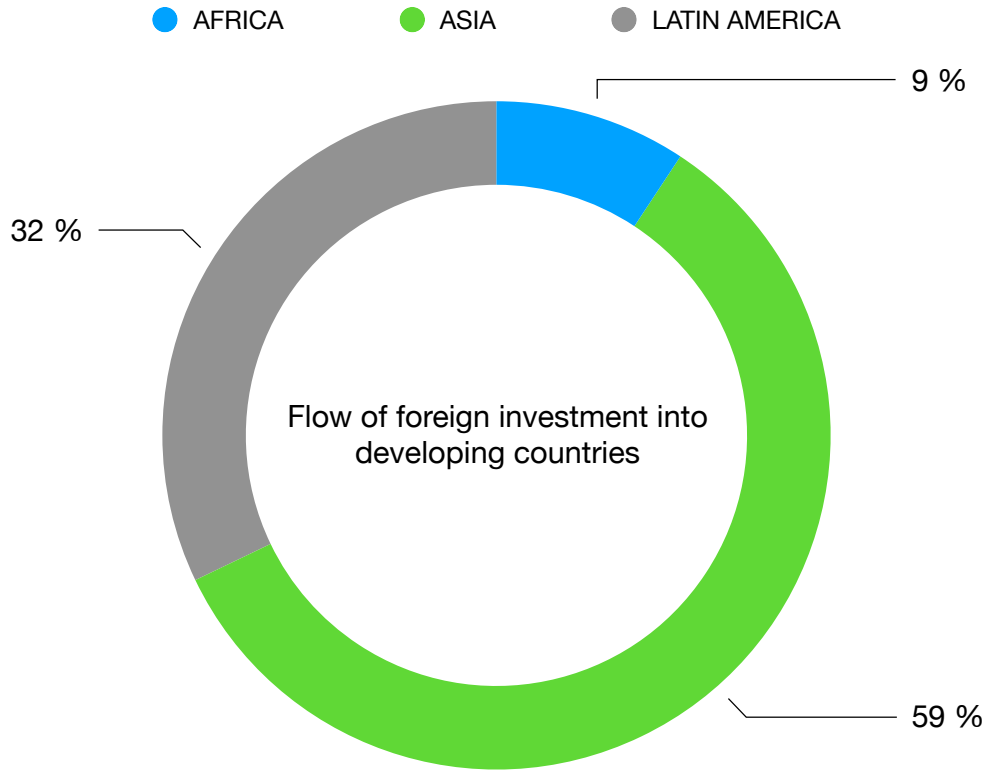

Figure 1. Inflow of foreign investment into developing countries

Source: Shkvarya, 2011

However, attracting foreign capital has not led to a complete solution to the problems facing developing countries, in particular, to overcoming poverty and underdevelopment. Moreover, some of them have become worse:

– uneven development increased as investment was directed primarily to those countries where there were prospects for their correct placement (China, India, Brazil, Mexico);

– competition to attract foreign investment has intensified;

– the benefits provided to foreign capital often went to the detriment of the interests of local entrepreneurs.

Thus, we can conclude that attracting foreign capital and foreign investment has contradictory results. On the one hand, attracting foreign capital, when used effectively, has proven to be quite effective in accelerating the economic development of a number of developing countries (India, China, Brazil). On the other hand, the problem of poverty and backwardness in African countries has only worsened.

The problem of poverty is most acute in African countries. Most African countries belong to the least developed group. Many of them are landlocked and have little connection with the outside world. These countries have an extremely low average annual income per capita ($500-1500), pre-industrial forms of labor predominate everywhere, and agriculture dominates the economy. There are 52 developing countries in Africa, most of which (38) are among the poorest and underdeveloped countries of Sub-Saharan Africa. In modern conditions, tropical Africa accounts for no more than 5% of the total influx of foreign investment into developing countries. For most countries on this continent, external debt exceeds 70% of GDP and 2.5 times export earnings.

Over the past decades, the differentiation of African countries in terms of the dynamics of socio-economic development has deepened significantly. At one pole are the least developed states – financial bankrupts with a destroyed and criminal economy (Liberia, Sierra Leone, Chad, the Republic of Congo, Somalia, etc.). The other pole is formed by South Africa, which is an industrial-agrarian giant by African standards, as well as countries (Nigeria, Zimbabwe, Kenya and others) that have a more or less developed industrial sector based on mining and processing of agricultural raw materials.

The nature and pace of economic growth in African countries is influenced by a number of constraining factors:

– poor economic infrastructure;
– internal political instability;
– interstate conflicts;
– reducing the influx of financial resources from outside;
– deteriorating terms of trade;
– difficulty in accessing international markets;
– overpopulation, famine and mass disease.

The African continent has rich reserves of various natural resources, but they are distributed extremely unevenly, which deprives a number of countries of the opportunity to receive so-called resource rent. The main specialization of African states in the world economy is agriculture and raw materials. In these countries, TNCs are widely active and invest in agricultural production, services, mining and processing industries, as well as in the development of communications.

Difficulties in reforming the economies of African countries are directly related to the circumstances of implementing the recommendations of the IMF and the World Bank, the low level of creditworthiness of states, the growth of their external debt, and political and military conflicts. The economic development of African countries is achieved by increasing the production and export of agricultural and primary goods, which are subject to significant market fluctuations. Realizing that the raw material orientation of industrial production and foreign trade does not provide any chance for equal integration into the world economy, representatives of African states decided to create the Union for the Industrialization of Africa, the purpose of which is to promote the industrial development of African countries, increase the competitiveness of their products, and encouragement in the region partnerships in the field of industrial production.

Thus, African countries are faced with a number of serious problems on the way to overcoming economic backwardness and, as a consequence, mass poverty. Having analyzed the current socio-economic situation in African countries, we can identify the following ways to overcome economic backwardness and poverty:

– reorganization of the economy, further industrialization and counteraction to TNCs, which are pursuing an active policy in their own interests to redistribute spheres of influence, sales markets, capital flows and access to raw materials;

– further integration of African countries, the creation of trade and customs unions on the continent for the purpose of mutual assistance among African countries, countering the destructive activities of TNCs

and a number of developed countries on the continent;

– maintaining military-political stability on the mainland, preventing civil and interstate conflicts;

– focus on the internal resources of countries – the creation of a domestic sales market;

– strengthening the legal framework – legislative protection of property rights and creation of conditions for their strengthening, including in the informal sector of economics;

– budget discipline – the budget deficit should not exceed reserves that allow it to be, financed without rising inflation; the current account deficit should be kept to no more than 3% of GDP (Kozak & Lebedeva, 2011);

– changing the priorities of government spending – spending should be reoriented from the political sphere (governance, defense, military spending) to the economic and social sphere (health, education, infrastructure);

– introduction of compulsory secondary education in all countries of the continent; creating favorable conditions for obtaining higher education;

– creating our own research base, increasing R&D expenses;

– increased healthcare costs – mandatory medical examinations and free treatment;

– carrying out a competent demographic policy – in some countries it is necessary to implement a policy to curb population growth;

– tax reform – reducing rates and expanding the tax base using a progressive tax scale;

– foreign direct investment – creating favorable conditions for attracting foreign capital, creating competition in the domestic market between foreign and national firms (at the same time, it is necessary to support the national manufacturer, small and medium-sized businesses);

– for the countries of Sub-Saharan Africa it is necessary to increase the role of the state in the economy, the creation of new jobs and enterprises by the state;

– for more developed countries in Africa, denationalization of enterprises in order to increase the efficiency of their activities;

– adoption of laws on freedom of movement of labor on the mainland and equal pay for foreign workers.

Thus, the development of effective national development strategies based on internal economic resources based on an integrated approach is of decisive importance in solving the problem of poverty and underdevelopment in African countries (Lomakin, 2010). With this approach, not only industrialization and post-industrialization, liberalization of economic life and transformation of agrarian relations are considered as prerequisites for creating a modern economy and achieving sustainable economic growth, but also educational reform, improving the healthcare system, mitigating inequality, pursuing a rational demographic policy, and stimulating problem solving employment. It is necessary not only to ensure economic growth, but also to change the consciousness of the people of African countries. At the same time, African countries should strive for mutual integration and mutual assistance. Developed countries need to provide targeted support to the economies of African countries, write off debts to these countries, liberalize trade in high technologies, not incite military-political conflicts on the continent (Libya can be considered as an example) and also lift sanctions against rogue countries. However, it should be noted that each of the African countries has its own socio-economic, political and cultural characteristics, therefore, when determining ways to overcome poverty and backwardness, it is necessary to take into account the characteristics of each specific country.

Conclusions

Thus, the problem of poverty in developing countries goes far beyond purely economic issues. It is becoming a complex problem: economic, social, cultural, political, international – with great destabilizing potential on a global scale. There is no doubt that in the coming decades it will be the most important global problem for humanity.

The problem of poverty in developing countries is an integral part of the complex of fundamental challenges that humanity faces in the context of globalization. We are talking about preserving the natural

environment, preventing the threat of nuclear war, resolving interethnic and interfaith conflicts, improving the quality of life and developing human creative potential.

In the era of globalization, the socio-economic differentiation of countries and regions of the world is intensifying. It would be extremely unreasonable not to see the dangers that arise from the continuation of such a situation. Thus, it forms in the broad public consciousness of the poorest countries a negative attitude towards the existing order in the world, which creates a threat to the stability of the world economy.

In this situation, the search for optimal ways to overcome poverty in developing countries comes to the fore. Of course, the most important factor in overcoming poverty and backwardness in developing countries is economic growth, since it is economic growth that leads to an increase in GNI, through which the consumption fund is formed.

The problem of poverty is most acute in African countries. Most of which (38) belong to the poorest and underdeveloped countries of Tropical Africa (Sub-Saharan Africa). African countries face a number of serious constraining factors on the way to overcoming poverty and backwardness: underdeveloped economies, low levels of education and health care, weak political and legal structures, military conflicts, etc. In this regard, to solve the problem of poverty in African countries, an integrated approach is needed, affecting all spheres of society.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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Problems and prospects for the development of 5G technologies in the modern economy: case study of Germany and the Netherlands

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Abstract. The active introduction of 5G technologies in the countries of North-East Asian countries, Europe and the United States is due to the expected direct and indirect effects on the economy and social sphere. Nowadays, they implemented in agriculture, healthcare, industrial production, media, and financial services. The deployment of 5G networks has its own specifics, requires a certain infrastructure and administrative support. The article assesses the problems these countries often face when implementing 5G technology, and determines the prospects for their development in terms of the modern economy. The leading countries in technological development in the European Union – Germany and the Netherlands – have been identified as the object of the study. The article uses a mixed approach to research: SWOT analysis, assessment of the multiplier effect on economic development (GDP growth) and the labor market (creation of new jobs) when implementing 5G technologies. To understand the current state of 5G implementation in Germany and the Netherlands, strengths were identified, such as general economic dynamics, tax support, and growing demand. Among the problem areas, an imbalance of the labor market was revealed – unemployment in Germany, a shortage of labor resources in the Netherlands, dependence on the common policy of the European Union, rising inflation, interest rates, and others. The determination of the direct effect showed that the multiplier value is much higher in small countries, that is, they will receive the maximum effects from investments in 5G technologies. Whereby, the large countries achieve a high absolute increase in GDP and employment.

Keywords: 5G technologies, mobile operators, the impact of 5G on the economy, SWOT analysis, multiplier effect the impact of 5G technologies on economic development, Germany, the Netherlands

JEL codes: O11, O14, O32

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Introduction

At the certain stages of their development, information and communication technologies (ICT) played an important role in the economy and social sphere. Countries which ealier introduced current forms of ICT gained an undoubted competitive advantage in the international market. Today, 5G technologies are becoming a new economical element, which have a great deal of responsibility. They provide a higher quality of user service, flexible infrastructure, a high level of security and reliability (Vlaskina, 2022). New technologies affect the economy and society through the expansion of communication capabilities on various platforms and the transformation of industrial sectors based on the use of big data (Allam, 2020).

Moreover, 5G technologies are able to provide platforms and networks for Industry 4.0 (Attaran, 2023). They contribute the Internet of Things and communication services mainstreaming (GSMA, 2017). Their wide application is expected in the media and entertainment sector, in manufacturing and trade, the creation of reliable cars, logistics, transportation, medicine, the development of smart cities, energy, etc.

Primarily, 5G technologies fulfil the 9th UN Sustainable Development Goal – creating sustainable infrastructure, promoting sustainable industrialization and stimulating innovation. They also form competitive opportunities for labor resources (Rastvortseva et al., 2008), income generation in industry, trade

(Prokushev & Kostin, 2022), the service sector, promote the introduction and innovations. In addition, the use of 5G technologies in daily life contributes to the implementation of the 11th Sustainable Development Goal. Namely, the establishment of «inclusive, safe, resilient, sustainably developing cities», which become drivers engines of the future economic growth.

5G technologies allow us the more effective production processes automation. They can be implemented in the service sector, which makes them a strategically important priority at the national level. The COVID-19 pandemic reveals the crucial role of mobile technologies, new business models for companies and new digital solutions for consumers. According to forecasts, by 2030, the change in economic processes due to the use of 5G technologies will contributes to the European economy an additional €102 bn per year[1].

In the economy of cities, technologies provide the development of new forms of transport services, including autonomous vehicles, regulation based on sensors and cameras. The high speed of information transmission makes it possible to ensure the safety of life in cities and regions, supports the work of emergency services, etc. 5G technologies are also used in the preservation of cultural heritage, allow ones to create virtual analogues (Di Giulio et al., 2019) and broadcast them widely.

The purpose of the study is to identify problems and prospects for the 5G technologies development in the modern economy. Two European countries, leaders in terms of technological development – Germany and the Netherlands – are the objects of the research.

At the first stage of the research we present the its theoretical aspects; show the importance of the 5G technologies development for the economy and social sphere. At the second stage we consider the appropriate methods and sources of statistical information. Results show the main trends in the 5G technologies development in the European Union and, using the example of Germany and the Netherlands, we will identify the strengths and weaknesses of the technological development process. There is also the assessment of the multiplicative effect of the 5G technologies impact on the economic development, namely, GDP growth and the number of employed, for the countries of the European Union. Conclusion presents some promising areas of its development.

The assessment of the economic benefits for countries and regions in terms of the introduction and operation of 5G technologies is considered from several points of view. One of the directions is the Internet of Things – the unhindered exchange of data generated by sensors, cameras, smartphones and other devices (Edler, 2019). Its implementation makes possible the development of industries related to GPS navigation, the movement of public and personal transport, emergency services, monitoring of cities economic services, certain service flexible switching on and off, etc. Moreover, PwC (2021) research reveals the impact on five areas: healthcare, smart home technologies, media, industrial production, and financial services.

There are a lot of studies concerning with the issue that 5G technologies can provide significant benefits in agriculture through the use of sensors and other monitoring devices to control plant growing, determine soil, and forecast weather conditions. For example, the Chinese company China Mobile launched the 5G + Smart Agriculture program, which uses 5G technologies to assess and analyze the fields and crops items (China Mobile, 2021).

An analysis of the effectiveness of the 5G technologies implementation conducted also for the healthcare system. According to it, innovations help to conduct consultations remotely, operate, contribute to a better understanding of the situation, as they operate the large volumes of medical information for the diagnosis and treatment of patients. The Smart Health project is being implemented in Italy today, where 5G is used for remote diagnosis and treatment of stroke patients (TIM Research Centre, 2020). This approach increases the efficiency and quality of medical care.

A whole block of research addresses the feasibility of implementing 5G technologies. For example, the need for more frequent placement of communication towers calls into question the safety for public health (Kostoff et al., 2020). There are also some problems with the use of 5G technologies in the industry (Ericsson, 2017). First of all, it is the high cost of network deployment. The analysis of the European Commission

[1] *GSMA Association. The Mobile Economy Europe 2021. https://www.gsma.com/mobileeconomy/wp-content/uploads/2021/09/GSMA_ME_Europe_2021_R_Web_Singles.pdf (accessed 10.05.2023)*

showed that the deployment of 4G in the EU member states cost 135 euros per subscriber. According to investment estimates, in 2025, the cost of deploying 5G will be 145 euros per subscriber. Hence, the total cost of implementing 5G technologies in the EU will be approximately €58 bn by 2025 (European Commission, 2016).

Methods

The importance of 5G technologies for the modern economy is realized in many countries of the world. The prospects of modernizing business models, increasing the level of competitiveness, and the quality of life are the purposes of introducing and distributing 5G technologies. The long term imbalance of technological development may aggravate the problem of inequality of countries (Rastvortseva et al., 2014). However, the countries availability to transition to a new level of technology varies. The countries of Asia and the United States have made more progress in this field (Fig. 1).

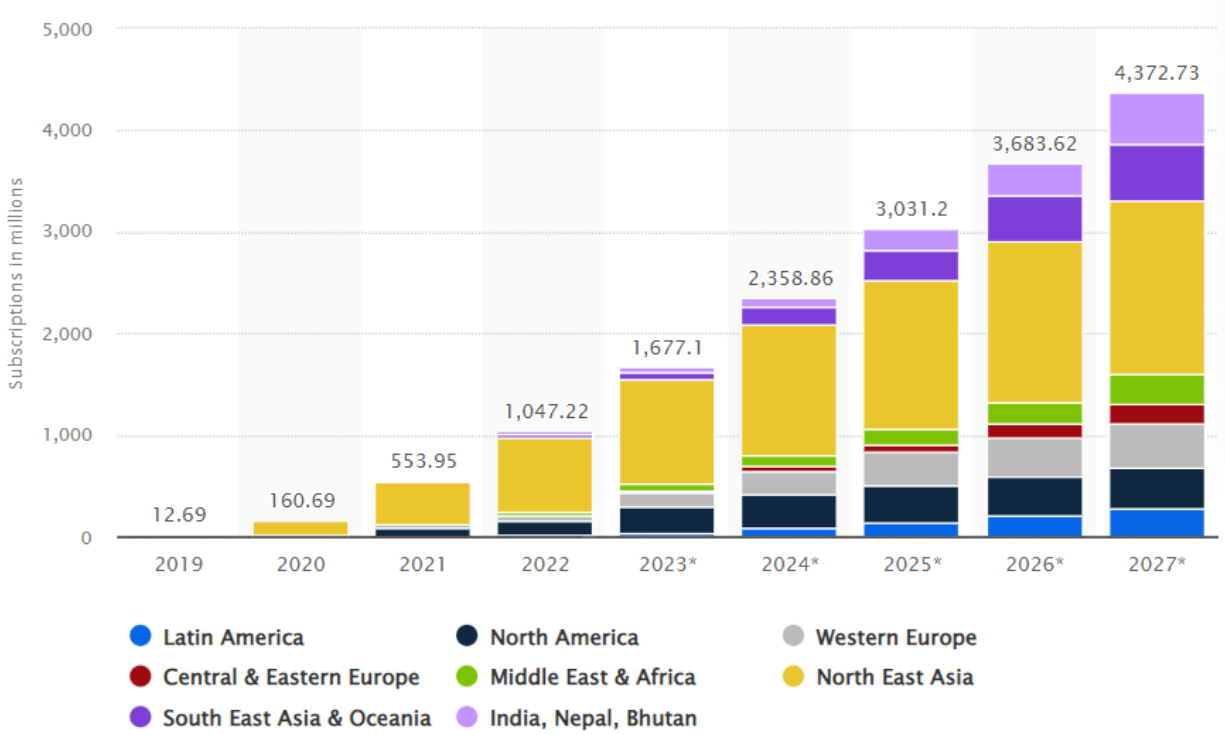


Figure 1. Forecast number of mobile 5G subscriptions worldwide by region, 2019-2027 (in millions)
Source: Ericsson. (November 1, 2022). Forecast number of mobile 5G subscriptions worldwide by region from 2019 to 2027 (in millions). https://www.statista.com/statistics/521598/5g-mobile-subscriptions-worldwide (accessed 02.05.2023).

The worldwide number of subscriptions to 5G mobile communications in 2019 amounted to 12.69 mln units, increasing to 1677.1 mln units by 2023. According to forecasts, in 2027 the number of subscriptions will amount to 4372.73 mln. A significant share of 5G subscriptions is in Northeast Asia[2] (in 2019 – 77.5%; in 2023 – 61.4%; according to forecasts in 2027 – 39%).

To assess the actual state of the 5G technologies development, prospects, external environment, factors, and conditions on case study of two leading countries Germany and the Netherlands, we propose to use a modification of SWOT analysis, which involves dividing all conditions into four groups: (SO) – strengths that represent development opportunities; (WO) – weaknesses, overcoming which will allow the country to get additional opportunities; (ST) – strengths that may become a threat in the future and require special attention; (WT) – weaknesses that pose a threat to development.

However, to assess the multiplicative effect of the 5G technologies impact on the social and economic spheres, we will use the approach of the European Commission (European Commission, 2016). This

[2] *The Northeast Asia region includes China, North and South Korea, Japan, and Mongolia. It accounts for a fifth of the world's population, a quarter of the world's GDP (according to: Political issues and peace-building issues UN). https://dppa.un.org/ru/northeast-asia (accessed 10.05.2023)*

technique determines the direct effect, which arises directly from investments into 5G infrastructure and the indirect impact of the first type (Type I multiplier effect). It is measured by an increase in production and an expansion of the number of services provided in the field of operating systems and ensuring the operation of 5G networks.

$$Type\ I\ Multiplier = \frac{Direct\ Effect\ +\ Indirect\ Effect}{Direct\ Effect} \quad (1)$$

it includes *Direct Effect* and *Indirect Effect*.

The induced effect (Type II multiplier effect) reflects changes in consumer spending and consumption of goods and services as a result of an increase in household income.

$$Type\ II\ Multiplier = \frac{Direct\ Effect\ +\ Indirect\ Effect\ +Induced\ Effect}{Direct\ Effect} \quad (2)$$

The effect of direct, indirect, and induced effects is shown in Figure 2.

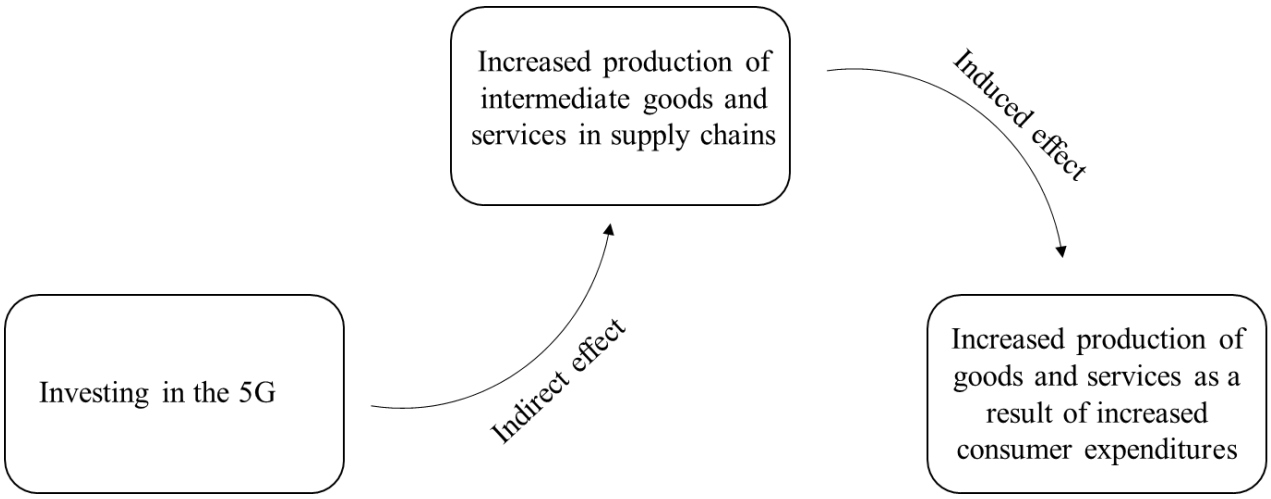


Figure 2. Direct and indirect effects of the 5G implementation

Source: composed according to the European Commission. Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe. https://op.europa.eu/en/publication-detail/-/publication/2baf523f-edcc-11e6-ad7c-01aa75ed71a1/language-en. (accessed 12.05.2023)

An Input-Output analysis is used to assess the economic benefits from the implementation of technologies (European Commission, 2016).

The Input-Output Analysis a qualitative tool for assessing the impact of the new technologies implementation on various sectors of the economy (Christ, 1955). It also can be used for decision-making in economics and business. Input-output tables give a quantitative idea of the interdependencies between different sectors of the national economy. Indirect and induced effects are calculated using input-output tables as follows:

$$L = (I - A)^{-1}, \quad (3)$$

where

L is the inverse Leontiev matrix, the matrix of direct material costs;

A is a matrix of technological coefficients calculated by dividing each cell of the intermediate internal supply by the total industry supply;

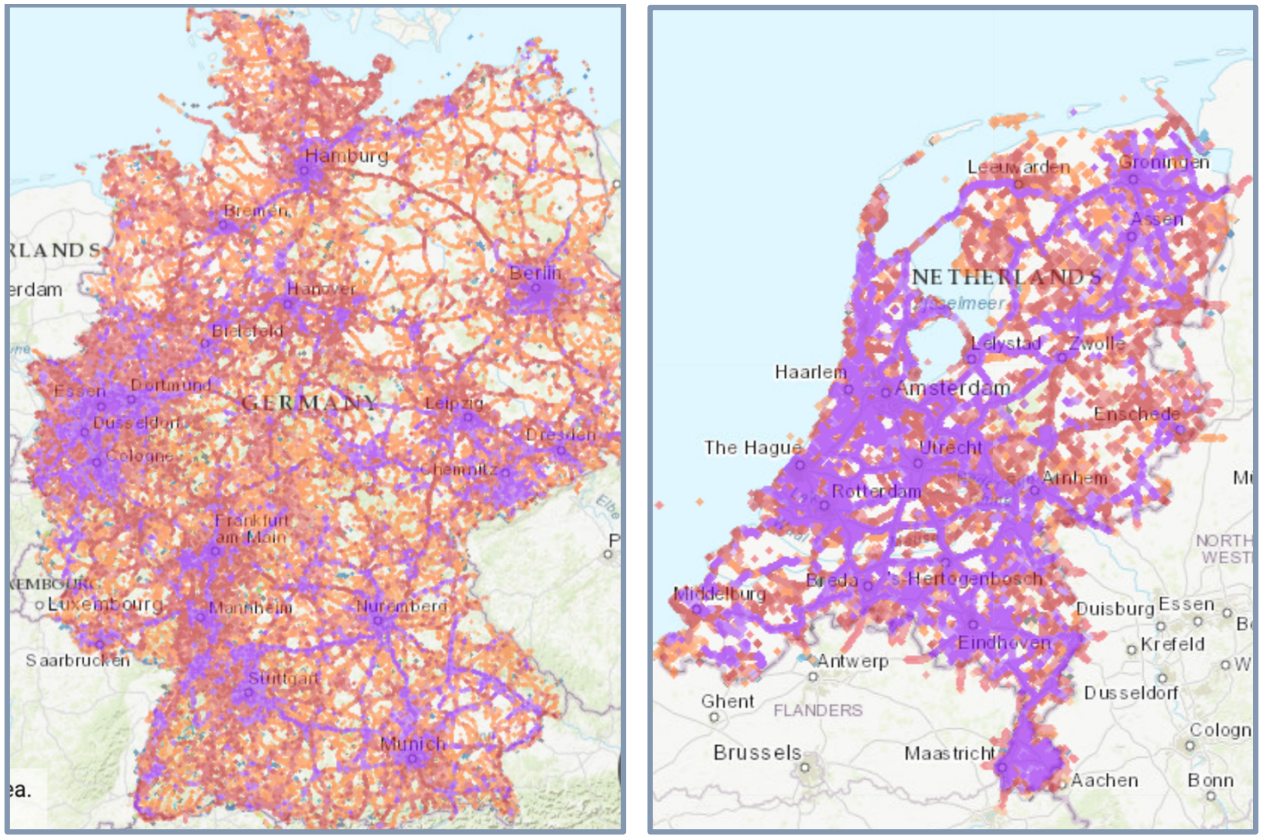
I is a unit matrix.

The databases of the World Bank, the European Commission, the Organization for Economic Cooperation and Development of the nPerf's objectives and GSMA news agencies, statistical databases Statista, Trading economics, EuroStat, WIPO publications and others served as sources of statistical and analytical data.

Results: analysis of the actual state and prospects for the 5G technologies development in Germany

and the Netherlands

Nowadays, Germany is one of the leading countries in Europe in terms of the 5G technologies implementation. 5G networks are deployed in all large and medium-sized cities. According to this indicator, Germany ranks world's 8th. However, in 2022, 58 cities had access to 5G mobile networks[3]. Currently, a significant part of the Netherlands territory is equipped with antennas providing connection to 5G networks, while 4G mobile networks still remain predominant. 4G and 5G mobile network coverage is shown in Figure 3.



a) Germany b) the Netherlands

Figure 3. 4G and 5G mobile network coverage map in Germany, (red – 4G, purple – 5G)
Source: https://www.nperf.com/en/map/DE/-/-./signal / (accessed 05.05.2023)

We used a SWOT analysis matrix for a more detailed reviewing of the problems and prospects of implementing 5G in Germany and the Netherlands (Fig. 4).

SO.G1, SO.N1. The high level of GDP per capita indicates the country has sufficient resources to invest in 5G and the development of corresponding infrastructure (Fig.5). In general, GDP is higher in Germany. Therefore, the need for new networks for economic development may be higher. GDP per capita is higher in the Netherlands. Therefore the demand from a more affluent population for new technologies can be rather higher.

The dynamics of GDP and GDP per capita as a whole are positive. A certain decline was observed in the overall indicator in 2020 due to the COVID-19 pandemic. In total GDP, this decline was not significant. During the analyzed period in Germany there was an increase of 9.06% (or 1.01% on average per year), in the Netherlands – 12.99% (or 1.44% per year). Per capita growth in Germany was 7.22% (or 0.8% per year), in the Netherlands – 13.45% (or 1.49%). In general, the volume of German GDP is four times higher, but in per capita terms it is lower (about 90%).

[3] *Number of cities in which 5G is available 2022 by country. Statista. https://www.statista.com/statistics/1215456/5g-cities-by-country (accessed 13.03.2023).*

Strengths (S)	Weaknesses (W)	
Germany **SO.G1**. High level of GDP, constant growth trend – 1% per year, per capita GDP growth by 0.8% per year **SO.G2**. Growth of the households with Internet access **SO.G3**. Support for mobile operators **the Netherlands** **SO.N1.** High level of GDP per capita with growth of 1.45% per year, GDP growth of 1.44% per year **SO.N2.** High Global Innovation Index ranking (2nd place in 2022) **SO.N3.** Tax benefits and preferences for R&D companies (all forms of support) **SO.N4**. Growth of the households with Internet access	**Germany** **SW.G1.** Dependence on EU policy in the field of 5G technology development **SW.G2.** Decrease in the number of patent applications in EPO in the digital communications field **SW.G3.** Rising unemployment rate **SW.G4.** Place in the top 10 in the ranking on the Global Innovation Index, growth **the Netherlands** **SW.N1.** Labor shortage, high level of vacancies	Features (O)
Germany **ST.G1.** High level of access to 4G mobile networks **ST.G2.** Significant progress in the deployment of Very High Capacity Networks (VHCN) **ST.G3.** In terms of the tax incentives, there are the tax credit and R&D grants only **the Netherlands** **ST.N1**. Expanding the frequency range for 5G deployment **ST.N2.** Growth in the total number of patent applications in EPO	**Germany** **WT.G1**. Rising inflation rate **WT.G2.** Rising interest rates in the EU **the Netherlands** **WT.N1.** Rising inflation rate **WT.N2**. Rising interest rates in the EU **WT.N3.** Low share of government spending on R&D	Threats (T)

Figure 4. The results of the SWOT analysis of the conditions for the 5G technologies implementation in Germany and the Netherlands

Source: composed by authors

SO.G2, SO.N4. The share of households with broadband Internet access is growing (Fig. 6). Indeed, the level of Internet use among individuals in both countries remains high (Fig. 6). Meanwhile, these trends can be defined as the strengths, which will determine the future socio-economic development.

In the Netherlands households used the Internet more actively throughout the analyzed period. While in the Netherlands over 90% of households are already connected to broadband Internet, in Germany it is only three-quarters of them.

ST.G2, ST.N1. Indeed, a significant progress has been made in Germany in the deployment of VHCN. In 2019, the share of connected households increased significantly when 5G connectivity was launched in Bonn and Berlin. At the same year, the share of connections in the Netherlands also increased due to the deployment of VHCN networks. The country occupies a leading position by this indicator in the European Union.

SO.N2, SW.G4. The rating of the Global Innovation Index is designed to assess the quality of the world countries development by a number of innovative indicators, availability to use innovations, resource, and resultant components of technological progress. 5G technologies are the basis for the high-tech projects and

new infrastructure development. Therefore, in general, an environment effective for innovations is extremely important for their effective implementation. The ranking of countries with the highest innovation Index (The Global Innovation Index), 2020-2022 is shown in (Table 1).

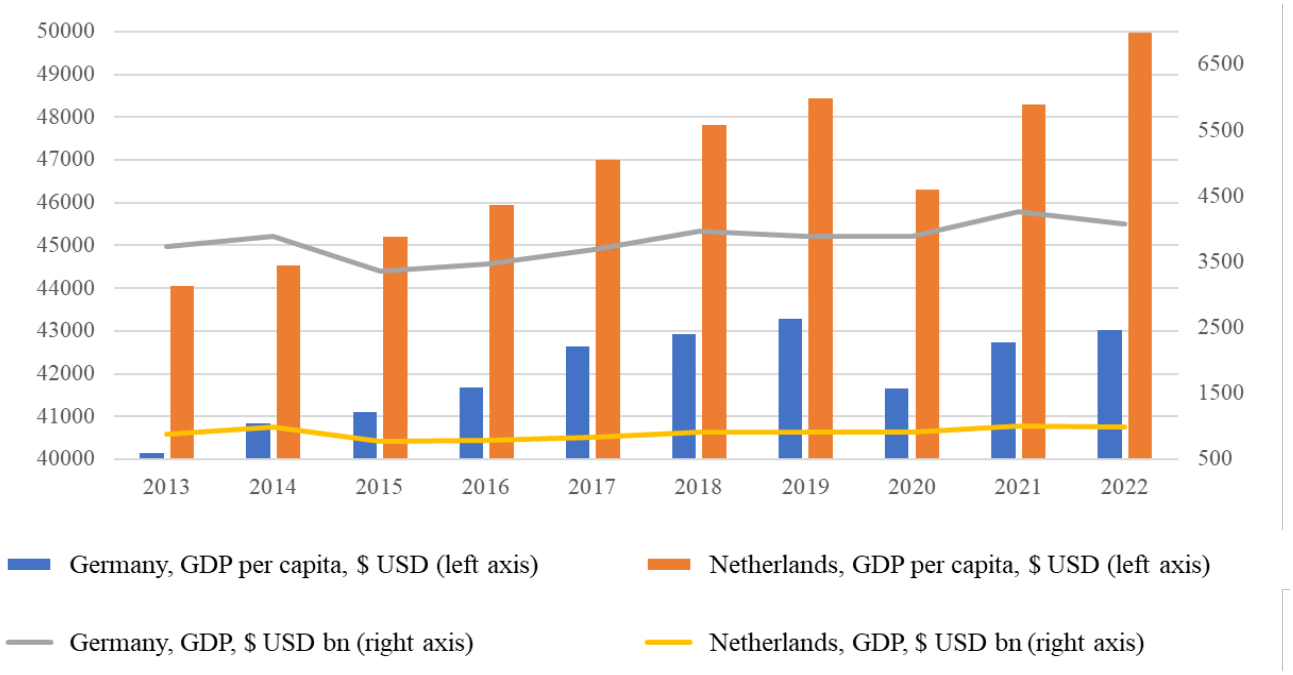


Figure 5. Dynamics of GDP and GDP per capita in Germany and the Netherlands, 2013-2022
Source: composed by authors according to: Trading Economics. https://tradingeconomics.com/ (accessed 01.05.2023).

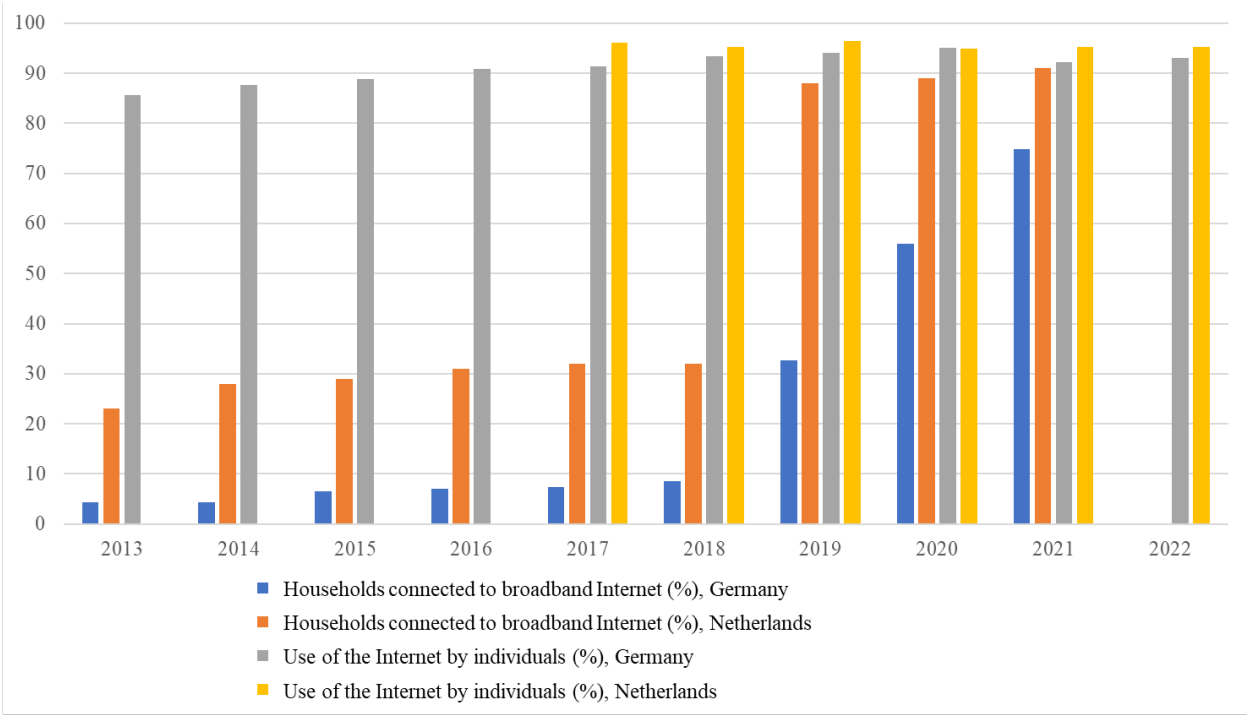


Figure 6. Some indicators of Internet development among individuals in Germany and the Netherlands in 2013-2022
Source: composed by authors according to: Eurostat. High-speed internet coverage. https://ec.europa.eu/eurostat/databrowser/view/SDG_17_60__custom_2400872/bookmark/table?lang=en&bookmarkId=0dbcd702-eabf-4c51-88a1-e10c9f2089e6; Internet use by individuals. https://ec.europa.eu/eurostat/databrowser/view/tin00028/default/table?lang=en; High-speed internet coverage. https://ec.europa.eu/eurostat/databrowser/view/SDG_17_60__custom_2400872/bookmark/table?lang=en&bookmarkId=0dbcd702-eabf-4c51-88a1-e10c9f2089e6; Internet use by individuals/ https://ec.europa.eu/eurostat/databrowser/view/tin00028/default/table?lang=en. (accessed 05.04.2023).

Table 1 – Top 10 countries leading in the ranking of the Global Innovation Index, 2020-2022

Country	2022		2021		2020	
	Index	General location / Location in the region	Index	General location / Location in the region	Index	General location / Location in the region
Switzerland	64.6	1 / 1	65.5	1 / 1	66.08	1 / 1
The USA	61.8	2 / 1	61.3	3 / 1	60.5	3 / 1
Sweden	61.6	3 / 2	63.1	2 / 2	62.47	2 / 2
United Kingdom	59.7	4 / 3	59.8	4 / 3	59.78	4 / 3
the Netherlands	58.0	5 / 4	58.6	6 / 4	58.76	5 / 4
Republic of Korea	57.8	6 / 1	59.3	5 / 1	56.11	10 / 2
Singapore	57.3	7 / 2	57.8	8 / 2	56.61	8 / 1
Germany	57.2	8 / 5	57.3	10 / 7	56.55	9 / 7
Finland	56.9	9 / 6	58.4	7 / 5	57.02	7 / 6
Denmark	55.9	10 / 7	57.3	9 / 6	57.53	6 / 5

Source: Composed by authors according to: Soumitra et al., 2020; Dutta et al., 2021; Dutta et al., 2022

SO.N3, ST.G3. Tax incentives are the strengths of Germany and the Netherlands. However, support for the innovations development, including for the deployment of the 5G network, is provided by the government. At the same time, in Germany, the main form of support was grants for R&D and a tax credit as a reduction in the amount of tax. In the Netherlands, the whole range of support is being implemented, including «superbug», accelerated depreciation, patent «boxes», benefits for salary payments, etc. (Solutseva et al., 2023). In 2020, in order to support enterprises during the COVID-19 pandemic, additional measures were introduced in Germany – grants and subsidies, administrative measures, benefits for small and medium-sized businesses, and assistance to individual industries. In the Netherlands, benefits related to human resources, tax deductions, preferential loans and other financial assistance are actively used (Solutseva et al., 2023).

SO.G2, SO.N4. There is a high demand for fast, high-quality Internet services in the countries. Probably, it could be another incentive for mobile operators to invest in 5G.

SO.G3. The transition to 5G in Germany is also supported by mobile operators. For instance, operators began to close outdated networks from 2021. O2 Company discontinued its 3G network in Germany at the end of 2021, delete frequencies segment of 2100 MHz, which will be used for 4G. In March 2022, Vodafone Germany, the largest German mobile operator, announced its plans on providing nationwide autonomous (SA) network coverage by 2025. When this service distributes across the country, the '5G+' brand will be used (GSMA Association, 2021). 5G SA has additional functionality, which is a key factor in using the advanced capabilities of this technology.

SW.G1. The dependence of German policy on the general guidelines of the European Union cannot be considered only a weak side, as this may bring additional opportunities in the future. The agenda and goals for the development of next-generation mobile networks set by the European Commission may encourage German private and public companies to invest more in 5G to support the regional goals. In 2021, the European Commission got a goal to provide gigabit connectivity in all EU households and 5G coverage in all settlements by 2030 (Eurostat, 2021).

Results: multiplicative effect of the 5G technologies influence on economic development

In order to determine the impact of the introduction of 5G technologies for economic development we use the «input-output» method presented earlier. Investments in 5G technologies are directed for the development of the appropriate infrastructure. In the European Union, these are radio and television equipment, communications (45%), construction (34%), and telecommunications (21%). Investments in

various sectors have an uneven impact on the economy. Therefore there is a need to assess the multiplicative effects of production and employment of types I and II[4].

Table 2 shows this effect in general and on the employed for the countries of the European Union, including the UK. As a result of investments in the 5G technologies development, direct input-output effects of the first type arise. As expected, the production growth will amount to €141.8 bn, which provides the occuring of 2.39 mln vacancies in the EU countries.

Table 2 – Investments in 5G and the resulting effects of the first type, mln euros

Country	Investing in 5G in 2020	Direct input-output effect of the first type	Direct input-output effect for the employed of the first type
Germany	9,280	20,740	211,100
United Kingdom*	7,040	16,520	172,100
France	7,030	17,110	224,700
Italy	6,830	15,700	186,830
Spain	5,190	14,600	329,400
the Netherlands	1,870	5,030	68,300
Poland	4,350	13,040	569,553
Belgium	1,230	3,150	36,300
Sweden	1,060	2,450	25,300
Austria	970	2,170	25200
Ireland	490	1,210	10,700
Denmark	620	1,480	14,800
Finland	600	1,501	19,900
Romania	2,270	4,660	252,300
Czech Republic	1,200	3,990	143,000
Portugal	1,170	3,730	127300
Greece	1,220	2,180	101,300
Hungary	1,130	3,450	134,600
Slovakia	620	1,980	71,500
Bulgaria	840	2,320	128,900
Luxembourg	60	122	600
Croatia	480	2,320	64,400
Lithuania	330	700	28,200
Slovenia	240	610	14,700
Latvia	230	570	16,800
Estonia	150	560	13,600
Cyprus	100	470	20,800
Malta	50	190	3,900

Source: European Commission. Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe. – Tech. Rep. 30-CE-0683419/00-45, 2016. https://connectcentre.ie/wp-content/uploads/2016/10/EC-Study_5G-in-Europe.pdf (accessed 13.03.2023).

[4] *European Commission. Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe. – Tech. Rep. 30-CE-0683419/00-45, 2016. https://connectcentre.ie/wp-content/uploads/2016/10/EC-Study_5G-in-Europe.pdf (accessed 13.03.2023).*

The matrix of direct effects from the 5G technologies implementation in the EU countries is shown in Figure 7. Horizontally, we note a direct effect for the employed or the number of vacancies, and vertically – GDP growth, or, a direct economic effect.

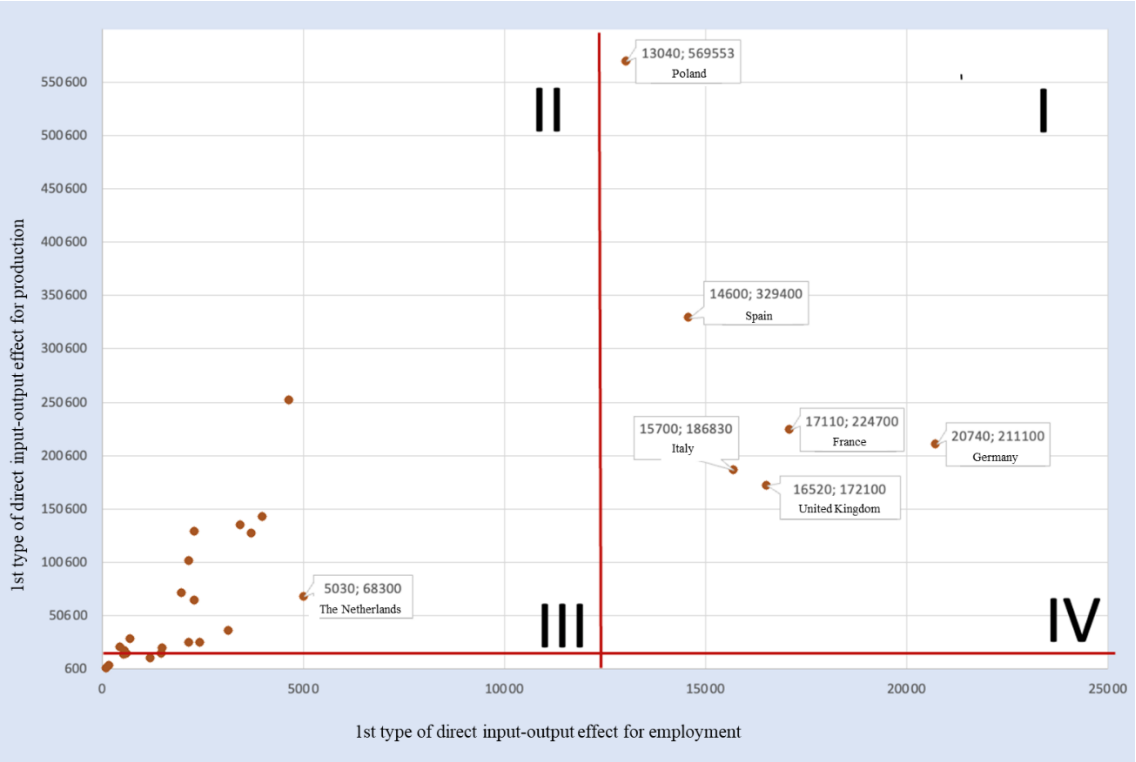


Figure 7. Matrix of economic effects on production and employment from the 5G implementation
Source: composed according to the European Commission. Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe. https://op.europa.eu/en/publication-detail/-/publication/2baf523f-edcc-11e6-ad7c-01aa75ed71a1/language-en (accessed 07.05.2023).

According to our research, the countries can be divided into four groups. For example, Poland, Spain, Italy, France, Germany, and the UK have the greatest effects in both directions. A number of countries benefit from the implementation it for production, including the Netherlands. A small group of countries have lower than average effect in the EU. However, there are no countries that would benefit more only for the employed – the economic effect is always presented.

Now, the 5G technologies implementation is not the only factor of economic development. Therefore, we propose to separate it from others by removing the scale factor of the economy, correlate the indicators to the largest country, and normalizing them. Rationing will allow us to compare the effects of the 5G technologies implementation on the production volume and the number of vacancies, if the scale of the economy and employment in all countries were comparable to the most effective regional economy – German one.

For the investment indicator, we calculate the rationing coefficients. They show the ratio of the most effective economy GDP to the GDP of the selected country economy.

Germany is the economy with the largest GDP in the EU. The country's GDP is € 3,889,669 mln. We calculate the rationing coefficient for investments in 5G in France:

$$qf_I = \frac{GDP_{GER}}{GDP_{FRA}}, \quad (4)$$

where:
GDP_{GER} – German GDP in 2020;
GDP_{FRA} – French GDP in 2020;
qf_I – the rationing coefficient for investments.

$$qf_I = (3\ 889\ 669)/(2\ 639\ 009) \approx 1{,}47 \quad (5)$$

Hence, German economy is 1.47 times more effective than the French one. Therefore, it is necessary to normalize investments in 5G by the same amount for compare them:

$$invest_{5G_{adj}} = qf_I * invest_{5G}, \quad (6)$$

where:
$invest_{5G_{adj}}$ – normalized investment volume;
qf_I – rationing coefficient for investments;
$invest_{5G}$ – the volume of investments.

$$invest_{5G_{adj}} = 1{,}47 * 7030 = 10\,362 \quad (7)$$

Similarly, we calculate the rationing coefficient for input-output production effects. For labour force indicators, we calculate rationing coefficients, which indicate the ratio of the size of the labour force in the country where it is largest to the size of the labour force in the selected country.

The country with the largest size of the labour forces is Germany – 43,501,000 employees in 2020. For example, we calculate the rationing coefficient for the first type of input-output effect for employment in France:

$$\boldsymbol{qf_{\mathrm{E}} = \frac{Labor\_force_{GER}}{Labor\_force_{FRA}}}, \quad (8)$$

where:
qf_E – rationing coefficient;
$Labor\_force_{GER}$ – labour force in Germany in 2020;
$Labor\_force_{FRA}$ – labour force in France in 2020.

$$qf_{\mathrm{E}} = (43\,501\,000)/(30\,379\,000) \approx 1{,}43 \quad (9)$$

Therefore, we can conclude that German labour force is 1.43 times larger than the French one, so it is necessary to normalise the 5G effect on employment (job gains) by the same value:

$$\boldsymbol{type\ I_{effect_{E_{adj}}} = qf_E * type\ I_{effect_E}}, \quad (10)$$

where:
type $I_{effect_{E_{adj}}}$ – the effect of the 5G implementation for employment is normalized;
qf_E – rationing coefficient;
type $I_{effect_{\mathrm{E}}}$ – the effect of the 5G implementation for employment.

$$\boldsymbol{type\ I_{effect_{E_{adj}}} = 1{,}43 * 224\,700 = 321\,175} \quad (11)$$

After the normalisation procedure, it is possible to use bar charts to demonstrate the countries for which the effect of 5G implementation on selected indicators will be the highest.

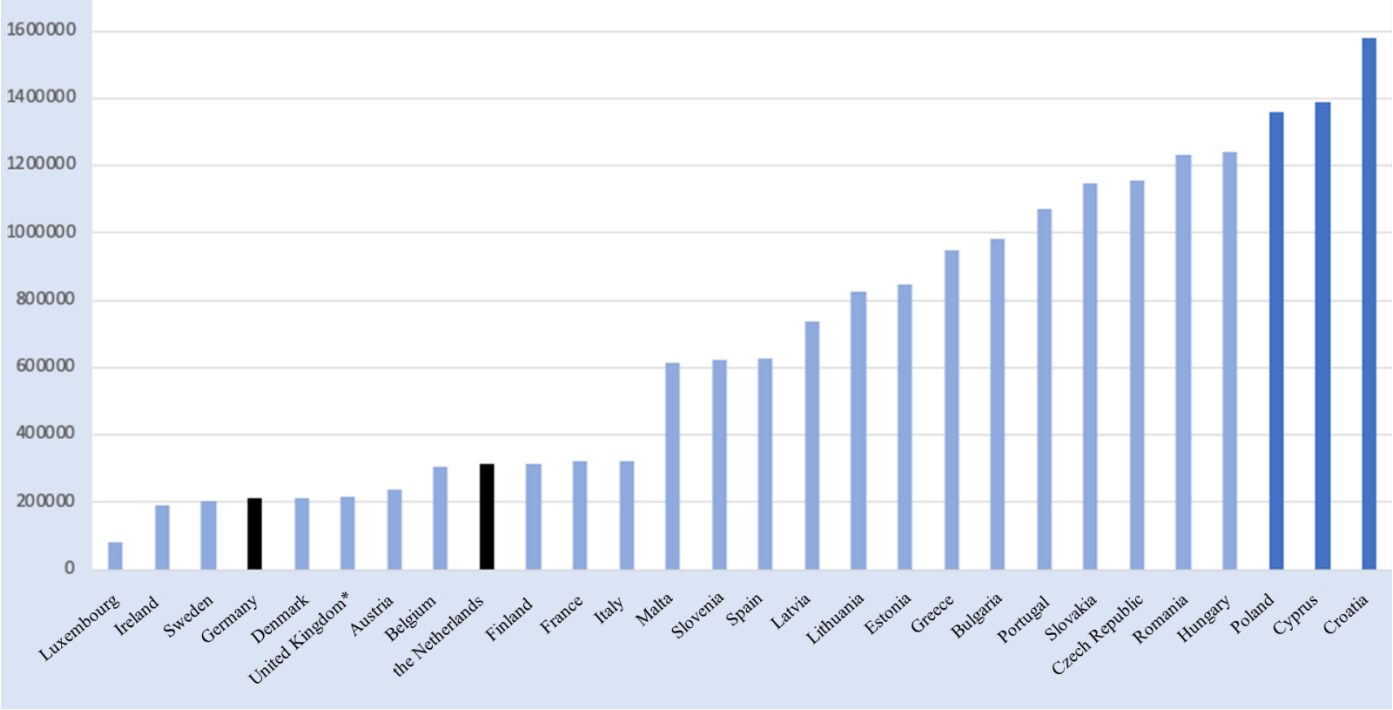
Firstly, consider the effect 5G investments in manufacturing (Figure 8). Here the largest effect of 5G investments will be in smaller countries (Croatia, Bulgaria, and Hungary). In terms of employment opportunities, countries such as Croatia, Cyprus, and Poland will benefit considerably.

To verify the representativeness of the obtained results, we will calculate the multiplier effect for each country from investments in 5G. The multipliers will allow us to assess the relationship between the increase in investment and the change in production and employment (Table 3).

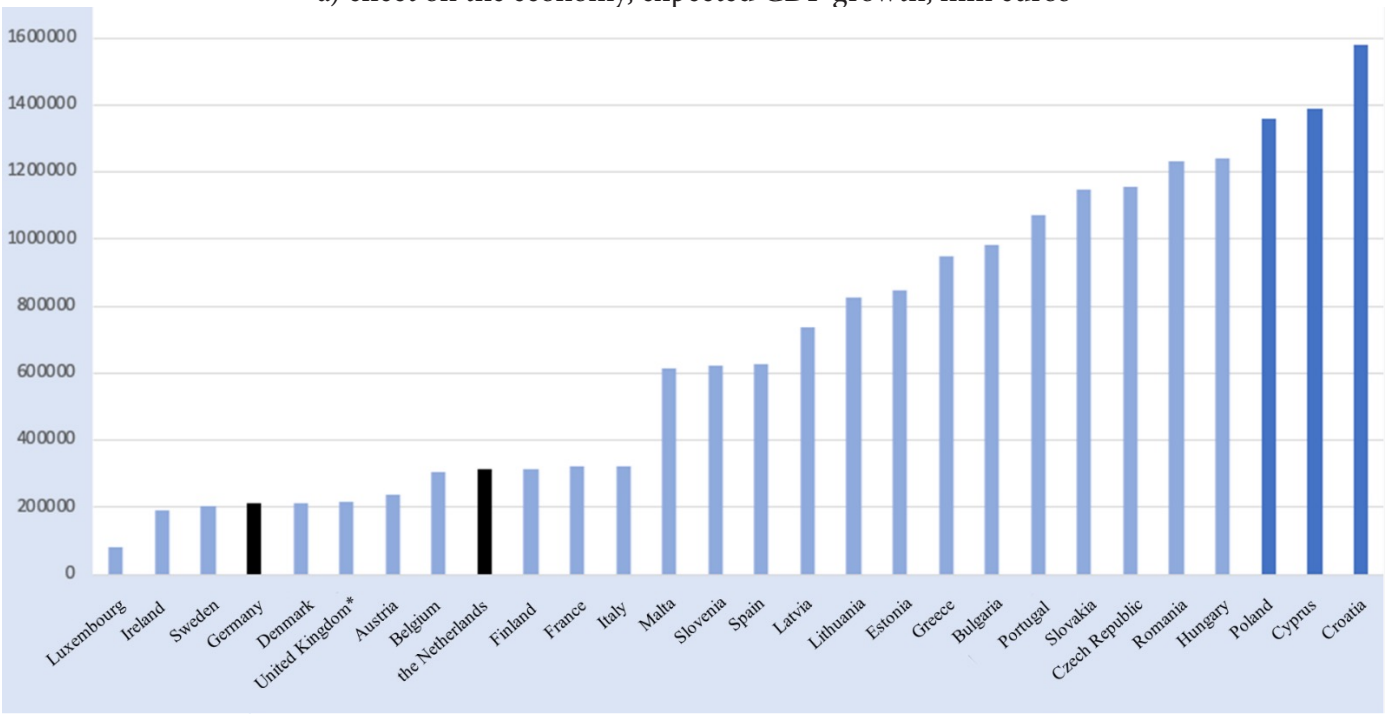
Consequently, the multiplicative effect of 5G investments is higher for lower economies. The countries with the highest multiplier for production (value equal to 4 and 5) are Cyprus, Croatia, Estonia, and Malta. Therefore, the increase in national output is expected for every million euros of investment by 4 and 5 million euros, respectively. The highest multiplier for employment is possessed by countries such as Cyprus, Bulgaria, Croatia, Poland, Hungary, with values of 208, 153, 134 and 131 respectively. An increase in employment for every million euros of investment in 5G will be accounted for by the multiplier value for the country concerned. These data are correlated with the results obtained after the rationing procedure.

For effective economies, the multiplier effect of the 5G technologies implementation will lower, but in

absolute terms it is quite high.



a) effect on the economy, expected GDP growth, mln euros



b) effect for the employed, expected new vacancies, people

Figure 8. Effects on economic development and employment growth from the 5G technologies implementation in the UN countries

Source: composed by authors

Table 3 – Multiplier effects for production and employment from the 5G technologies implementation in the UN countries

Country	The multiplier effect for production	The multiplier effect for employment
Croatia	5	134
Cyprus	5	208

Country	The multiplier effect for production	The multiplier effect for employment
Malta	4	78
Estonia	4	91
Czech Republic	3	119
Slovakia	3	115
Portugal	3	109
Hungary	3	119
Poland	3	131
Spain	3	63
Bulgaria	3	153
the Netherlands	3	37
Belgium	3	30
Slovenia	3	61
Finland	3	33
Latvia	2	73
Ireland	2	22
France	2	32
Denmark	2	24
United Kingdom*	2	24
Sweden	2	24
Italy	2	27
Austria	2	26
Germany	2	23
Lithuania	2	85
Romania	2	111
Luxembourg	2	10
Greece	2	83

Source: composed by authors

Consequently, the multiplicative effect of 5G investments is higher for lower economies. The countries with the highest multiplier for production (value equal to 4 and 5) are Cyprus, Croatia, Estonia, and Malta. Therefore, the increase in national output is expected for every million euros of investment by 4 and 5 million euros, respectively. The highest multiplier for employment is possessed by countries such as Cyprus, Bulgaria, Croatia, Poland, Hungary, with values of 208, 153, 134 and 131 respectively. An increase in employment for every million euros of investment in 5G will be accounted for by the multiplier value for the country concerned. These data are correlated with the results obtained after the rationing procedure.

For effective economies, the multiplier effect of the 5G technologies implementation will lower, but in absolute terms it is quite high.

Conclusions

The 5G technologies implementation at the national level enhances the investment attractiveness of the territory. It allows companies to increase income through better customer service, superiority over competitors, increased demand, reliability, production and reduced risks and costs.

In many ways, the development of 5G technology depends on the interest and policy of the government. In Germany, the goal of maximizing the potential of the technology was set back in 2017. Germany is planned to become the leading market for 5G implementation. The «5G-Strategie für Deutschland» strategy,

adopted in the same year, consolidated and regulated all measures taken with regard to the implementation and development of 5G mobile technologies. It extends to 2025 and includes five strands: accelerating network deployment; providing the most optimal frequencies for 5G; promoting co-operation between telecommunications companies and users; supporting 5G research and its deployment in cities at an early stage (BMDV, 2021).

R&D and technology development remains dynamic. Today, while discussing the prospects and challenges of implementing 5G technologies, we can reasonably assume and predict the introduction of the next generation of technologies – 6G. Since every innovation brings significant benefits but also has a shorter lifespan, the occurrence of 6G is not remote. These technologies are expected to be implemented in the development of smart cities, namely digital twins, augmented reality, the Internet of Things, etc. (Allam & Jones, 2021).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Svetlana N. Rastvortseva – concept, project administration, reviewing and editing.
Irina A. Bondarenko – formal analysis, collecting data, project design.

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The growth of average life expectancy as a factor of the global competitiveness of the Russian Federation

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Abstract. The growth of average life expectancy affecting the economically active period of life is one of the key factors in the global competitiveness of the state. It determined the relevance of the presented study. The purpose of the presented studies is to analyse predictive assessments of the prospects for achieving the national goal of increasing life expectancy in Russia by 2030 up to 78 years. The research revealed the following: it is necessary to take into account the impact of cycles of social economic activity as the factors affecting life expectancy, along with the factors which traditionally considered having the significant impact on world life expectancy (bad habits, climatic and environmental conditions, exposure to chronic stress, nutritional balance, daily physical activity, health care, country economic development, etc.). The scientific novelty of the study concerns with the identification of the main factors allowing the national policy to achieve this particular goal. The practical significance of the results obtained provides the possibility of their use in improving the national policy in terms of both population and labour economics.

Keywords: average life expectancy, global competitiveness factor, Russian Federation.

JEL codes: I12, J11, N30

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Introduction

The goal of «increasing life expectancy up to 78 years» is one of the most significant among the national goals defined by the Decree of the President of the Russian Federation No. 474 of July 21, 2020[1] (Fig. 1) in the unit of goals aimed at preserving the population, health, and well-being of people.

This task is an extremely difficult one. However, especially by the end of 2018 this indicator was 66.91 years in the Russian Federation[2]. Indeed, recently the country was involved into several waves of the COVID-19 pandemic, and other crisis events.

In this regard, it seems quite relevant to assess the prospects for achieving the national goal of «increasing life expectancy to 78 years by 2030».

Therefore, the purpose of the presented studies is to assess the prospects for achieving the national goal of «increasing life expectancy to 78 years» by 2020 in terms of the changes taking place in the political, economic, and social spheres in the country and worldwide.

Methods

The methodological basis of the research was provided by well-known scientific works devoted to the problem of increasing life expectancy of the World Health Organization (WHO)[3], the Presidium of the

[1] *https://www.garant.ru/products/ipo/prime/doc/74304210/(accessed 01.02.2023)*
[2] *Life expectancy according to Rosstat. Available at: https://rosinfostat.ru/prodolzhitelnost-zhizni/?ysclid=l66oapv4pv493880792. (accessed 01.02.2023)*
[3] *The plan of the Decade of Healthy Aging for the period 2020-2030. Available at: https://www.who.int/docs/default-source/decade-of-healthy-ageing/full-decade-proposal/decade-proposal-fulldraft-ru.pdf?sfvrsn=ccd95796_8 (accessed 01.02.2023)*

Russian Academy of Sciences[4], LifeBio[5], as well as such authors as Dvorsky G[6]., Egorushkin S.[7], Kravchenko E.[8], Lomskaya T.[9], Tergesen E.[10], Ulumbekova G.[11], Khel I.[12], Chernyshev E.[13], Shipacheva D.[14], etc.

Results

This study is a logical continuation of previous author's studies (Tebekin, Mitropolskaya-Rodionova & Khoreva, 2021) devoted to assessing the prospects for ensuring sustainable population growth in the Russian Federation, defined by Presidential Decree No. 474 of July 21 2020 in the unit of goals aimed at preserving the population, health, and well-being of people (Fig. 1).

The conducted studies show the presence of the several sources demonstrating an assessment of the national average life expectancy.

The first source is retrospective data from Rosstat, demonstrating data on average life expectancy in Russia from the end of the nineteenth century to nowadays.

The scientific sources devoted to the description of the dynamics of average life expectancy in Russia contain the comparison of life expectancy in the country as follows:

- during the Soviet period (period of prosperity of the USSR) – from the 1960s to the 1980s;
- during the transition period (the period of liberalism in the Russian Federation) – in the 1990s;
- in the period of modern history (the period of state capitalism in the Russian Federation) – since the 2000s.

However, there are different interpretations of these statistics.

Some sources emphasize the achievement of the all-time high for average life expectancy in Russia in the 2010s compared to similar one of the USSR.

Thus, in 2012, the average life expectancy in the Russian Federation was 70.24 years, exceeding the Soviet all-time high of 70.13 years in 1986-1987[15] (Fig.2).

The other sources compare the current values of life expectancy in Russia with the minimum of the 1990s[16] (Fig.3).

Meanwhile, we possess the comparison of the modern development indicators with the absolute minimum during the collapse of the 1990s used by many researchers as fundamentally incorrect one.

In fact, these correlations do not reveal the obvious effectiveness of development processes.

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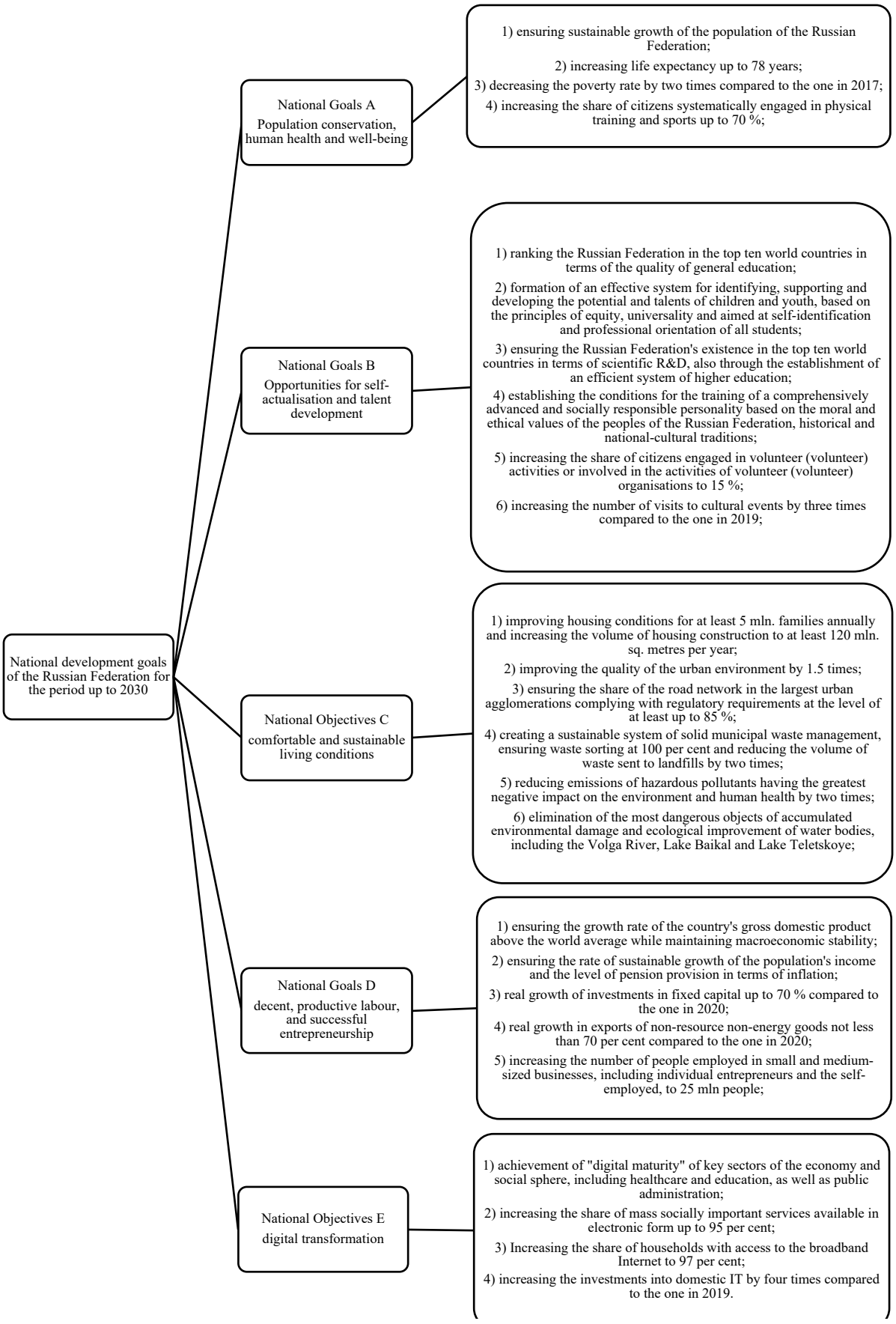

Figure 1. National goals defined by the Decree of the President of the Russian Federation No. 474 of July 21, 2020

Source: Decree of the President of the Russian Federation No. 474 of July 21, 2020

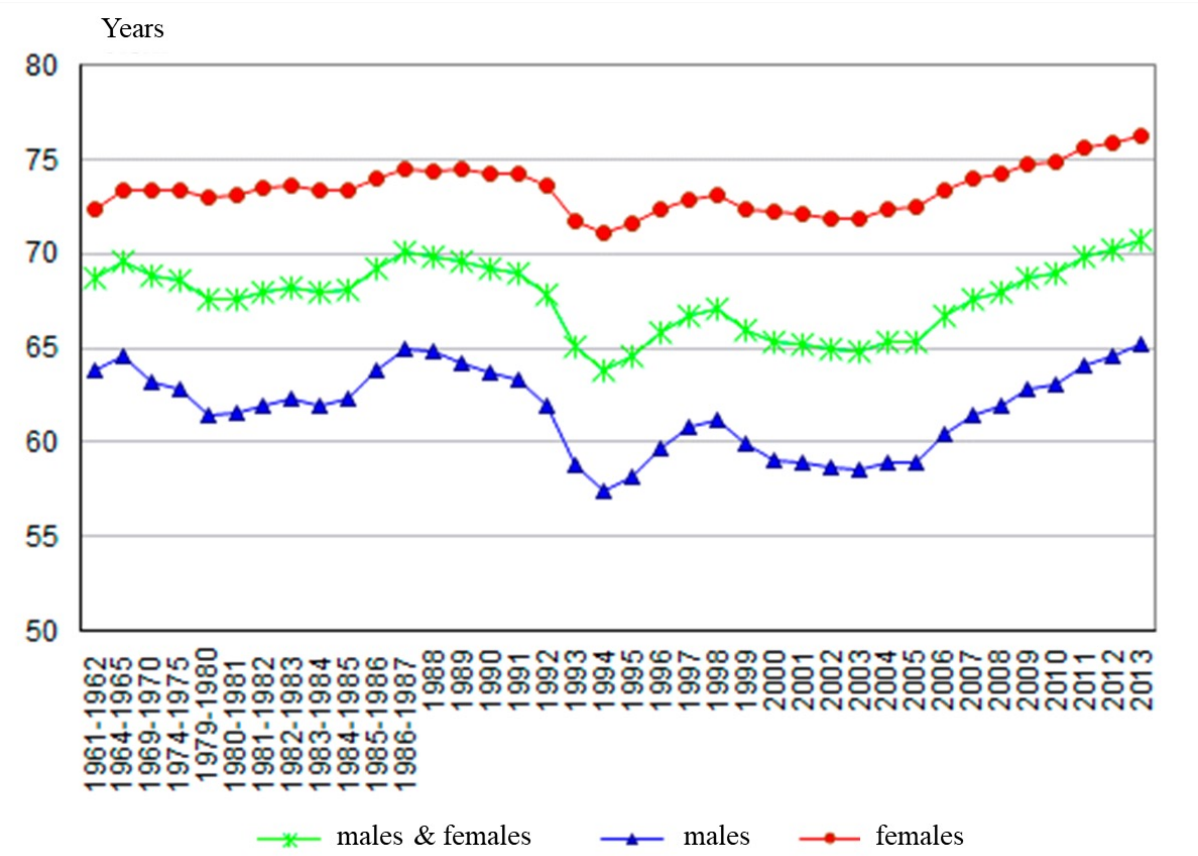

Figure 2. Dynamics of average life expectancy in Russia in the period of 1961-2013
Source: https://ruxpert.ru/Statistics:Continuation_life_Of Russia

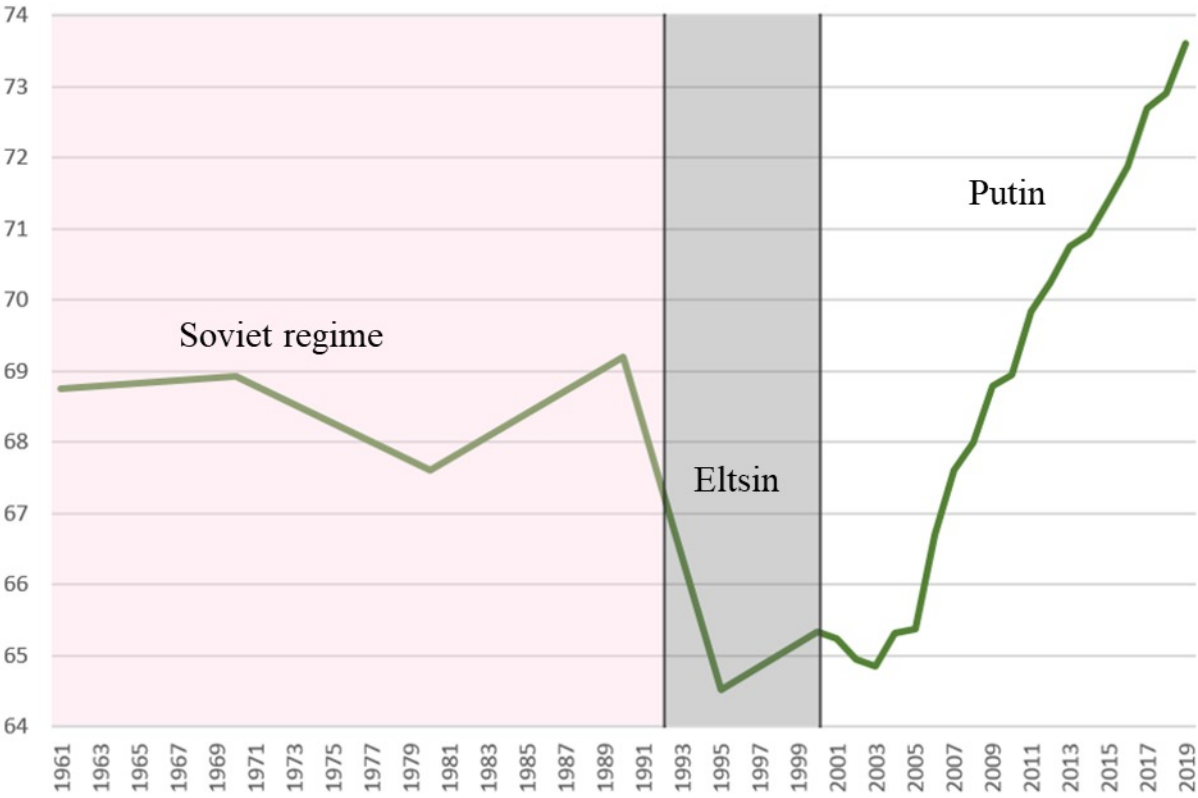

Figure 3. Dynamics of average life expectancy in Russia in the period of 1961-2019
Source: https://ruxpert.ru/Statistics:Continuation_life_Of Russia

According to the historical correlations, during the Soviet era all developmental achievements always compared with the achievements of the pre-revolutionary Russian Empire in 1913. It reveals the extra public achievements (before the outbreak of the First World War), when, for example, Russia's gross industrial production was 5.3% of global one versus 3.6% in 2022 year[17].

Additionally, there is the discrepancy in assessments of average life expectancy in Russia. However, according to Rosstat data in the period 2004-2011 the average life expectancy in the country increased from 65.31 to 69.83 years (or increased by 6.92%). But according to the CIA World Factbook, the average life expectancy in Russia did not increase and was 66.39 years in 2004 and 66.29 years in in 2011 (or decreased by 0.15%)[18].

The author's assessment of the average life expectancy dynamics in Russia is presented in Fig.4.

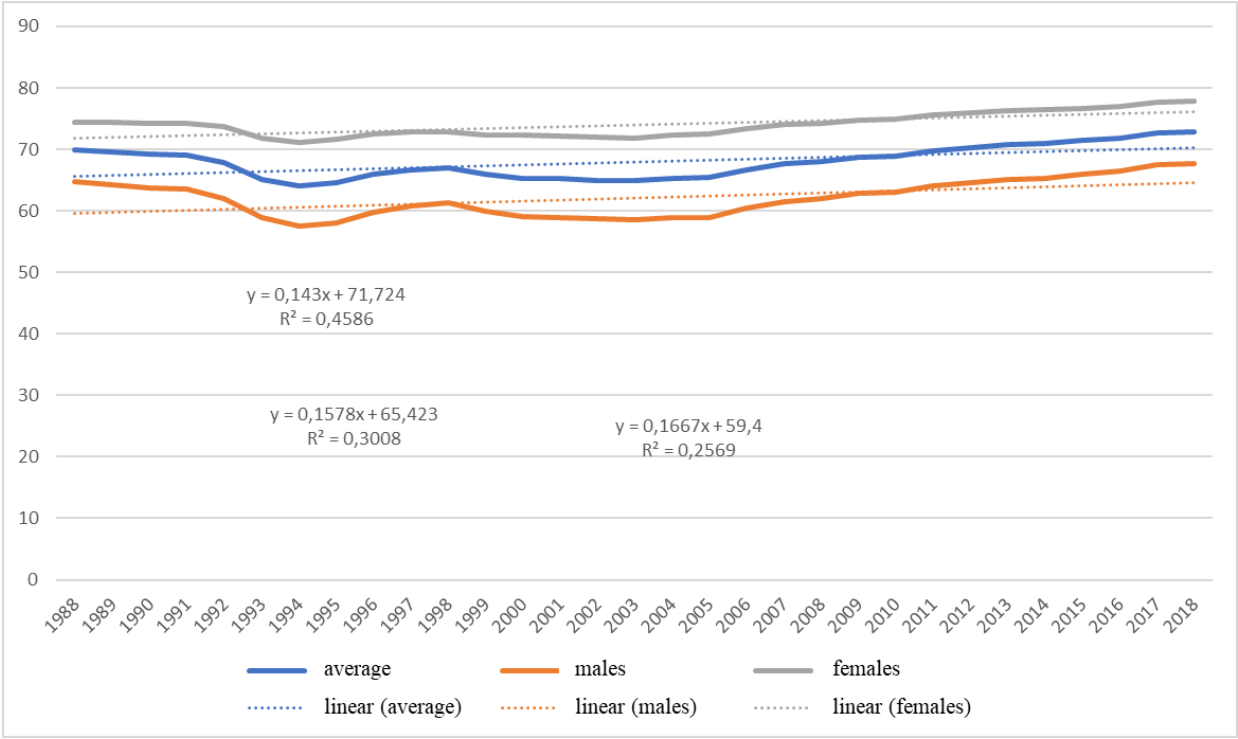

Figure 4. Assessment of the average life expectancy dynamics in Russia in the period 1988-2018
Source: Demographics. https://rosstat.gov.ru›folder/12781

According to statistical data presented in Fig. 4, we can expect the average life expectancy by 2030, if the trends of the last 30 years are maintained as follows:

- 61.04 years for males,
- 73.44 years – for females,
- 67.31 years – for the population in general.

Note these values (67 years) differ significantly from the required value of the indicator – 78 years.

The author's assessments of the national life expectancy dynamics (Fig. 4) are substantially lower than the results of the Rosstat's forecast of the average life expectancy in the Russian Federation until 2035. It is not only for the lowest, but also for the medium (Fig. 5), and high variant of the forecast. According to the forecast variants, in 2030 the average life expectancy in the country is expected to be 74.84, 77.54, and 79.74 years, respectively[19].

[17] *Industries of the world's countries in the table. Available at: https://visasam.ru/emigration/economy/promyshlennost-stran-mira.html. (accessed 01.02.2023)*
[18] *CIA. The World Factbook Life Expectancy. Available at: https://web.archive.org/web/20111026030831/https://www.cia.gov/library/publications/the-worldfactbook/rankorder/2102rank.html?countryName =Russia&countryCode=rs&regionCode=cas&rank=161#rs (accessed 01.02.2023)*
[19] *Demographics. Available at: https://rosstat.gov.ru›folder/12781. (accessed 01.02.2023).*

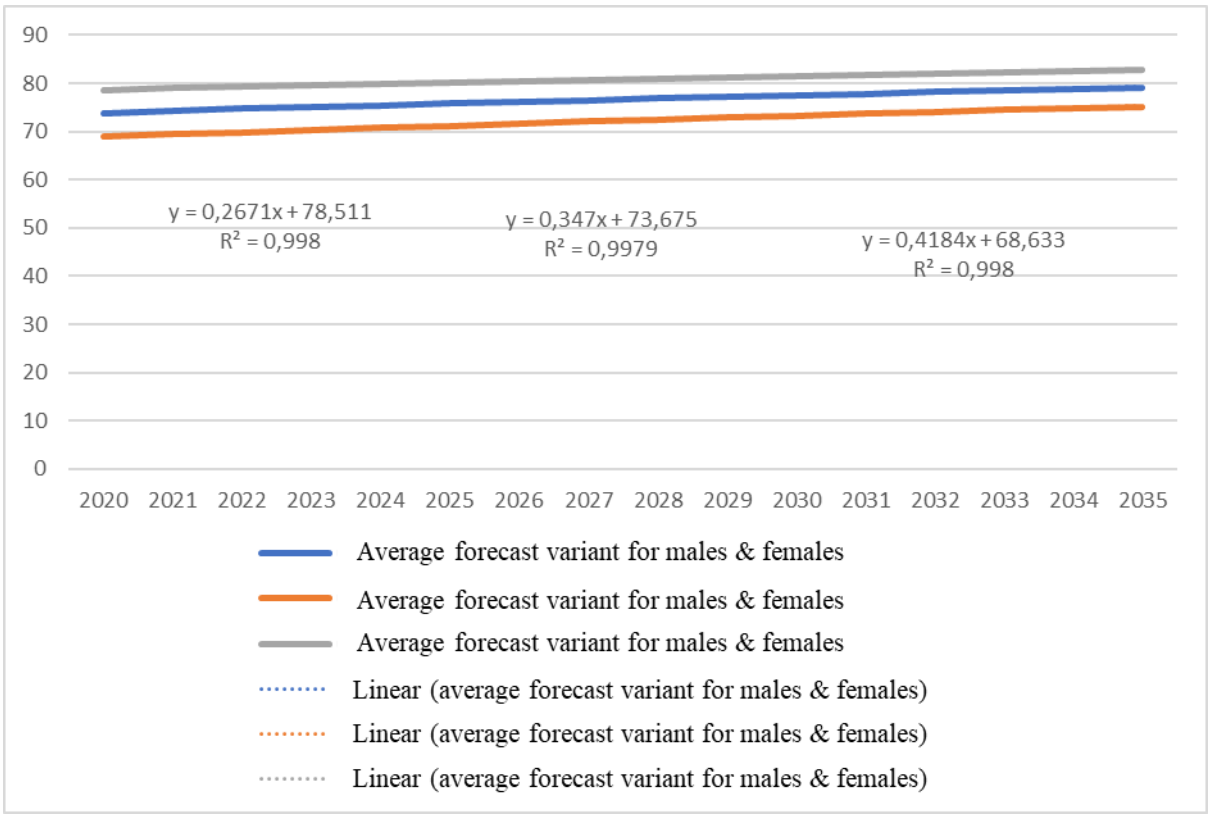

Figure 5. The medium variant of Rosstat's forecast of the average life expectancy in the Russian Federation up to 2035

Source: Demographics. https://rosstat.gov.ru›folder/12781

The level of linearity in Rosstat's forecast assesses the average life expectancy in the Russian Federation up to 2035. It is varying for the low, medium, and high forecast variants within the range of $R^2 = 0.988 – 0.994$. It indicates that these forecasts do not take into account a large number of factors affecting the dynamics of people's life expectancy. In order to understand it, we have to compare the results of Rosstat's forecast of average life expectancy in the Russian Federation for 2020-2035, presented in Fig.5-7, with the results of the analysis of average life expectancy in the Russian Federation in the period 1998-2018. Indeed, its coefficient of determination for the linear approximation model varies within $R^2 = 0.256 \div 0.458$ (see fig. 4).

The insufficient quality of Rosstat's forecasts is confirmed by the absence of accounting for the impact of cyclical processes in the social and economic development, including epidemics, geopolitical, and economic issues.

As for epidemics, it is necessary to take into account the impact of the COVID-19 pandemic on the national average life expectancy. Therefore, according to available assessments, in 2020 the life expectancy of Russians decreased by 1.8 years compared to the previous year and reached 71.5 years (Korolenko, 2022).

By other expert assessments, nowadays Russia is involved into the demographic tragedy. And SMO has aggravated the previous years crisis[20]. Generally, the experts highlight the following components:

- over the past three years, Russia has lost about 2 million people as a result of SMO, diseases, and the citizens departure;

- according to Western experts, from 500,000 to 1,000,000 people migrated abroad (mostly, well-educated youth);

- losses place a significant strain on a shrinking, sickly population. For example, commenting on the increase of the working week length for Russians increased in the first quarter of 2023 to a record level of 38.5 hours since 2010, the Minister of Labour and Social Protection of the Russian Federation A. Kotyakov explained this trend by a shortage of personnel (we mean the aging of the population, the migration of young

[20] *Kolesnikov A. A demographic tragedy is unfolding in Russia. SVO has aggravated the crisis that began even before it began. Available at: https://smart-lab.ru/blog/883343.php. (accessed 01.02.2023).*

people abroad, etc.)[21].

- life expectancy of Russian males has decreased by almost 5 years similar to Haiti. Now Russian males live six years less than Bangladesh ones; 18 years less than Japanese ones;

- Russia may enter a fatal demographic crisis, which began in the 90's (Fig.3). Note, after the peak in 1994, the population began to decrease due to the negative ratio of fertility and mortality (Fig.6), which is not covered by the influx of migrants. Only in 2020 and 2021, according to foreign experts, the population in Russia decreased by 1.3 min people, and the death rate exceeded the birth rate by 1.7 million people. According to Rosstat, the natural population decline in the country in 2021 was 1.04 mln people, exceeding the previous maximum in the history of modern Russia in 2000 – minus 958.5 thousand people. At the same time, mortality in Russia in 2021 increased by 15.1%, reaching 2.44 million people, and the birth rate decreased by 2.3%, amounting to 1.4 million people, which is the lowest since 2002[22].

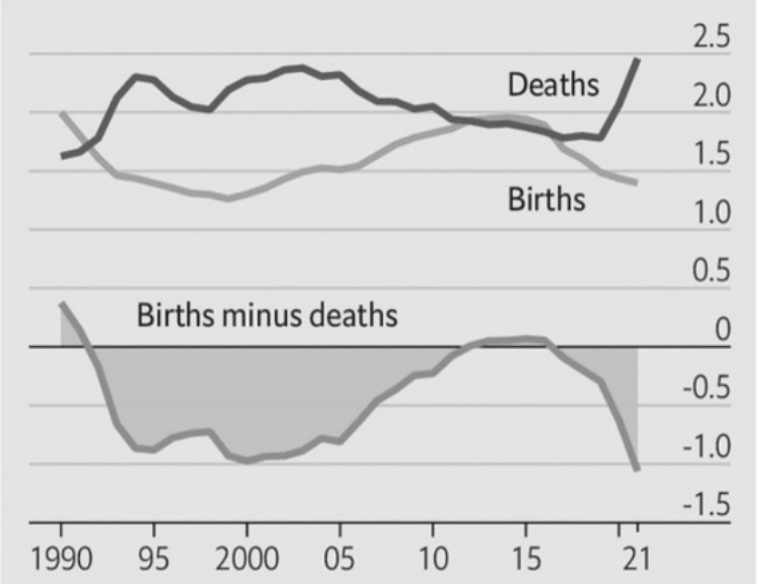

Figure 6. The dynamics of births and deaths in Russia in the period 1990-2021
Source: UN Population Division, 2022

According to the UN forecasts[23], the population in Russia in 50 years may reach only 120 million, even provided the current dynamics models are maintained. They will rank Russia to the world 15th place in terms of population against the 6th place in 1995;

- as a signal indicator of the chronic demographic problems in Russia the number of registered births in April 2022 (after the beginning of the SMO) is highlighted. It recognized the lowest one since the XVIII century;

- population decline not only in Russia, but also in most post-Soviet states is characterized by a process of controlled reduction. However, the restoring of Russian population to a high level of immigration nowadays is absolutely not justified;

- the number of ethnic Russians in the period of 2010-2021 decreased by 5.4 million people, and their share in the country's population declined from 78% to 72%;

- according to official Russian statistics, the death rate from COVID-19 was 388 thousand people. It is considered as a relatively low indicator. But, according to The Economist, USA, the total excess mortality in Russia in the period 2020-2023 is in the range of 1.2 to 1.6 mln people. It is comparable to the population

[21] *Kotyakovexplainedtheincreaseinthelengthoftheworkingweekfor Russians. Availableat:https://ria.ru/20230706/kadry-1882528990.html?utm_source=yxnews&utm_medium=mobile&utm_referrer=https%3A%2F%2Fdzen.ru%2Fnews%2Fstory%2FGlava_Mintruda_Kotyakov_deficit_kadrov_vedet_krostu_prodolzhitelnosti_rabochej_nedeli--511fbca61176f3f7cbe76adea7db0775. (accessed 01.02.2023).*

[22] *The natural decline of the population in Russia for the year exceeded 1 million people. Available at: https://www.rbc.ru/economics /28/01/2022/61f3bbaa9a794767f04fdaa7. (accessed 01.02.2023).*

[23] *World Population Prospects 2022. Available at: https://population.un.org/wpp/ (accessed 01.02.2023)*

losses as a result of the pandemic in China and the USA. Indeed, their population is many times larger than in Russia (9.6 times, and 2.1 times, respectively);

- totally, as a result of deaths from the pandemic and migration from mobilization abroad, Russia in the period 2020-2023, in addition to the usual demographic deterioration, lost from 1.9 to 2.8 min people. This indicator is worse than it was in Russia in the «dashing 1990s», which arose as a result of «shock therapy»[24];

- balance of the sexes has been greatly distorted. Meanwhile, in 2021 the number of females over the age of 18 exceeded the number of males over the age of 18 by 21%. Indeed, after 10% of young people were leaving the country in 2022 (the majority of males with higher education), this imbalance has intensified significantly.

The auditors of the Accounting Chamber also questioned the impact of the consequences of the pandemic and the geopolitical situation on the national goal achievability for an average life expectancy of 78 years[25].

Therefore, factors affecting the average life expectancy in the Russian Federation are traditionally considered to have the greatest impact on its duration in the world:

1) bad habits – smoking, alcohol, and drug addiction;
2) climatic conditions and the state of the environment;
3) chronic stress;
4) balanced nutrition;
5) daily physical activity;
6) health care;
7) economic development.

Considering the dynamics of average life expectancy, experts reasonably note that in Russia it differs significantly from other countries primarily due to the causes of mortality. In terms of their impact Russia ranks several times (!) higher than the leading economically developed countries. These causes are as follows: alcohol poisoning, suicide, cardiovascular diseases, injuries, murders (Demographic Modernization of Russia: 1900-2000, 2006).

Indeed, according to the World Health Organization, Russia ranks world 176th in terms of alcohol poisoning of 189 countries in the rating[26].

In this regard, we can note the people mass poisoning in June 2023 with alcohol under the brand «Mr. Cider» containing life-threatening methyl alcohol and butyric acids. More than 100 people suffered from poisoning in several regions (Kurgan, Nizhny Novgorod, Penza, Samara, Udmurt Republic, Ulyanovsk, Chuvash Republic), 36 of them died[27].

According to the World Health Organization, Russia ranks world 172th in terms of suicide rate of 184 countries covered in the rating[28].

By to the level of cardiovascular diseases Russia ranks world 1st place. Moreover, almost 60% of all deaths in Russia are associated with heart diseases[29].

By the impact of injuries Russia ranks world 49th[30].

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[24] «Shock therapy»: how Russia experienced price liberalization 25 years ago. Available at: https://www.rbc.ru/photoreport/02/01/2017 (accessed 03.02.2023).

[25] The Accounting Chamber saw the risk of not achieving the life expectancy goal, Experts believe that by 2030 it will be 2-3 years below the plan. Available at: https://www.rbc.ru/economics/19/10/2022/634e9bf19a79472a56cbef1d. (accessed 01.02.2023).

[26] World Health Organization: Global Status Report on Alcohol and Health 2018. Available at: https://gtmarket.ru/ratings/global-alcohol-consumption#russia (accessed 01.02.2023).

[27] The number of people poisoned by the drink «Mr. Cider» exceeded 105. 36 of them died. Available at: https://rtvi.com/news/chislo-otravivshihsya-napitkom-mister-sidr-prevysilo-105-chelovek-iz-nih-36-pogibli/.(accessed 01.02.2023).

[28] World Health Organization: Suicide in the World 2021. Available at: https://gtmarket.ru/ratings/global-suicide-ranking#russia. (accessed 01.02.2023).

[29] Indicators of cardiovascular diseases by country in 2023. Available at: https://translated.turbopages.org/proxy_u/en-ru.ru.54235e01-64a4f83b-210dcd8c-74722d776562/https/worldpopulationreview.com/country-rankings/heart-disease-rates-by-country. (accessed 01.02.2023).

[30] SafetyIndexbyCountry2022.Availableat:https://www.numbeo.com/crime/rankings_by_country.jsp?title=2022&displayColumn=1 (accessed 01.02.2023).

At the same time, according to Rosstat data, there is a positive trend in the industrial accidents (Fig.7)[31].

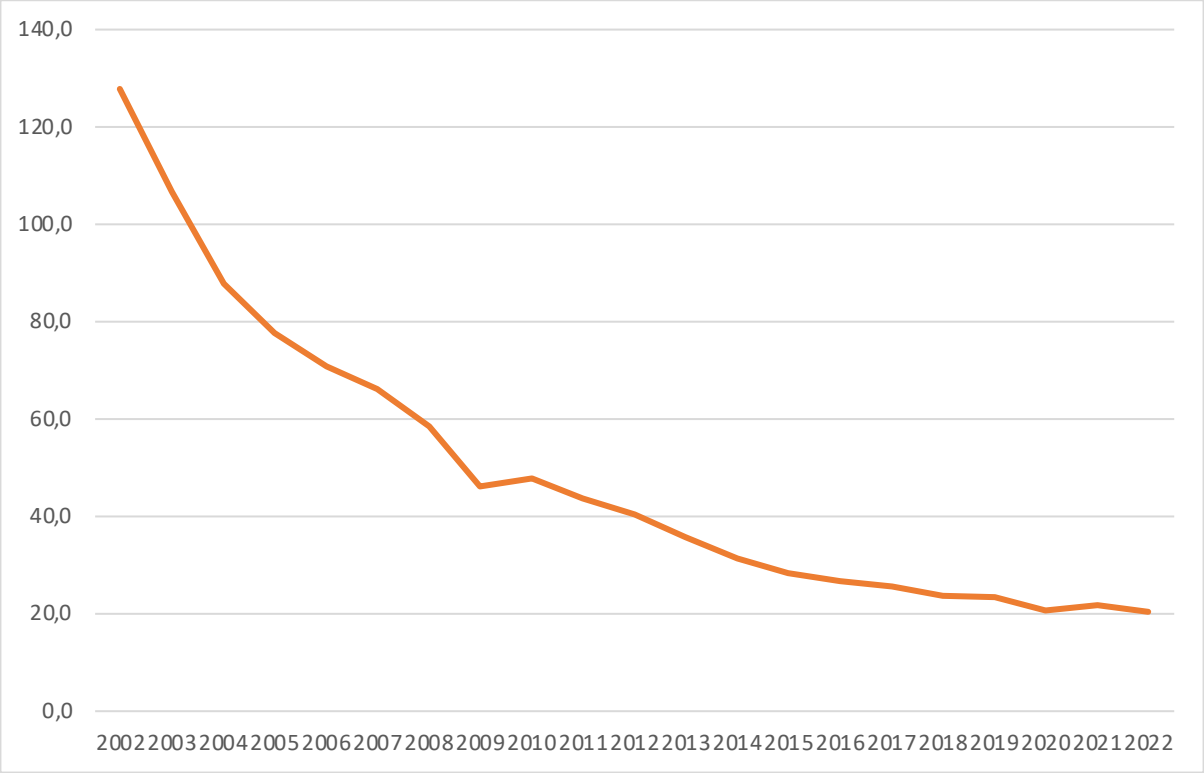

Figure 7. Dynamics concerning the number of people injured in industrial accidents in Russia in the period 2002-2022, thousand people

Source: Industrial injuries. Available at: https://rosstat.gov.ru/working_conditions

However, Rosstat data differ greatly from expert assessments[32].

In particular, experts believe in:

- on the one hand, «companies hide injuries received by employees during the industrial accidents in order not to pay fines and increased rates of contributions to the Social Insurance Fund»;
- on the other hand, official injury statistics do not take into account the huge shadow sector of the economy, where industrial injuries are «framed as a domestic ones».

Experts also pay attention not only and not so much to Rosstat data, but to the data of the International Labour Organization, according to which «Russia remains the leader in the number of deaths in the workplace even among post-Soviet countries» (Fig.8)[33].

Such leadership of modern Russia in industrial accidents (see Fig.8) is very surprising, since the country does not produce a lot (if compared with the USSR). The problem of import dependence nowadays is the evidence.

According to representatives of the Confederation of Labour of Russia, «the victory speeches of officials (regarding the statistics of industrial accidents – author's note) are unjustified. However, the decrease in statistical indicators of injuries (which officials explain by updating labour protection rules, growth of production culture, technological breakthroughs, improvement of machines, introduction of robots, etc.) is not due to the improvement of working conditions, but to the weakening of labour control is associated not with the improvement of working conditions, but with the weakening of control in the labour sphere». Moreover, in Russia:

[31] *Industrial injuries. Available at: https://rosstat.gov.ru/working_conditions. (accessed 01.02.2023).*
[32] *Russia is among the leaders in the number of deaths in the workplace. Available at: https://russian.eurasianet.org/(accessed 01.02.2023)*
[33] *Russia is among the leaders in the number of deaths in the workplace. Available at: https://russian.eurasianet.org/(accessed 01.02.2023)*

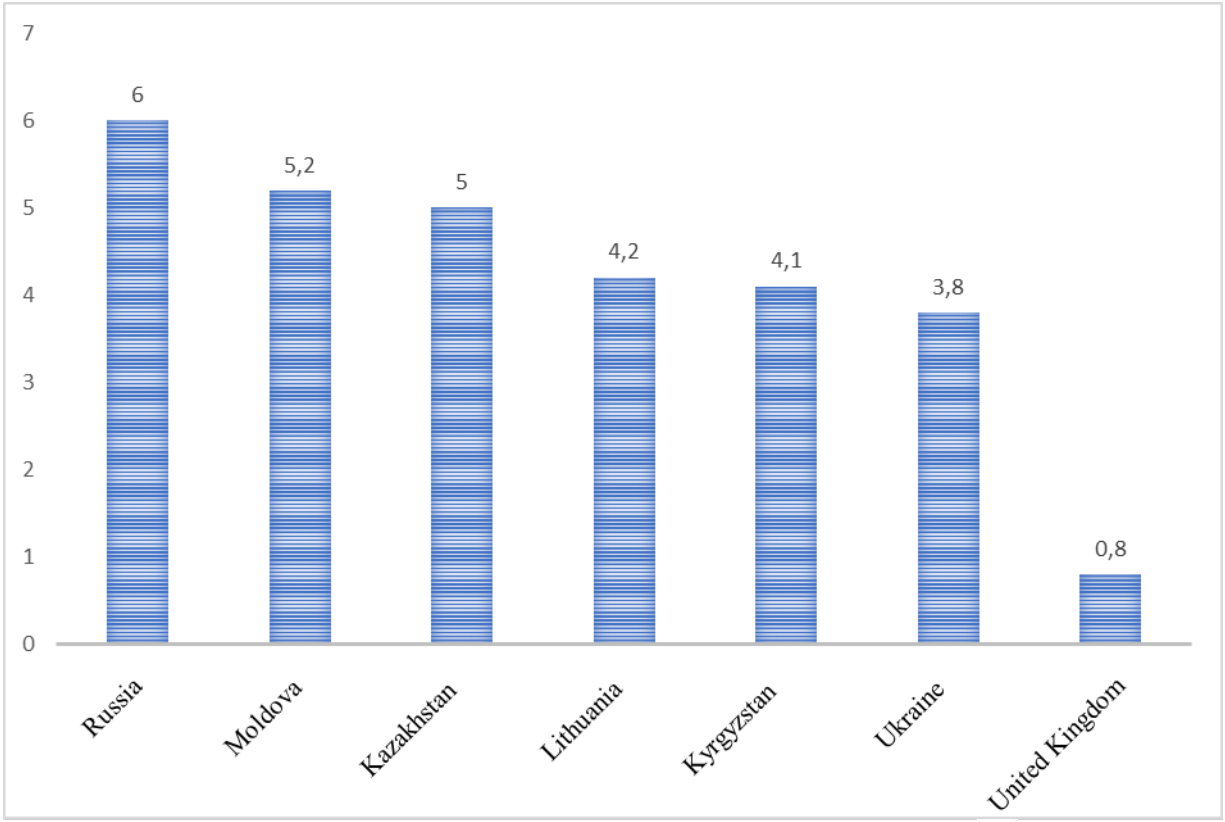

Figure 8. Comparative statistics on the number of deaths in the workplace per 100 thousand people per year
Source: https://russian.eurasianet.org/

- in 2014 was introduced a new electronic declaration system for compliance of labour conditions with public standards;

- since 2016 there has been a moratorium on scheduled inspections by state agencies of small and medium-sized businesses;

- «official statistics» is based on employers' reports. Many of them are hiding accidents, and without a direct statement from employees (about cases of injuries – author's note) inspectors do not come». Thus, according to official statistics, in the period 2010-2016, the number of industrial accidents victims in Russia decreased by 1.78 times (see Fig.7). Althought, the number of work safety inspections during this period, according to Rosstat, decreased by 2.7 times;

- employers prefer to hide industrial accidents, because their indicators directly affect the costs of insurance of employees against accidents (discounts and premiums on insurance premiums can reach 40% of the tariff, not counting fines for violation of labour safety rules) .

Furthermore, real industrial accidents are underestimated in official statistics by the growing shadow sector of the economy. Many employers do not have a labour agreement, paying wages in ''illegal payment in cash» in order not to pay official assessments on the wage fund (WF), including payments to social funds accounting for 30% of the WF.

In the context of domestic injuries, statistics on the death rate in road accidents is the most general one. By this indicator, Russia, according to the World Health Organization, ranks world 114th of 179 countries in the rating .

As for murders according to the UN Office on Drugs and Crime, Russia ranks world 56th of 227 countries in the ranking .

As for the growth of average life expectancy in the country periodically reported by officials, we should mention the statement of the Deputy Prime Minister of the Government of the Russian Federation T. Golikova, who made a following statement in December 2022: «Moscow has almost reached the goal of life expectancy for 2030» . But we also should agree with the opinion of demographer A. Vishnevsky – «we are still far

from European life expectancy» . Indeed, Russia, according to the data of the United Nations Department of Economic and Social Affairs, ranks only 165th of 236 countries in the world. It also ranks world 103th in terms of healthy life expectancy of 183 countries in the rating .

Conclusions

Consequently, the research demonstrates significant difficulties in achieving the national goal of «increasing life expectancy to 78 years» by 2030 due to the geopolitical and economic changes affecting the development of the Russian Federation in the recent years. Besides in general, the existing processes significantly complicate the provision of life expectancy growth positive dynamics in the Russian Federation.

Forecast assessments of life expectancy in the Russian Federation for the period up to 2035, made by Rosstat, have a poor accuracy because they do not consider cyclical patterns in the society's socio-economic development.

The research revealed the following: it is necessary to take into account the impact of cycles of social economic activity as the factors affecting life expectancy, along with the factors which traditionally considered having the significant impact on world life expectancy (bad habits, climatic and environmental conditions, exposure to chronic stress, nutritional balance, daily physical activity, health care, country economic development, etc.).

The paper demonstrates the importance of assessing a country's life expectancy not only in temporal dynamics (based on the «yesterday-today-tomorrow» principle), but also in spatial dynamics (i.e. in comparison with other countries) in terms of global competitiveness.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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Problems of forming a competitive strategy for the development of the sharing economy ecosystem

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Abstract. The article analyzes a new socio-economic phenomenon – the "ecosystem of the sharing economy". The authors consider a fundamentally new structure of this phenomenon in terms of the positions, links, and interactions of all participants of the sharing economy. The purpose of the study is to identify the problems of forming a competitive strategy for the development of the ecosystem of sharing economy. The authors highlight the main challenges of collaborative consumption ecosystems, and identify practical competitive strategies of the sharing economy to achieve sustainable development. The authors use the example of the French economy to examine the challenges of institutionalizing the collaborative consumption economy. As a result, the authors found that market players need to build models of sharing economy ecosystem functioning to further development and implementation of a competitive strategy. The authors also revealed that platform managers need to develop new capabilities and facilitate interactions between ecosystem players to ensure a competitive strategic position in the sharing consumption market.

Keywords: sharing consumption/utilisation economy, ecosystem, sharing economy, development strategies, business models, social entrepreneurship, digital platforms, platform economy.

JEL codes: O16, O33

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Introduction

Changing peoples'minds, as well as the development of high-tech digital platforms, have made the the sharing economy ecosystem popular within academic discourse. In fact, the sharing consumption economy can be seen as an ecosystem because it comprises many interconnected "organisms" (i.e. interest groups) that coexist and interact in a dynamic environment.

The relevance of the research is the increasing importance of the collaborative consumption economy for modern society (see Figure 1). It makes market players consider the integration of the of the sharing economy principles into the development of their own business models.

It is challenging because sharing economy business models connect thousands of suppliers and customers through an information and communication technology (ICT) platform that relies on the active participation of a wide range of diverse ecosystem stakeholders.

Therefore, understanding why some firms employ different strategies and how these strategies vary from firm to firm and from region to region remains an extremely important issue.

The purpose of the study is to identify the issues of forming a competitive strategy for the development of the sharing economy ecosystems.

Main part

The concept of the "sharing consumption economy" can be defined as a socio-economic ecosystem that typically uses information technology to connect different stakeholders – individuals, companies,

governments, etc. – to share or access different products and services, and enable collaborative consumption (Avdokushin & Kuznetsova, 2021; Laamanen et al., 2016). The sharing consumption economy represents a radical shift to the way how business is organised. It is forcing many theories and practices of managing labour, employment, the firm, and the nature of economic enterprise.

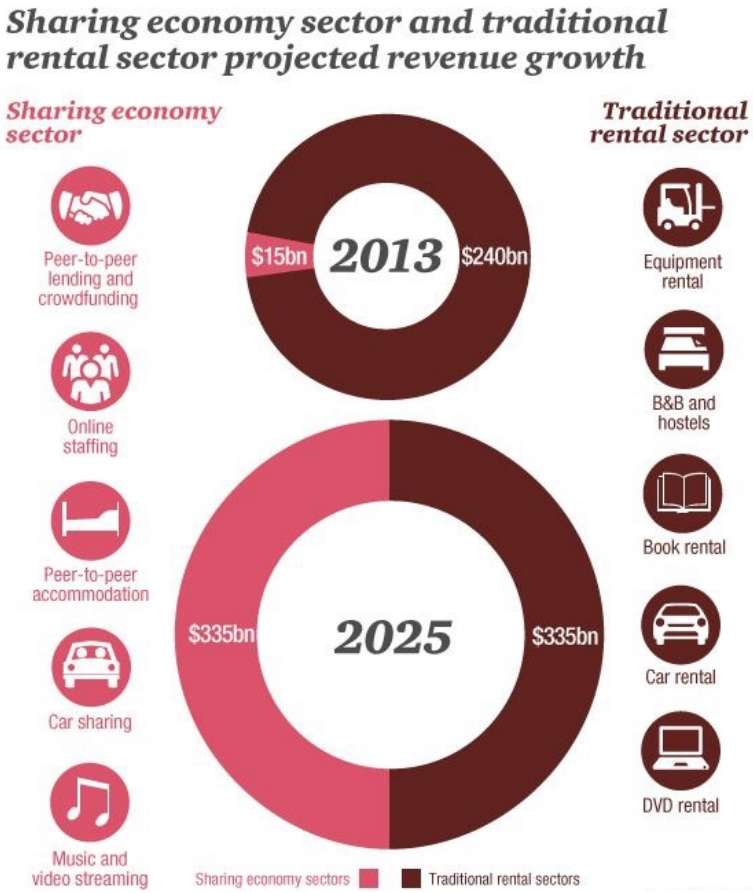

Figure 1. Scale of the sharing economy growth

Source: PwC analysis

Sharing consumption economy business models typically represent a higher level of interconnection diversity and opportunities for co-investment, co-learning, and co-innovation than traditional ones.

When analyzing the indicators of this phenomenon development, in the period from 2021 to 2022, in general, the economy of sharing consumption in Russia showed steady growth. Despite the crisis, people prefer not giving up consumption of goods through sharing them. In this respect, sharing consumption showed its advantage over traditional industries, which have been experiencing a significant decline since the beginning of the year (Plotnikov & Anisimova, 2023).

The economic literature describes the sharing consumption economy and the sharing economy in terms of forming the basis of the modern sharing economy (Rong et al., 2021).

Here we will describe the differences between organisation in the sharing economy and traditional organisations.

Firstly, and most obviously, the boundaries are much more permeable as providers easily and frequently choose or abandon platforms.

Secondly, sharing economy organisations need to 'encourage users' – in other words, attract both buyers and sellers to the platform in order to create and retain value.

The sharing economy has become a prevalent and innovative economic phenomenon with the boom of the digital economy and acts as a template for an innovative business model in value co-creation (Rong et al., 2021).

We consider three stages of the sharing economy growth, which can be described as follows (Table 1).

Table 1 – Stages of the sharing economy growth

Stage of the sharing economy growth	Description
Community stage	As far as early stage development is concerned, value creation is critical. For example, Airbnb promotes value creation through online communities where user participation and interaction is encouraged.
Scaling stage	As for the growth stage, collaborative economy platforms should attract more and more users and expand their platform network base.
Legitimisation stage	This stage is necessary to keep long-term relationships with the different communities. Recently, some socially irresponsible actions have questioned the legitimacy of the sharing economy.

Source: Rong et al., 2021

We analyse the structure of the sharing economy ecosystem more closely, which will provide insights into the internal and external interconnections of the process.

Based on Uri Bronfenbrenner's ecological systems theory, the ecosystem of the collaborative consumption economy consists of four interconnected subsystems with different interest groups pursuing goals at different levels (see Fig. 2) (Leunga, Xueb & Wena, 2019).

Figure 2 shows an illustrative example on all interconnected subsystems are formed into separate layers.

The first layer is a microsystem. It includes the suppliers and consumers, the actions and interactions between which constitute the core product and/or key experiences of the sharing economy.

The second layer is a mesosystem. It includes the intermediary agent platforms that connect suppliers and consumers using modern technology broadly.

The third layer is an exosystem. It includes partners, competitors, and various levels of government.

The interactions between layers and the mainstream sharing economy ensure maturation and continuous adaptation of the system.

The final layer is the macrosystem. This layer is formed by the world community. On the one hand, the community shapes the cultural values, belief systems and lifestyles in which shared organisms are embedded. On the other hand, it receives many socio-cultural, economic and environmental externalities from the sharing economy.

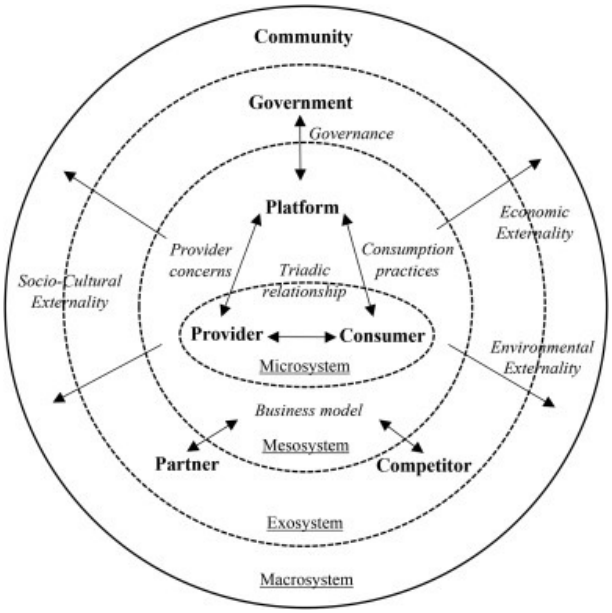

Figure 2. The ecosystem of the sharing economy

Source: Leunga, Xueb & Wena, 2019

There are three stakeholder groups: platform, supplier and consumer, together forming a scale: a symbiotic triadic system based on a mutually beneficial relationship between the three actors. However, the three actors also express different perspectives for their own interests. For example, platforms are profit-driven businesses and are therefore mainly concerned with building and developing their business models. Suppliers form the employment issues when operating on platforms, while consumers are confronted with consumption practices in the sharing economy (Leunga, Xueb & Wena, 2019).

Thus, the efficient state of the sharing economy ecosystem is manifested through the attitude of stakeholder groups. Only if the ecosystem benefits a larger part of the community rather than a smaller part, it is considered the competitive one.

An analysis of the works of foreign, Chinese, and Russian economists allows us to conclude that the sharing economy was influenced by the development of the platform economy, which evolved in several directions, ensuring the rapid development in this sphere.

In the case of the sharing economy operating ecosystem, the following challenges appear on its way (Laamanen et al., 2016):

- the first challenge is the way of the creation "communities" of providers interacting on the platforms.
- The second challenge relates to ensuring the service provided is meeting the customers' expectations. In traditional organisations, managers developed and implemented hiring standards, trained employees and provided monitoring and supervision, including firing ineffective employees, to ensure quality and safety standards are met. Platforms operating in the collaborative consumption economy hardly solve these problems. Platforms "manage" their suppliers through ratings.
- Some studies concern with the validity of ratings in the face of fairly widespread rating fraud, while others report reasonably good correspondence between ratings and traditional measures such as hospital performance.
- Also the business models of many corporations are based on the idea of private ownership of goods. When studying the carsharing market, it is worth paying attention to institutional factors and how they influence some fundamental business decisions.
- There are two models of carsharing: so-called station-based carsharing (people must return the car to the place where they get it up), and free-floating carsharing, (people can make one-way trips and leave the car anywhere as long as it is within the service's operating area). The authors realised that corporate-backed actors preferred the free-floating model because it allowed for faster growth, while smaller and more environmentally focused organisations tended to promote a station-based business model. This particular research shows that institutional structures, by influencing different values, affect the choice of business practices even in a seemingly similar field.
- Another challenge is that many companies of the sharing economy face enormous difficulties in achieving legitimacy and especially in dealing with political organisations which can regulate or tax their business models. For example, local jurisdictions often tax hotel rooms, often at rates higher than sales taxes (because, for the most part, taxes are not paid by local voters), and these cities are concerned that housing rented through Airbnb will not be subject to such taxes.

A failure to adapt the business model to local conditions can lead to loss of community approval, which can reduce the ability of a sharing economy company to obtain the resources and scale needed to operate profitably, low market share and ultimately leave the market.

An important issue for companies operating within the sharing economy remains reaching agreements with local regulators. For some social actors, "undermining" and "modernising outdated rules" is, for others, breaking the law and avoiding regulation. Comparing Airbnb and Uber in three different contexts is a useful step in improving our understanding of how companies operating within the sharing economy harmonise their institutional environments.

The author Xiao Zhou introduces the concept of "platform hegemony". The need for legal innovations, according to the scientist, are the most effective means of counteracting hegemony at present (Zhou, 2021).

Chinese economists provide a rationale for the tasks facing antimonopoly authorities in the field of

improving antimonopoly legislation and increasing the competitiveness of the industry (Li & Gao, 2021). The authors include the creation of conditions for platform companies to operate in a competitive environment in accordance with market rules, and for the government to make timely changes to its antitrust laws to meet market needs. Having identified the main challenges of the sharing ecosystem, it is worth identifying practical competitive strategies for the sharing economy to achieve sustainable development.

1. Relevance to mutual interests.

To make the sharing economy a healthy and sustainable ecosystem, mutual interests and the common good should come before the conflicting interests of individual players. Each player should pursue their own goals without compromising the interests of others. When the majority of players express positive attitudes while reflecting favourable intentions, the sharing economy will be on the right path to a sustainable future.

Platforms, for example, rely on suppliers and consumers to generate revenue and growth. Therefore, platforms should proactively address issues such as trust, privacy, security, employment income and benefits, consumer spending and experience by focusing on their business models. Platforms should also promote the localisation of the sharing economy as a common community interest. In addition, competitors should change their business mindset and strategy to coexist with platforms rather than directly compete with them (Leunga, Xueb & Wena, 2019).

Traditional enterprises can use their strengths such as brand awareness, consistent quality, and security guarantees to differentiate themselves from sharing economy platforms.

Moreover, the government should take into account the interests of all players when drafting rules for the new economy to consider market access requirements, legal liability, consumer protection, and new labour policies.

2. Co-operation for shared success.

The reciprocal nature of the sharing economy makes cooperation between all players possible. It creates a pathway to achieve mutual interests. Current challenges of the sharing economy can only be solved through the co-operation.

For example, platforms, partners, and government need to work together to address employment issues. On the one hand, platforms can offer services and/or training programmes to suppliers, sometimes through partnerships. On the other hand, the government could create new programmes that provide benefits, such as health insurance and pension plans, for suppliers in the sharing economy (Leunga, Xueb & Wena, 2019).

Platforms, providers, and government can also work together to address governance issues. Platforms should take responsibility for collecting sales tax and reporting provider income on personal income. Government should be inclusive and transparent in adopting new regulations.

In terms of a competitive perspective, traditional enterprises could collaborate with platforms to take advantage of new opportunities and become partners in the sharing economy. Through cooperation, different stakeholder groups, although having different individual goals, learn, adapt, and innovate together to form a dynamic and co-evolving ecosystem of the collaborative consumption economy.

3. Committed to a social responsibility.

The stability and sustainability of the sharing economy system is largely determined by the external effects it has on the global community. Only if the business model has a largely positive impact on other parts of the world will its innovative results and breakthrough expectations be welcomed. Therefore, a concerted effort should be made to properly measure, monitor, and manage the externalities of the sharing economy.

Social responsibility is the idea, in accordance with, the businesses should "go beyond their profit-oriented activities and improve the well-being of society by making the world a better place" (Leunga, Xueb & Wena, 2019). By taking social responsibility, interest groups in the sharing economy should act responsibly to achieve positive outcomes, such as efficient use of resources and job creation, and minimise its negative impacts, including housing shortages, racial discrimination, and tax evasion. Interest groups should also build long-term institutions, and develop targeted programmes to improve the system's relationship with society. Eventually, the ecosystem of the sharing economy will become a sustainable system, growing and expanding rapidly. It also helps create a more efficient and sustainable world.

In order to best understand how the sharing economy process is developing in the world, it is better to consider the example of a country where the majority of the population has already experienced the sharing economy. For instance, we can note France. According to this country experience, we can learn how problems were solved at the institutional level.

Based on the secret information obtained by Consumer Science and Analytics (CSA) Research for Cofidis (Compagnie financiére de Distribution; a company offering online credit solutions), 81% of the French have at least once offered a shared service: they have put a used product on sale, offered to rent their car, or their flat. Only 28% do it regularly (Lewkowicz, 2021).

The co-operative economy has been a subject of interest in France for several years, with researchers, associations, and the government writing reports and memos on the phenomenon and the key players in this field. Historically, co-operatives have been of great importance in France and the French co-operative movement is one of the most important in the world.

The practice of collaborative consumption is primarily related to saving money – 87% of the French named it as a reason. Their second motivation is to get money (for 76%). At the third place, by the citizens, is the sense of utility (in 41% of cases, e.g., sharing cars and making their own products) (Lewkowicz, 2021).

The Ministry of Economy provides the following definition: "The sharing economy of collaborative consumption is a modern innovative way of consumption, production, and trade. It colloborate initiatives to lend, rent, donate, barter, or sell goods and services between individuals, for instance, car sharing and equipment sharing between neighbours".

France has passed several laws regarding the taxation of the sharing economy. The 2015 Finance Law gave accommodation platforms the ability to collect a tourist tax. In Paris, Airbnb started collecting this tax on 1 October 2015. The amount is €0.83 per night per traveller. In total, the collection of this tax should generate several million euros for the Paris municipality. In March 2017, the Senate published a report on the taxation of the sharing economy, which includes the following statement: "The automatic collection of tourist tax by platforms is an important step forward: it is a simple and efficient process demonstrating the possibility to modernise tax collection within the digital economy" (author's translation).

The Conseil National du Numérique has published a report. In this report it considers that all stakeholders and activities should be included in the collection of taxes, a prerequisite to guarantee a fair and equal redistribution of wealth.

Therefore, a provision in the Finance Act 2016 suggests the collaborative platforms will inform their members of the amount they must declare to the tax authorities. These platforms will be required to send their members an annual statement of their income. The Finance Act 2015 for 2016 (extracts) contains several articles defining how this should be organised and the National Commercial Court ("Tribunal National de Commerce") made a statement on 28 January 2016 which reinforces the information obligations of platforms relating to digital "tying".

The sharing economy is intensively discussed and analysed in France. It is issued by workers, researchers, practitioners, and policy makers. French MP Pascal Terras summarised them in a report on the sharing economy to the Prime Minister released in February 2016. This report includes nineteen proposals related to the sharing economy to address potential problems associated with platforms and their workers (Lewkowicz, 2021):

1. To ensure the reliability of the terms and conditions in which the various offers are listed.

2. To improve the reliability of online reviews by requiring platforms to report reviews posts have been verified and, if so, specify the terms and conditions.To offer a place to evaluate platforms.

3. To offer the consumer clear, readable, and accessible information about the platform's responsibilities, the quality of the offer and the guarantees associated with its status.

4. To promote the convergence of social protection of independent workers and employees.

5. To mobilize a personal activity account to establish true account portability (from one operating system to another).

6. To take into account periods of activity on platforms as part of the procedure for validating acquired

experience (allowing French employees to validate their diploma if they can demonstrate that they have acquired skills through experience).

7. To define the terms and conditions for severing relationships with providers.

8. To promote secondary security to increase access to housing, provide access to credit and improve social protection for platform workers.

9. To organise training events for suppliers.

10. To ensure platforms contribution into public fees in France.

11. To clarify the doctrine of tax administration with respect to the distinction between income and cost sharing and the doctrine of social administration with respect to the concept of professional.

12. To respond to the challenges of recruiting digital talent in the sharing economy sector.

13. To interact with platforms in the process of automating tax and social procedures.

14. To simplify the entrepreneurial approach by allowing platforms to act as a trusted third party.

15. To take into account the development of the sharing economy within the framework of digital inclusion policies.

16. To establish an observatory of the sharing economy.

17. To promote experimental shared territories.

18. To promote remote working and protect the rights and responsibilities of remote workers.

Thus, the example of the process development under consideration in France suggests the growing realisation among independent workers which collective action is a key to strengthening their position and defending their interests.

The issue of the status of workers in the sharing economy, who are considered "legally independent" but "economically dependent", needs the special attention. This issue is currently one of the main discussed topics in France.

On this subject, the authors have two main points of view. The first is the evolution of the status of the employee to incorporate workers who are legally self-employed but economically dependent on the platform. This would favour the development of more flexible and independent working arrangements. This is realised through the use of technological tools, which would involve extending employment status to the notion of the worker's economic dependence (not just legal subordination). Another line of thought has been to create a status for legally independent but economically dependent workers, based on models implemented in some of our European neighbouring countries. This status aims to grant "special rights in terms of notice of dismissal, training and remuneration to self-employed workers who make up the majority of their turnover with the client" (Lewkowicz, 2021).

Conclusions

To summarise the results of this research, the ecosystem of the sharing economy is still at its early stages of development where the needs and goals of the actors in the inner layers are being met for the first time. The future development of the sharing economy should focus on meeting the goals of the outer layers and more actors to pave the way for a healthy and sustainable ecosystem.

The sharing economy highlights many features and issues studied by management experts: design and choice of a business model, strategies for achieving institutional legitimacy, avoidance of being constrained by government action, as well as making people subscribe to and then provide quality goods and services when those people are neither employees nor even contractors. The sharing economy therefore focuses on a number of important social, organisational and governance issues, and does so in somewhat unique, new contexts. Current firms and platform providers are better positioned to adapt to the changes and should develop and implement strategies to survive in the future. However, it requires a model of an ecosystem work and changing over time. Moreover, platform services are created by co-evolving entities connected by multiple relationships (Xu et al., 2021). Platform managers need to develop relational capabilities and facilitate interactions between actors to ensure a competitive strategic position. In addition, we should not overlook the fact that there is a turbulent competitive ecosystem environment where threats may be of similar (another competing platform)

or different (incumbent) types.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Anastasia V. Glebova – concept, collecting data, project design.
Anna A. Khryseva – project administration, formal analysis, reviewing and editing.

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Analysis of human capital development indicators (case study on the Central Federal District regions)

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Abstract. The paper concerns with the theories and concepts defining the role of a person as a resource, factor, and capital in the modern innovative economy. The authors analyse the indicators of the Sustainable Development Goals, socio-economic development of the Russian Federation necessary for monitoring the achievement of national projects indicators, human development index, and its components in the regions of the Central Federal District in 2018 and 2019. Based on Rosstat data on 2005-2021 for the regions of the Central Federal District, the paper assesses the main indicators of the human capital of the Central Federal District regions: population density, life expectancy, the proportion of people aged 65 and older to the people of the active working age, mortality of the population of the active working age, total fertility rate, infant mortality rate, income and poverty levels of the population, employment rate, the composition of the employed population by age and level of education, for men and women, urban and rural population. The study found that the Central Federal District is ahead of the Russian average in a significant part of the analyzed indicators (except for the average age of the employed population). This refers to the Human Development Index, real monetary income of the population, unemployment rate and a number of other indicators. Within the Central Federal District, Moscow and the Moscow Region are the leaders in terms of the dynamics of human capital development indicator.

Keywords: human capital, economic person, sociological person, sustainable development goals, national project, assessment of the regional human capital, human development index, demographic indicators, employment and income indicators, regions of the Central Federal District.

JEL codes: C82, I32, J11, J31, O18

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Introduction

The transformation of human into a factor of economic growth as a bearer of knowledge, skills, competences, in relation to the increasing role of intellectual resources ("explicit" and "implicit" knowledge), and the importance of a person as an initiator and innovator in the economy has led to the development of various theories related to human capital, a factor of economic growth and socio-economic progress. These are, first of all, the theory of human capital (J. Minser, T. Schultz, G. Becker), the theory of social capital (P. Bourdieu, R. Putnam, J. Jacobs, R. Salisbury, J. Coleman, B. Wellman, S. Wortley). In terms of the resource approach, researchers began to discuss the role of intangible resources, develop the ideas and legislation in the field of intellectual property, and study the national intellectual capital and its components: human, market, technological, and renewable ones (Chub, 2022).

Adam Smith's model of economic man is transformed (in the interpretation of Meckling and K. Brunner is a REMM – Resourceful, Evaluative, Maximizing Man) into a model of an ethical economic man (Berendeeva, 2019), which is complemented by a model of a sociological man (Lindenberg's model is an SRSM – Socialized, Role-playing, Sanctioned Man, which is complemented by an OSAM – Optioned, Sensitive, Acting model).

Nowadays, interdisciplinary studies of human capital are being conducted, for example, the influence

of personality traits on the economic behaviour of individuals (Gimpelson, Zudina & Kapelyushnikov, 2020), the formation of the middle class in Russia (the interface of economics with sociology), etc.

The middle class is considered as a driver of economic growth and ensuring social stability in society. Investments in human capital act as a provider of changes and new standards of consumption (Pishnyak et al., 2020). According to research, in 2018 32% of the population of the Russian Federation could be attributed to the middle class, which is significantly lower than the peak level of 38% at the end of 2015. There is a tendency of reducing the middle class, a change in the "portrait" of the middle class, its economic behaviour (Orlova & Lavrova, 2020).

Russian scientists study various aspects of human capital: the evolution of concepts, the features of human capital of different age categories, for example, pre-retirement age, etc. (Malikova, 2020).

I. Karelin (2022) identifies the following elements of human capital: health capital, competence capital, culture capital, creativity capital, motivation capital, trustworthiness capital, digital competence capital.

By the classification of I. Tomakova, J. Kopteva, and M. Shikyrzh (2022) there are biophysical capital, cultural and educational capital, total labour, and motivational capital, etc.

I. Adova and T. Kaloshina (2022) studies human capital in terms of the sociology of management as a complex and multidimensional category, grouping the factors of human capital into demographic, psychophysiological, competence, socio-cultural, technological, etc. However, many factors influencing the formation of human capital at the meso-level act as indicators of the regional socio-economic development, using both sociological methods and economic assessments.

There is an issue of the capitalization of human resources in modern Russia, determining the reserve of human capital and making long-term forecasts for the development of the country and its territories (Vorontsova et al., 2020).

This research proposes assessment of the human capital of an individual, a commercial enterprise, a region, and a state (Korotovskikh, 2019).

Human capital can be assessed at the macro-, meso-, and micro- levels. There are several approaches to the assessment of human capital: costly, profitable, market ones (Korotovskikh, 2019). At the level of the national and regional economy, the sociological method, the index approach to the assessment of human capital, as well as their combination have recently been developed in domestic publications (Miroshnichenko, 2021), multidimensional statistical methods and correlation analysis (Vorontsova et al., 2020), the index method are used (Podgorskaya & Bakhmatova, 2020).

There are numerous publications on the assessment of the Russian regions human capital. For example, D. Diaghilev and A. Zlokazov (2022) assess the components of the human capital of the Sverdlovsk and Tyumen regions, Perm Krai by 19 indicators, calculate the integral index of the regional human capital based on the assessment of education, healthcare, labour, and socio-cultural capital for each territory.

Indeed, the issues of the role of the human factor in terms of the economic relations transformation are considered by the journal "Theoretical Economics", published by the Yaroslavl State Technical University. For example, E.V. Trifonov dwells on the historical economic laws of human development, finds out their cause-and-effect relationships. According to the system of the historical laws development, he believes in occurring of the harmonious man model after the model of economic man. Also he justifies the consistent appearance of a harmonious, creative, superman, cosmic man, man of higher material and spiritual practices on the arrangement of outer space. The author possesses the high productivity of a harmonious person, higher than the productivity of an economic one, and the development of abilities of each person should become the object of the public primary attention and support; on a large scale it can become "the most powerful factor of development and prosperity of the economy and society" (Trifonov, 2022).

According to O. Brizhak (2021), the intellectual capital or "intellectual power transforms and cognizes modern ecosystems, generates qualitatively new ideas meeting the challenges of the new economic reality and, based on such ideas, creates effective capital combinations." The author actualizes the ides of involving intellectual capital into the national economy development in modern conditions of deep technological transformations, and considers the role of the creative sector and creative industries in it.

S. Shkiotov (2022) examines the amount of regional budget expenditures on the information and communication technologies development, and their effectiveness in 85 subjects of the Russian Federation.

However, highlighting aspects of creative work and creative personality, scientists research the negative aspects of the digitalization impact digitalization on a person. As M. Kovalchuk (2022) notes, "a person harmonious live in two planes of worldview (real and virtual); it causes a transformation of his or her consciousness, personality characteristics and his or her social identity". The dangerous consequences of digitalization of life are noted, when for young people the virtual world replaces the real one, and the network environment affects the personality and morality of young people, and one of the human addictions appears – digital, computer and, as a consequence, "digital degradation". The author considers the creation of the competencies which allow us to use digital information without harm to one's health (first of all, mental one), critically evaluate it, etc. (Kovalchuk, 2022).

L. Batrakova (2021) notes the relevance of the scientific research in the field of human capital formation in the innovative economy. Human capital is currently becoming a determining factor in the creation of new modern technologies, production facilities, the development of high-tech products, implementation of the concept of the digital economy as a whole.

A. Akaev and V. Sadovnichy (2021) believe that "in the digital age, the majority of cognitive work will be retained by the human factor, since these works, as a rule, can be fragmented into non-programmable tasks (50-75%) requiring creative human labour to solve them, and routine programmable tasks which can be performed by intelligent machines (IM)".

The purpose of the study is to correlate indicators of the state and development of human capital in indicators of Sustainable Development Goals, indicators of socio-economic development of the Russian Federation necessary for monitoring the achievement of indicators of national projects. Also we analyse the dynamics of the human development index and its components in the regions of the Central Federal District. Moreover, based on Rosstat data, we analyse the main indicators of the human capital of the Central Federal District regions in terms of the demography, employment, and income of the population.

Methods

The object of the study was the regions of the Central Federal District (CFD). The subject of the study includes the indicators related to the formation and development of human capital in the regions of the Central Federal District.

The study period is 2005-2021; according to the human development index – 2018 and 2019.

Research methods are as follows: system and institutional approaches, comparative analysis of Rosstat data in dynamics and by region.

Results

The target public indicators for maintaining and developing the country's human capital are determined, firstly, by the Sustainable Development Goals until 2030, approved by the UN General Assembly in 2017, and adjusted in 2020-2022, and, secondly, by the indicators of socio-economic development of the Russian Federation necessary for monitoring the achievement of the national projects indicators.

Achieving the Sustainable Development Goals provides for the implementation of 17 goals and 169 tasks to poverty elimination, the planet's resources conservation and general well-being ensuring (Russian Statistical Yearbook, 2022).

Goal 1. End poverty in all its forms everywhere (2 indicators).

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture (4 indicators).

Goal 3. Ensure healthy lives and promote well-being for all at all ages (17 indicators).

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (1 indicator).

Goal 5. Achieve gender equality and empower all women and girls (5 indicators).

Goal 6. Ensure availability and sustainable management of water and sanitation for all (2 indicators).

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all (2 indicators).

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (8 indicators).

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (5 indicators).

Goal 10. Reduce inequality within and among countries (2 indicators).

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable (1 indicator).

Goal 12. Ensure sustainable consumption and production patterns (1 indicator).

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (1 indicator).

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels (2 indicators).

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development (2 indicators).

The following indicators, reflecting the development of human capital and its contribution to improving the efficiency of economic development, in our opinion, are (see Table 1).

Table 1 – Indicators of the Sustainable Development Goals reflecting the characteristics of human capital, 2017-2021

Period	2017	2018	2019	2020	2021
4.4.1. Proportion of youth (adults) with information and communications technology skills, %.					
At the age of 15-24 years	94.1	94.2	92.9	92.2	93.3
At the age of 15-74 years	75.5	77.3	75.5	75.4	77.5
8.3.1. Proportion of informal employment in the non-agricultural sector, %*	16.7	16.9	17.4	16.9	17.4
8.5.2. Unemployment rate, %*	5.2	4.8	4.6	5.8	4.8
8.6.1. Proportion of youth (aged 15 to 24) not studying, working or acquiring vocational skills,%*	10.5	10.2	10.6	10.9	10.2
8.7.1. Proportion of children aged 5 to 17 engaged in child labour, %**		0.4		0.4	
8.8.1. Industrial injuries, including deaths, per 100,000 employees	126.3	118.6	116.9	101.7	108.2
Including deaths	5.64	5.39	5.28	4.52	6.03
9.2.2. Employment in the manufacturing sector, % of total employment	14.2	14.1	14.3	14.2	14.2
9.5.1.Expenditure on R&D, % of GDP	1.11	1.0	1.04	1.1	1.0
9.5.2. Researchers (full-time equivalents) per million population	2, 795,6	2, 764,5	2, 730,3	2, 718,7	2, 674,0

**these indicators are presented by sex (men, women) and the unemployment rate by men, women, disabled persons*

***formation of the indicator one time every 2 years based on the results of the Comprehensive Observation of Living Conditions of the Population*

Source: Russian Statistical Yearbook, 2022

The indicators of socio-economic development of the Russian Federation necessary for monitoring the indicators of national projects achievement include indicators characterizing demography and health care development, living conditions of people (housing and urban environment), the development of small and

medium-sized businesses, and support for individual entrepreneurial initiative, science and digital economy (see Table 2).

Table 2 – Indicators of socio-economic development of the Russian Federation necessary for monitoring the achievement of indicators of national projects

Name of the national project	Indicators of the national projects
Demographics	Life expectancy of citizens aged 55 years, years. Mortality rate of population above working age (women over 55, men over 60 years), deaths per 100,000 of the corresponding age people.
Healthcare	Mortality of the working–age population (women aged 16-54 years, men aged 16-59 years), deaths per 100,000 people of the corresponding age.
Housing and urban environment	The volume of housing construction, mln m2 of the total area of residential premises. Housing completion in multi-apartment residential buildings, mln m2 of total floor area of residential premises. The average cost of 1 m2 of model housing in the primary market, thousand RUB.
Science	The share of researchers under the age of 39 in the total number of Russian researchers, %. The ratio of the growth rate of domestic R&D costs of all sources to the growth rate of GDP. Internal R&D costs of all sources (at current prices), bn RUB.
Digital Economy of the Russian Federation	The share of households with broadband access to the Internet information and telecommunications network, %. The cost share of domestic software purchased and (or) leased by federal executive authorities, executive authorities of the subjects of the Russian Federation and other state authorities, %. The cost share of domestic software purchased and (or) leased by state corporations, companies with public operation, %.
Small and medium-sized entrepreneurship and support for individual entrepreneurial initiative	The share of small and medium-sized enterprises in the GDP 9 in current prices), %.

Source: Russian Statistical Yearbook, 2022

Many of the above-mentioned indicators of the Sustainable Development Goals and socio-economic Development of the Russian Federation necessary for monitoring the national projects indicators achievement relate to the living standards indicators.

Nowadays, researches of the living standards indicators are still relevant (Berendeeva & Ledyakina, 2021), and reflect the characteristics of human capital.

For instance, V. Stepanov, V. Bobkov, E. Shamaeva, and E. Odintsova (2022) propose an integral indicator of the living standards (derived on the basis of the socio-economic indicators), which is considered as an important criterion indicator of the effectiveness of regional socio-economic policy. They consider a model linking the indicator of the living standards with a set of indicators of socio-economic policy in the regions of Russia. They also identify a set of indicators related to the implementation of regional socio-economic policy (indices of human potential, innovation, infrastructure, information society, etc.).

Decree of the President of the Russian Federation No. 68 of February 4, 2021 identifies 20 indicators for assessing the effectiveness of the activities of senior officials (prominent public officials) and the activities

of executive authorities of the subjects of the Russian Federation. However, most of them are indicators characterizing the living standards, the quality of human capital:

– trust in the authorities (which is determined by assessing public opinion regarding the achievement of the national development goals of the Russian Federation in the subjects of the Russian Federation);
– population of the subject of the Russian Federation;
– life expectancy at birth;
– the number of people employed in the small and medium-sized businesses, including individual entrepreneurs and self-employed;
– growth rate (growth index) of real average monthly wages;
– the growth rate (growth index) of the real per capita money incomes;
– poverty level;
– housing quantity;
– number of families improved the housing conditions;
– the proportion of citizens who are systematically engaged in physical training and sports;
– effectiveness of the system of identification, advancement and support of talented children and youth;
– conditions for the training of a socially responsible and balanced personality;
– number of cultural events attended;
– the proportion of citizens engaged in voluntary (volunteer) activities;
– education level;
– quality of the urban environment;
– environmental quality;
– others.

The Human Development Index (HDI) acts as an integral indicator of human capital development in both world and Russian practice. At the end of 2019, the HDI in Russia was 0.824; the country ranked 52nd in the world in terms of the living standards. According to the data of the Analytical Center under the Government of the Russian Federation for 2019, Moscow city occupies a leading position in the HDI rating by regions; at the same time, a high gap remains in our country between the subjects of the Russian Federation with the highest and least level of human development – in 2019 the difference was 19.4% . 1st place among the federal districts in Russia occupies the Ural, 2nd – Central, 3rd – Northwestern, 4th – Volga, 5th – Siberian, 6th – Southern, 7th – Far Eastern, 8th – North Caucasian one.

The regions of the Central Federal District are divided into types: highly developed – financial and economic centers (Moscow city and the Moscow region), developed – based on manufacturing (Lipetsk and Yaroslavl regions) or mining industry (Belgorod region), medium-developed – industrial and agricultural (Vladimir, Ivanovo, Kaluga, Kostroma, Ryazan, Smolensk, Tver, and Tula regions), and agricultural and industrial (Bryansk, Voronezh, Kursk, Oryol, Tambov regions). There are no less developed (according to the classification of the Analytical Center under the Government of the Russian Federation) in the Central Federal District.

Our analysis according to the data for 2019 showed the highest HDI are in Moscow city (0.94), Belgorod region (0.882), Moscow region (0.866), respectively; the lowest ones are in Ivanovo (0.812), Tver (0.833), Bryansk and Kostroma regions (0.83), respectively. The analysis of the HDI components showed the following:

– Moscow city is the leader by all HDI components;
– the income index is the highest one (more than 0.8) in the Belgorod, Voronezh, Kaluga, Kursk, Lipetsk, Moscow, Tula, Yaroslavl regions, and in Moscow city;
– the longevity index is the highest one (more than 0.8) in the Belgorod, Voronezh, Lipetsk, Moscow, Ryazan, Tambov regions, and in Moscow city;
– The education index in the regions is quite high – about 0.94 and higher; the maximum values are in Moscow city (0.997), Oryol region (0.979), more than 0.96 – in Belgorod, Voronezh, Kaluga, Kursk, Ryazan, and Yaroslavl regions (see Table 3).

Table 3 – HDI rating of the regions of the Central Federal District in 2019

	GDP per capita, (in purchasing-power adjusted dollars)	Income index	Life expectancy, years	Longevity Index	Education Index	HDI (2019)	Rank in Russia (2019)	HDI (2018)	Rank in Russia (2018)
The Russian Federation	29,189	0.857	73.3	0.806	0.952	0.870			
Central Federal District	32,727	0.875	74.5	0.826	0.965	0.887	2	0.883	2
Belgorod region	31,759	0.870	74.2	0.820	0.960	0.882	10	0.877	10
Bryansk region	16,178	0.768	72.3	0.789	0.943	0.830	66	0.822	68
Vladimir region	18,192	0.786	71.9	0.781	0.947	0.835	58	0.825	64
Voronezh region	20,793	0.806	73.6	0.811	0.969	0.859	23	0.853	24
Ivanovo region	11,930	0.722	71.8	0.781	0.948	0.812	77	0.805	78
Kaluga region	24,755	0.833	72.4	0.789	0.960	0.858	25	0.851	27
Kostroma region	16,407	0.77	72.4	0.789	0.939	0.830	65	0.826	63
Kursk region	22,966	0.821	72.3	0.788	0.968	0.856	26	0.851	28
Lipetsk region	26,236	0.841	73.3	0.806	0.946	0.862	19	0.861	17
Moscow region	27,585	0.849	73.9	0.814	0.941	0.866	15	0.860	18
Oryol region	18,873	0.792	72.6	0.793	0.979	0.850	35	0.841	43
Ryazan region	18,945	0.792	73.2	0.803	0.960	0.849	39	0.844	37
Smolensk region	17,739	0.782	71.9	0.782	0.949	0.834	59	0.826	62
Tambov region	18,129	0.786	73.6	0.809	0.954	0.846	42	0.842	41
Tver region	18,383	0.788	71.2	0.771	0.951	0.833	60	0.827	60
Tula region	21,704	0.813	72.2	0.787	0.959	0.849	37	0.845	36
Yaroslavl region	22,820	0.820	72.9	0.799	0.964	0.858	24	0.852	26
Moscow	49,043	0.936	78.4	0.889	0.997	0.940	1	0.936	1

Source: Human Development Index in Russia: Regional differences (December 2021)

Researchers assess the quality of human capital in accordance with the following: education, health, and the external environment. Human health and education, including advanced training, obtaining new knowledge, developing new skills and competencies play an important role in the formation of human capital. It is especially important for the formation of human capital in the conditions of digital economy. The researchers use a different number of indicators for assessing human capital. For instance, among them are: 45 statistical indicators (demographic, labour, research, and socio-cultural) (Gurban & Myzin, 2012); 146 indicators of statistical and sociological assessment[1]; integral indicators (Vorontsova et al., 2020); an integral assessment of the level of human capital development by structural elements (Novikova, Oleksiuk & Novikov,

[1] *Index of human capital development in the Far East // Agency for the Development of Human Capital in the Far East of Russia [Electronic resource]. Available at: https://index.hcfe. ru/about/ (accessed 10.01/2023)*

2020). The use of these methods allows us to identify regions with high, medium, and low efficiency of human capital, and propose measures to reduce this type of regional differentiation (Karelin, 2022).

The average productivity of human capital is calculated as the ratio of the GDP per employee to the indicator of human capital and regional differentiation of the human capital efficiency (Karelin, 2022).

The most popular are: a) the methodology by N. Shepeleva and A. Akulov (2016), which was supplemented by I. Karelin (2022) who introduced the capital component of population digital competencies; b) the methodology proposed by O. Zabelina, T. Kozlova and A. Romanyuk (2013) (see Table 4).

Table 4 – Indicators for assessing the human capital of the territory (according to the Russian researchers)

Name of the national project	Indicators of the national projects
I.N. Karelin (2022)	Elements of human capital: 1) health capital (indicators: life expectancy at birth, years); 2) competence capital (average duration of education of the economically active population, years); 3) capital of culture (the number of theater spectators and the number of museum visits per 1,000 people, people); 4) capital of creativity (the number of personnel engaged in R&D, per 100 thousand people, people.); 5) motivation capital (employment rate, %); 6) reliability capital (the number of registered crimes per 100 thousand people, units); 7) digital competence capital (digital quality index of the population).
I.A. Tomakova, J.Yu. Kopteva, M. Shikyrzh (2022)	Elements of human capital: 1) biophysical capital (birth rate, population structure by working age, share of investments in healthcare, etc.); 2) cultural and educational capital (the total area of residential premises per inhabitant on average, the share of managers and specialists with specialized higher education, provision of preschool educational organizations, the number of students of colleges and universities per 1000 people, the share of investments in education, the number of employees engaged in scientific research, etc.); 3) total labour and motivational capital (the level of average monthly wages, the unemployment rate, investments in fixed assets, the region's need for personnel, the share of the organizations' payroll in total costs, in revenue, etc.).
O. Zabelina, T. Kozlova and A. Romanyuk (2013)	Indicators: – the number of students of higher educational institutions per 10 thousand people; – the number of personnel engaged in scientific research and development, per 10 thousand people employed in the economy; – the share of expenditures of the consolidated budget of the region on education, physical training, health care, social policy to GRP; – investments in education, healthcare, social services, and other social and personal services to the total volume of investments in fixed assets; – the level of population economic activity; – the population unemployment rate; – employment with higher education to population ratio;

Name of the national project	Indicators of the national projects
	– the share of innovative goods (works, services) in the total volume of shipped goods (works, services); – life expectancy at birth; – morbidity rate per 1000 people population; – the number of theater spectators per 1000 people population; – the number of visits to museums per 1000 people population – the number of registered crimes per 100 thousand people population; – percentage of persons (households) with Internet access; – sale of alcoholic beverages in total per capita.
L.A. Novikova, N.V. Oleksiuk, N.A. Novikov (2020)	Indicators (indexes): – index of life expectancy of the population (the ratio of average life expectancy to the maximum achieved); – education index (the ratio of the number of students to the total number of young people from 15 to 30 years old); – income index (the ratio of the number of population groups receiving benefits to the number of population groups receiving average incomes); – health index (the ratio of the amount of health care costs of 10 % of the inactive part of the population to the amount of costs of 10% of the richest).
T.A. Miroshnichenko (2021)	Indicators: employment, salary, children with preschool education; available social area per person; share of the working age population; life expectancy; share of private enterprises in the total number of operating enterprises.

Source: composed by authors

However, researchers assessing the indicators of the formation and development of human capital propose to improve the methodological base: for example, to conduct panel surveys of households, representative annual surveys to study various aspects of the well-being of the population, to use objective and subjective indicators, etc. (Vorontsova et al., 2020).

We consider the main indicators of the Central Federal District regions human capital by units: demography, employment, personal income.

In 2005-2021, with a small increase in the population of the Central Federal District (by 1 mln people), a noticeable increase in the population was observed in Moscow city (by 1.7 mln people, 15.7%) and in the Moscow region (by about 1 mln people, 14.5%).

Recently, there was a depopulation in the Central Federal District as a whole, and in all regions with excluding only the Moscow region (see Table 5).

Table 5 – Population dynamics of the Central Federal District regions

	Population (year-end estimate; thousand people)				Population change (annual growth; as a percentage)	
	2005	2010	2020	2021	2020	2021
Central Federal District	38,109	38,445	39,251	39,104	-0.5	-0.4
Belgorod region	1,512	1,532	1,541	1,532	-0.5	-0.6

	Population (year-end estimate; thousand people)				Population change (annual growth; as a percentage)	
	2005	2010	2020	2021	2020	2021
Bryansk region	1,327	1,275	1,183	1,169	-0.8	-1.2
Vladimir region	1,486	1,441	1,342	1,324	-1.2	-1.4
Voronezh region	2,361	2,335	2,306	2,287	-0.8	-0.8
Ivanovo region	1,102	1,060	987	977	-1.0	-1.0
Kaluga region	1,023	1,009	1,001	1,013	-0.2	1.2
Kostroma region	700	666	628	621	-0.8	-1.2
Kursk region	1,178	1,126	1,097	1,083	-0.7	-1.2
Lipetsk region	1,194	1,172	1,128	1,114	-1.0	-1.3
Moscow region	6,784	7,106	7,708	7,769	0.2	0.8
Oryol region	822	786	725	714	-1.2	-1.5
Ryazan region	1,189	1,152	1,098	1,085	-1.0	-1.2
Smolensk region	1,025	983	921	910	-1.5	-1.2
Tambov region	1,139	1,090	995	981	-1.2	-1.4
Tver region	1,415	1,350	1,246	1,230	-1.2	-1.3
Tula region	1,615	1,550	1,449	1,433	-1.2	-1.2
Yaroslavl region	1,313	1,271	1,241	1,227	-1.0	-1.1
Moscow	10,924	11,541	12,655	12,635	-0.2	-0.2

Source: Regions of Russia. Socio-economic indicators, 2022

The analysis of life expectancy of the population in 2021 in the subjects of the CFD demonstrated significant regional differences by this indicator. In most regions it is 68-69 years. In other subjects it is 70 years and higher: Moscow city (74.55), Belgorod (70.67), and Moscow regions (70.35) (Regions of Russia. Socio-economic indicators, 2022). The indicator of life expectancy is influenced by the population age structure. In the regions of the Central Federal District, the proportion of people over the working age is 26.1% (2021). The difference by this indicator is 6.7%. For instance, in the Moscow region it is 22.7%, in the Tambov region – 29.4%, in Ryazan region it is 28.4%, and Tula region it is 28.8%. In most regions of the Central Federal District this indicator is in the range of 26.2-27.9% (Regions of Russia. Socio-economic indicators, 2022).

According to Rosstat data on 2005-2015, the mortality rate of the working-age population in the regions of the Central Federal District decreased by 1.6 times. In 2015-2021 it increased by 1.2 times which is a negative trend. In 2005-2021, the infant mortality rate in the Central Federal District regions decreased by 2.5 times, and the total fertility rate increased by 1.23 times which is a positive trend.

The analysis of the indicators of population fertility and mortality by subjects of the Central Federal District in 2021 showed the following:

– the total fertility rate in most subjects of the Central Federal District fluctuates in the range of 1.2-1.4 (the maximum value is in Moscow city – 1.597 and in the Moscow region it is 1.460, the minimum value is in the Smolensk region – 1.130), which indicates a narrowed replacement of these regions population (the limit of population replacement is 2.1);

– the greatest differences in the mortality rate of the working-age population (by 1.9 times): from 423.2 – in Moscow city to 807.5 – in the Tver region. By this indicator, the excess of the average value for the Central Federal District (586.9) is in the Bryansk, Vladimir, Ivanovo, Kostroma, Kursk, Lipetsk, Ryazan, Smolensk, Tula, Yaroslavl regions (more than 700). Below the average value for the Central Federal District are those in the Belgorod (556.3), and Moscow (579.4) regions;

– significant differences in the infant mortality rate (2.2 times): the minimum value is in the Bryansk

region (3.0), the maximum is in the Vladimir and Orel regions (6.7) (see Table 6).

Table 6 – Indicators of the population fertility and mortality of the subjects of the Central Federal District in 2021

	Total fertility rate*	Mortality of the working-age population**	Infant mortality rates ***	
			Infant mortality rates	Rank in the Russian Federation 2021
Central Federal District	1.422	586.9	4.0	
Belgorod region	1.267	556.3	4.4	42
Bryansk region	1.280	747.6	3.0	4
Vladimir region	1.277	758.7	6.7	81
Voronezh region	1.287	657.4	4.5	43
Ivanovo region	1.261	706.4	3.2	6
Kaluga region	1.440	698.1	3.5	9
Kostroma region	1.383	720.9	3.8	23
Kursk region	1.341	708.0	3.7	19
Lipetsk region	1.340	735.7	3.7	16
Moscow region	1.460	579.4	3.7	21
Oryol region	1.221	688.0	6.7	80
Ryazan region	1.236	714.6	5.6	71
Smolensk region	1.130	763.2	6.3	78
Tambov region	1.284	666.2	3.4	8
Tver region	1.311	807.5	4.7	48
Tula region	1.224	723.9	5.8	73
Yaroslavl region	1.356	701.9	3.7	15
Moscow	1.597	423.2	3.6	12

**number of children per 1 woman*
***the number of deaths per 100,000 people of the appropriate age*
****the number of children died under the age of 1 year, per 1,000 live births*
Source: Regions of Russia. Socio-economic indicators, 2022

The analysis of population employment by the subjects of the Central Federal District in 2021 revealed the following:

– the employment rate in the regions for 2019-2021 has changed insignificantly: more than 1 % increased only in Ivanovo (+1.6 %), Kaluga (+1.3 %), Yaroslavl (+1.2 %) regions. The highest employment rate is in Moscow city – 67.2% (2019) and 66.2% (2021). The lowest employment rate in 2021 among the regions of the Central Federal District was in the Ryazan region (53.1%), Oryol (53.8%), 60% or more – in Belgorod (61%), Kaluga (62%), Lipetsk (62%), Moscow (62.8%), Tula (60.7%) regions;

– The average age of the employed population in the Central Federal District is 42.7 years which is higher than for Russia as a whole – 41.8 years. The maximum indicator is in Moscow city (43.2 years). Among the other regions of the Central Federal District, fluctuations in this indicator are insignificant: from 41.5 (Smolensk region) to 42.9 (Tambov, Tula regions);

– more than 85% of the employed population in the Central Federal District has higher (40.6%) and secondary specialized education (44.5%). The highest proportion of employees with higher education is in Moscow city (51.8%), the Moscow region (42.5%). In other regions, the share of employed with higher education is in the range of 27-30% – in Bryansk, Vladimir, Ivanovo, Kostroma, Tambov, Tver, Yaroslavl

regions (minimum – 27.2%); in the range of 30-35% – in Belgorod, Voronezh, Kaluga, Kursk, Lipetsk, Oryol, Ryazan, Smolensk, Tula regions (maximum – 35.2%);

– the highest proportion of employed with secondary specialized education is in the Kostroma region (54.3%); in the Kursk, Lipetsk, Ryazan, Tambov, Tver, Yaroslavl regions this indicator is higher than 50%. The lowest values are in Voronezh (38.4%), Moscow Region (41.1%), and Moscow city (41%);

– high employment with secondary general education (more than 20%) in Bryansk, Voronezh (the maximum value is 23.5%), Ivanovo regions; the minimum value is in Moscow city (5.6%);

– employed with basic general education (grades 9 of school) is 1.5% (Moscow city); 5.6% (Ryazan region) (see Table 7);

– the employment rate of the urban population in 2021 is 63.2%. The highest employment rates of the urban population are in Moscow city (66.2%) and the Moscow region (64%). Among other regions of the Central Federal District, the highest employment of the urban population is in Kaluga (63.4%), Belgorod (63.2%), and Lipetsk (62%) regions. The employment of the urban population is minimal, in the range of 55-59% is in the Bryansk, Kostroma, Oryol, Ryazan (the minimum value is 55.5%), Smolensk, Tambov regions, in other regions – in the range of 60-65%;

– The employment rate of the rural population is 54.5% and varies by region from 47.1% (Ryazan region) to 57.6% (Kaluga region). Among other regions of the Central Federal District, the highest employment of rural population is in the Moscow region (57.5%), medium (56-57%) is in Belgorod, Vladimir, Ivanovo, Lipetsk, Smolensk, Tula regions; low (about 50%) is in Voronezh, Kostroma, Oryol regions;

– the unemployment rate (according to sample surveys of the population) in the regions of the Central Federal District is 3.5%, which is lower than the average for Russia – 4.8%; the minimum unemployment is in Moscow city (2.6%), in other regions of the Central Federal District it ranges from 3.4% (Bryansk, Moscow regions) to 5.9% (Yaroslavl region). The unemployed are 79.2% urban and 20.8 % rural, 48.9% male and 51.1% female. The highest unemployment is in the age group of 30-39 years, followed by the age of 20-29, and 50-59. The total number of the unemployed is dominated by persons with secondary specialized (41.6%), and higher education (28.5%). The registered unemployment rate (0.6%) is almost 6 times lower than the general one (3.5%) (Regions of Russia. Socio-economic indicators, 2022).

The characteristics of employment of the region's population are primarily influenced by the sectoral structure of the economy:

– a high proportion of people employed in manufacturing industries (over 20% of the total number of people employed) – in Vladimir (the maximum value is 24.3%), Ivanovo (21.3%), Kaluga (23.3%), Kostroma (21.3%), Tula (22.3%), Yaroslavl (20.6%) regions. The minimum values are in Moscow city (9%), Kursk (13.4%), and Voronezh (13.7%) regions;

– a high proportion of people employed in agriculture, forestry, hunting, fishing and fish farming in the Tambov region (21.1% of the total number of employed), 10-12.5% – in the Belgorod, Voronezh, Kursk, Lipetsk regions, less than 5% – in the Vladimir, Ivanovo, Kaluga, Moscow, Smolensk regions;

– a high proportion in the employment of wholesale and retail trade; repair of motor vehicles and motorcycles (over 20% of the total number of employed) is in the Voronezh, Ivanovo, Moscow regions and Moscow city (Regions of Russia. Socio-economic indicators, 2022).

Employment of the population is closely related to migration of the population (primarily intraregional and interregional) Our study showed that residents of Moscow, Moscow, Vladimir, Kaluga, Tver, Tula regions are much more actively involved in interregional migration than in intraregional ones. The regions located around the Moscow agglomeration compete for attracting investments, skilled labour, and talented youth; there is a migration outflow of the most qualified personnel to the Moscow agglomeration. At the same time, there is a reverse trend associated with an increase in the pace of withdrawal of production and office functions from Moscow to neighbouring regions, with the arrival of investors, with the strengthening of interregional ties for the supply of food and light industry products, with the migration of Muscovites and residents of the Moscow region to country houses, cottages, etc. (Berendeeva & Berendeeva, 2022).

Table 7 – Composition of the employed population by level of education

	Employed - total	Including have an education						
		higher	secondary specialized – total	from it		average general	basic general	do not have a basic general
				on the programs of training middle-ranking specialists	on the training programs for qualified workers and employees 1)			
Central Federal District	100	40.6	44.5	27.5	17.0	12.2	2.5	0.1
Belgorod region	100	33.7	49.8	24.6	25.2	14.7	1.6	0.2
Bryansk region	100	28.7	49.2	28.0	21.2	20.0	2.0	0.1
Vladimir region	100	28.6	48.1	24.8	23.3	19.4	3.8	0.2
Voronezh region	100	35.2	38.4	26.9	11.5	23.5	2.9	0.1
Ivanovo region	100	28.0	46.8	22.7	24.1	21.0	4.0	0.2
Kaluga region	100	30.6	47.3	27.7	19.6	19.3	2.7	0.1
Kostroma region	100	27.6	54.3	36.5	17.8	12.1	5.5	0.4
Kursk region	100	34.7	52.0	26.4	25.6	10.4	2.8	0.2
Lipetsk region	100	30.3	52.8	31.6	21.1	14.9	1.8	0.2
Moscow region	100	42.5	41.1	27.5	13.6	14.3	2.0	0.0
Oryol region	100	34.8	46.4	23.2	23.2	14.8	4.0	…
Ryazan region	100	34.0	50.4	30.0	20.5	9.5	5.6	0.5
Smolensk region	100	30.7	49.4	29.3	20.1	14.1	5.4	0.3
Tambov region	100	29.1	53.0	31.7	21.3	13.8	3.5	0.6
Tver region	100	27.2	53.7	30.1	23.6	13.7	5.1	0.3

	Employed - total	Including have an education						
		higher	secondary specialized – total	from it		average general	basic general	do not have a basic general
				on the programs of training middle-ranking specialists	on the training programs for qualified workers and employees 1)			
Tula region	100	32.9	48.1	29.8	18.3	16.3	2.6	0.2
Yaroslavl region	100	29.8	51.5	22.8	28.7	13.8	4.6	0.2
Moscow	100	51.8	41.0	27.5	13.5	5.6	1.5	0.1

1) Including initial professional education
Source: Regions of Russia. Socio-economic indicators, 2022

The factors correlating with the coefficient of migration growth in the studied regions are as follows: the proportion of the population of working age, the unemployment rate according to sample surveys of the population, the average monthly nominal accrued wages of employees of organizations, consolidated budget expenditures per capita, gross regional product per capita, production index (by manufacturing industries), etc. (Kareev & Berendeeva, 2022).

The analysis of income indicators of the population by subjects of the Central Federal District in 2019-2021 showed the following:

– the situation with real monetary incomes in the Central Federal District regions is better than in Russia as a whole. But in the last 3 years, real incomes of the population have been declining, especially in 2020, when there was an epidemic of Covid-19. In 2019 the decline in real incomes of the population was typical for 6 regions (Ivanovo, Orel, Ryazan, Tambov, Tula, Yaroslavl regions), in 2020 – for all regions (except Moscow), in 2021 – only for the Lipetsk and Tambov regions. The largest increase in the indicator in 2021. It was observed in Moscow city (107.6%) and the Moscow region (106.4%) (see Table 8);

– the real accrued wages of employees of organizations in 2019-2021 in all regions of the Central Federal District grew: in general, in the Central Federal District – 106,2% (2019), 104,2% (2020), 105,6% (2021). Moscow city always has the maximum indices for the growth of real incomes and wages in the Central Federal District. In 2021, the growth of real wages in Moscow city amounted to 106.8%, while in the regions of the Central Federal District the indicator was 102% or less in 3 regions (Lipetsk, Tula, Yaroslavl), more than 102 to 103.8% – in 7 regions (Voronezh, Ivanovo, Kaluga, Moscow, Ryazan, Smolensk, Tambov), 104% and higher – in 7 regions (Belgorod, Bryansk, Vladimir, Kostroma, Kursk, Orel, Tver) and Moscow city;

– the ratio of the average monthly accrued wages of employees of organizations with the subsistence minimum (as a percentage) in 2021 in Russia as a whole was 236%. The maximum values in the Central Federal District in 2021 were in Moscow city (547.7%) and the Moscow region (427.3%), the minimum (less than 300%) – in the Ivanovo (277%), Kostroma (293.3%) and Bryansk (294.4%) regions;

– the share of the population with monetary incomes below the subsistence minimum/poverty line in Russia in these years decreased from 12.3% (2019) to 11.0% (2021). In 2021, the minimum values of the indicator were in Moscow city (5.5%) and the Moscow region (6%), the maximum – in the regions: Smolensk (14.3%), Bryansk (13.0%), Ivanovo (12.9%). Relatively low values of the indicator were in: Belgorod (7.0%), Voronezh (7.9%), Kaluga (8.9%), Kursk (9.1%), Lipetsk (8.1%), Tula (9.7%), Yaroslavl (8.9%) regions (Regions of Russia. Socio-economic indicators, 2022).

Table 8 – Dynamics of income and the level of poverty of the subjects of the Central Federal District in 2019-2021

	Real monetary incomes of the population (as a percentage of the previous year)			The number of people with monetary incomes below the subsistence minimum/ poverty line (as a percentage of the total population of the subject)			The ratio of the average monthly accrued wages of employees of organizations with the value of the subsistence minimum, percent
	2019	2020	2021	2019	2020	2021	2021
The Russian Federation	101.9	98.6	103.8	12.3	12.1	11.0	236
Central Federal District	103.0	98.7	105.2				
Belgorod region	100.7	98.1	100.7	7.8	7.2	7.0	392.8
Bryansk region	100.4	96.2	102.1	13.8	13.6	13.0	294.4
Vladimir region	102.0	98.0	101.1	12.6	12.5	11.8	327.3
Voronezh region	101.1	95.5	100.2	8.9	8.5	7.9	386.8
Ivanovo region	99.5	97.2	100.1	14.2	13.7	12.9	277.0
Kaluga region	102.7	99.5	100.5	10.2	9.7	8.9	391.1
Kostroma region	101.0	97.2	102.2	12.6	12.5	11.8	293.3
Kursk region	100.9	97.8	101.0	9.9	9.9	9.1	359.6
Lipetsk region	102.6	95.7	98.9	8.6	8.4	8.1	374.1
Moscow region	102.7	97.7	106.4	7.3	6.8	6.0	427.3
Oryol region	99.6	98.6	101.6	13.6	12.9	12.1	311.4
Ryazan region	99.9	97.2	102.6	12.7	12.8	12.4	349.0
Smolensk region	100.4	98.3	100.5	16.3	15.6	14.3	303.4
Tambov region	98.1	94.3	99.1	10.7	10.8	10.5	313.0
Tver region	103.2	97.4	101.6	11.7	11.4	10.8	331.7
Tula region	99.9	98.2	100.6	10.3	10.1	9.7	375.2
Yaroslavl region	99.5	98.3	103.9	10.3	9.9	8.9	350.7
Moscow	104.6	100.2	107.6	6.4	6.0	5.5	547.7

Source: Regions of Russia. Socio-economic indicators, 2022

Further analysis of the human capital characteristics by the subjects of the Russian Federation implies a comparison of indicators on financing education, healthcare, other social sectors, indicators of the development of science and innovation, etc.

Conclusions

Our analysis showed that according to the data for 2019, the highest human development index (HDI) is in Moscow and Belgorod regions and in Moscow city; the lowest one is in the Ivanovo, Tver, Bryansk, and Kostroma regions. The analysis of the components of HDI showed the following:

– Moscow city is the leader by all HDI components;

– the income index is the highest (more than 0.8) in the Belgorod, Voronezh, Kaluga, Kursk, Lipetsk, Moscow, Tula, Yaroslavl regions and in Moscow city;

– the longevity index is the highest (more than 0.8) in the Belgorod, Voronezh, Lipetsk, Moscow, Ryazan, Tambov regions, and in Moscow city;

– the education index in the regions is quite high – about 0.94 and higher; the maximum values are in Moscow city, Oryol; more than 0.96 – in Belgorod, Voronezh, Kaluga, Kursk, Ryazan and Yaroslavl regions.

The total fertility rate for 2005-2021 increased in the regions of the Central Federal District by 1.23 times, while in most subjects of the Central Federal District it fluctuates in the range of 1.2-1.4 (the maximum values are in Moscow city and the Moscow region, the minimum value is in the Smolensk region), which generally indicates a narrowed reproduction of these regions population.

In 2005-2015, the mortality rate of the working-age population in the regions of the Central Federal District decreased by 1.6 times (a positive trend), and in 2015-2021 it increased by 1.2 times (a negative trend). According to the mortality rate of the working–age population, the differences by region are 1.9 times: the minimum value is in Moscow city, the maximum is in the Tver region.

In 2005-2021, the infant mortality rate in the Central Federal District regions decreased by 2.5 times. There are significant differences (2.2 times) in this indicator: the minimum value is in the Bryansk region, the maximum value is in the Vladimir and Orel regions.

The situation with real monetary incomes in the Central Federal District regions is better than in Russia as a whole. In 2019 the decline in real incomes of the population was typical for 6 regions (Ivanovo, Orel, Ryazan, Tambov, Tula, Yaroslavl regions), in 2020 – for all regions (except Moscow city), in 2021 – only for the Lipetsk and Tambov regions. The largest increase by the indicator was in 2021 in Moscow city and the Moscow region. Moscow always has the maximum indices for the growth of real incomes and wages, the minimum indicator of poverty of the population in the Central Federal District.

The real accrued wages of employees of organizations in 2019-2021 in all regions of the Central Federal District decrease: according to the ratio of the average monthly accrued wages of employees with the subsistence minimum in 2021, the maximum values in the Central Federal District in 2021 were in Moscow city and the Moscow region, the minimum (less than 300%) – in the Ivanovo, Kostroma, and Bryansk regions.

The proportion of the population with monetary incomes below the subsistence minimum/poverty line in Russia has been declining in these years. In 2021, the minimum values of the indicator were in Moscow city and the Moscow region, the maximum – in the Smolensk, Bryansk, Ivanovo regions. Relatively low values of the indicator were in Belgorod, Voronezh, Kaluga, Kursk, Lipetsk, Tula, Yaroslavl regions.

The employment rate in the regions in 2019-2021 has changed insignificantly: more than 1% has increased only in the Ivanovo, Kaluga, and Yaroslavl regions. The highest employment rate is in Moscow city, the lowest employment rate in 2021 among the regions of the Central Federal District is in the Ryazan and Orel regions. The average age of the employed population in the Central Federal District is 42.7 years on average, which is higher than the average for Russia as a whole.

More than 85% of the employed in the Central Federal District has higher and secondary specialized education. The highest proportion of employees with higher education is in Moscow city (51.8%), and the Moscow region (42.5%). In seven regions, the proportion of employees with higher education is in the range of 27-30%, in nine regions – in the range of 30-35%. In seven regions, a high proportion of employees with secondary specialized education – 50-54%.

The employment rate of the urban population exceeds the employment rate of the rural population by 8.7%. High employment of the urban population (more than 62%) is in Moscow city, Moscow, Kaluga, Belgorod, and Lipetsk regions. The minimum employment of the urban population in the range of 55-59%

is in the Bryansk, Kostroma, Oryol, Ryazan, Smolensk, Tambov regions. The highest employment of rural population (56-58%) is in Kaluga, Moscow, Belgorod, Vladimir, Ivanovo, Lipetsk, Smolensk, Tula regions; low (about 50%) – in Voronezh, Kostroma, Oryol regions; the lowest employment (50% and below) – in Voronezh, Kostroma, Oryol, Ryazan regions.

The unemployment rate in the Central Federal District regions is lower than the average for Russia; the minimum unemployment is in Moscow city (2.6%), in other regions of the Central Federal District it ranges from 3.4% to 5.9%. The unemployed are 79.2% urban and 20.8% rural, 48.9% male and 51.1% female. The highest unemployment is in the group of 30-39 years, followed by the age of 20-29, and 50-59. The total number of the unemployed is dominated by persons with secondary specialized (41.6%) and higher education (28.5%). The registered unemployment rate (0.6%) is almost 6 times lower than the general one (according to sample surveys of the population).

The characteristics of regional employment are primarily influenced by the sectoral structure of the economy, as well as by population migration. In many regions interregional migration prevails over intraregional one.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Alla B. Berendeeva – conceptualization, project administration, writing – original draft.
Dmitry V. Kareev – data curation, formal analysis, validation, writing – review & editing.

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The role of personal competition of the technical university graduate in the local labour market

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Abstract. In terms of market relations the problem of competitiveness is revealed through the relationships of various subjects of economic activity. Many researchers study it at the interdisciplinary level. However, graduate's personal competitiveness in the labour market is understudied scientifically. When graduates of a technical university enter the local labour market, this factor becomes the main one. Therefore, the issue of assessing the level of young specialists' personal competitiveness is very relevant. The paper concerns with the social phenomenon of personal competitiveness including both personal and acquired components. During this particular study on the personal competitiveness of Yaroslavl State Technical University (YSTU) students' level, we defined the role of the technical university graduate personal competition in the local labour market. The purpose of the study is to assess the role of personal competitiveness of YSTU students in the local labour market during their employment. The objective of the study was to identify the motivation of employment as a factor of personal competitiveness. The main hypothesis is the assumption that at employment stage the level of personal competitiveness is the main factor determining the competitiveness of YSTU graduates. The most appropriate research method is the method of sociological survey through Google forms. The validity of the results was ensured by the sample size of 10% of sampling population size. The results of the empirical research presented made it possible to achieve the study goal and confirm its general hypothesis. Based on the data obtained, the paper describes the level of personal competitiveness of YSTU students.

Keywords: competitiveness, labour market, personal competition, competence, personal competitive advantages, hereditary competitive advantages, imperfect competition, standard of living, relevance, motivation.

JEL codes: A14

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Introduction

The Russian higher education system is focused on training specialists with professional and general cultural competencies. They allow them to withstand competition in the labour market. Therefore, an important task of the Russian higher education system is to form the readiness of a university graduate to compete in this market. The level of competition for graduates of higher educational institutions is determined by the desire of young professionals to find a job in a specialty with a satisfactory level of salary. It compensates their the efforts spent on education. The enterprises are also interested in specialists who are capable of practical solutions to professional problems. The system of higher education cannot fail to respond to the requirements of the market. Therefore, it is developing in accordance with the demands of students, forming the qualities which allow students to apply knowledge, skills, and abilities necessary in their professional activity.

The basis of this process should be the formation of an idea that a graduate enters the labour market, primarily, as a job seeker. It requires both the university staff and the graduate himself to know the current

situation of employment at the local level. In accordance with the explanatory dictionary, the labour market is the processes through which workers and employers contact and resolve issues related to wages and working conditions.

The state of the labour market is constantly undergoing changes depending on the socio-political and economic development of the state and the region. In addition, it is necessary to take into account the impact of external and internal factors on the labour market. External factors include the crisis decline of social production, the structural restructuring of production, and the democratization of public life, etc. The internal ones include the demographic situation, migration, education, the existing system of training and retraining of personnel, etc. (Fayzullin & Fayzullin, 2006). According to researchers of the labour market, the price and amount due for cost of labour, which are the most important structural elements of its self-adjustment, the level of per capita consumption of the population, have not been brought into mutual correspondence in the labour market of Russia. It is a factor of the formation and acceleration of contradictions between supply and demand in this field. Increasing of the financial costs for the reproduction of labour resources, the expansion of free pricing boundaries, the growth of inflation, the violation of the principles of social justice led to a widening gap between the price of labour and its value. It contributed to a further decrease in the role of the self-adjustment mechanism based on value relations in a market economy. The deterioration of living standards led to an increase in the population's need for jobs which became a factor of «pressure» of labour potential on the labour market (Fayzullin & Fayzullin, 2020).

The open market captures the entire working-age population, including the workforce and vacancies registered with the employment service, as well as places in the vocational education system. Employers and employees interact directly or through intermediaries. The natural and climatic conditions, the insufficiently balanced distribution of productive forces led to the formation of uneven unemployment rate among various age groups in the Russian labour market. And the young people are particularly affected it.

Therefore, it is necessary to define the main components of the local labour market. They are as follows:

- the job market where a graduate can choose a place of employment more or less corresponding to his desires;
- the labour market, where more than one person can apply for the same job, which creates a competitive situation;
- the employee and the employer should be able to negotiate to coordinate their interests. Meanwhile, if employees are forced to agree to any working conditions, and employers accept any employee, there is no competitive environment (Kuteitsyna, 2011).

However, a ccompetition in the labour market is predetermined by the desire of workers to be in demand in it. In terms of the individual in the labour market, the concept of demand should be considered through the socio-professional one. Professional demand is a necessary condition for the efficiency of economic activity. The demand for specialists is performed in the context of the existing labour market.

According to E.V. Kharitonova (2011): «the socio-professional relevance of a personality can be defined as a meta-system of relations between three global components: society, personality, and profession, which is both a process and a result of a person's entry into socio-cultural and professional reality». The personal-activity approach by E.V. Kharitonova in determining the demand, allows us to pay attention to the effectiveness of a personal resources realization. However, in a socio-philosophical sense, the study of the demand essence as a need allows us to consider this phenomenon not only in terms of social interaction but also as a motivation for it. In accordance with the conclusions above, we can distinguish two levels of personality demand which can be primary (abstract) and secondary (specific) ones. Primary (abstract) demand is a depersonalized need for something. In the labour market it is characterized by the need for an employee as an abstract person who possess certain professional and personal qualities and the requirement for potential employees to meet the needs of the employer. The availability of a vacancy (demand in the labour market) generates applicants offers. The employer's interest in a particular applicant transforms the primary demand into a secondary one and assumes its demand in the labour market. Thus, secondary demand characterizes the personalized need for a certain applicant who has the most suitable personal qualities for the employer, and the requirement for

this applicant with the conclusion of an employment relationship. The secondary demand reflects a subjective position based on the opinion of a particular employer on the particular applicant. All mentioned above allows us to consider the demand for an applicant in the labour market as the employer's necessity for an applicant as a potential employee (Kharitonova, 2012).

Competition is one of the core factors of economic development. But the subjects of competition are still understudied. Most economic theories perceive competition as a non-subjective process. Competition analysis is not accompanied by competitor analysis. Apparently, therefore, there is not enough research on personal competitiveness in various spheres of human activity. Although this phenomenon accompanies the existence of mankind since the division of labour. There is still no consensus on this concept. Perhaps this phenomenon is not natural, but social. However, it is difficult to assess it.

Some scientists believe it is natural; others define the competition as a reaction to uncertainty and an attempt to form a certain and controlled system for eliminating this uncertainty. That is, not only the possible consequences of such actions, but even their motivating mechanisms are hidden from the eyes of the scientist. Secondly, the process of forming a classical scientific research – from a descriptive to a normative function – is very complicated. The absence of repetitive or reproducible phenomena made the process of scientific verification of forecasts in the field of competition, however, as well as any socio-economic phenomenon, problematic (Sorokin, 2012).

There are objective reasons and prerequisites for a diverse scientific study of competition as a public life phenomenon. For instance, the personal principle in the actions of economic entities is especially necessary when studying the problems of employment of university graduates. Such research can help educational organizations in compiling competence passports for graduates of management and entrepreneurship programs. The study of the competitive motivation, styles, and manners of competitive behaviour, competitive competencies, students' abilities and their personal qualities, significant for competitive actions can become the basis for the formation of readiness of the higher education institution graduate to compete in the labour market (Rubin, 2017).

Thus, in order to form the competitiveness of a graduate, it is necessary: on the part of the university – knowledge of the local labour market state, on the part of the student – the level of personal competitiveness. Graduates of the university in the labour market can be attributed to the category of labour resources experiencing difficulties when looking for a job. One of the reasons for this is insufficient competitive potential, including:

- economical crises;
- discrepancy between supply and demand in the labour market;
- poor graduate's life position;
- inconsistency of professional competences with the job requirements;
- discrimination in the labour market, etc. (Motova & Shcherbakova, 2012).

Methods

In order to assess the level of personal competitiveness of full-time undergraduate students of all specialities of Yaroslavl State Technical University, a Google questionnaire survey was performed. The sample size was 10% of the general sample. The purpose of the empirical study was to determine the level of personal competitiveness of the YSTU students. The subject is the relationship of the personal competitiveness level with the process of employment in the local labour market. The applicant's ability to get the desired job is related to his or her personal competitiveness. The first stage in which a university student's personal competitiveness manifests itself is his or her enrolment. The competitiveness of specialists in the labour market does not arise when a graduate starts looking for a job. It happens when the graduate, being an entrant, chooses a profession. At this stage, there is no awareness of entrants on the situation on the local labour market. There is no accurate interaction between employment agencies, employers, and educational institutions. The imbalance of supply and demand in the labour market is also related to all mentioned above.

The hypothesis of the study was the assumption that at this stage the factor of the family financial

situation takes the first place among the factors determining the competitiveness of school graduates. The reason is the transition from a planned economy to a market economy over the past three decades. It has resulted in the impoverishment of a large part of the population. It has also formed a significant income gap between urban and rural population. Indeed, the preparation for the Unified State Exam provides mainly by the tutors. It is greatly affected the ability to compete for students of urban and rural schools when entering the university. The most of the young people choose a speciality with no thought about what professions are more in demand in the labour market, where they will work after graduation, how they will look for a job, etc.

Results

To verify this hypothesis, the survey included a set of questions. The first is: «Where was the school you graduated from?»

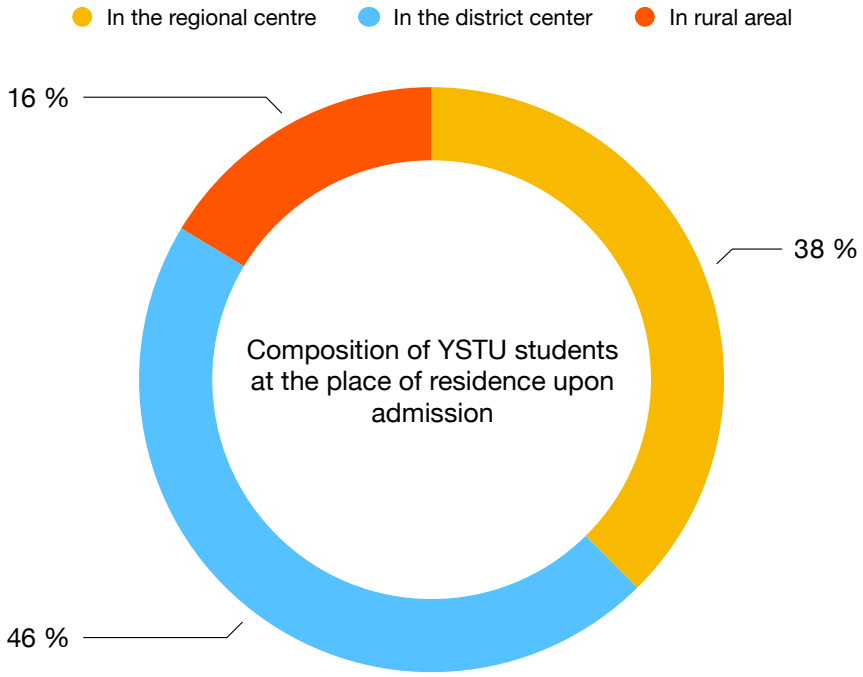

Figure 1. Composition of YSTU students at the place of residence upon admission (% of the number of respondents)

Source: composed by authors

According to the data obtained, 62.6% of those entering YSTU are graduates of the rural schools. Among the reasons why the choice of this university was made, the top three are:

- location of the university (52.9%);
- easy admission (51.2%);
- insufficient points for enter another university (25.3%).

The amount is more than 100% because the respondents could choose three options.

To support this hypothesis, we can also mention that 30.6% of students are studying and working at the time of the survey implementation. The main reason of their working is generally the option «I need money for a living, my parents can't support me» (59.3%).

Thus, summarizing the results obtained, we can define the financial factor as the major one. The financial situation of the family reduces the personal competitive opportunities in choosing an educational institution for graduates of rural schools. The low level of income, deficiency of permanent earnings do not allow parents to create favorable initial conditions necessary for their children career. Unfortunately, children who grew up in such families initially have low competitiveness in the labour market.

Considering the subjective component of the school graduates readiness level – future students – to compete in the labour market, the questionnaire contains the question: «When you entered the university, what was the most important for you?» (the amount is more than 100% because the respondents could choose

three options). Among the reasons why the choice of this university was made, the top three are:

- get a higher education (90.6%);
- the opportunity of self-actualization (65.6%);
- the possibility of easy employment (40.6%).

But during the studying students are changing their minds about the profession; the state of the labour market, and their own capabilities are changed, too. The second stage of personal competitiveness is the formation of readiness for employment. Employment refers to the process which is the selection of a workplace and the corresponding formalisation through the signing of an agreement with a specific employer. Indeed, employment is any process of getting a job both independently and with the help of special authorities .

Personal competitive advantages of each person can be divided into two categories: natural (hereditary) and acquired. Hereditary competitive advantages include:

- abilities;
- temperament;
- physical characteristics.

Acquired personal competitive advantages include:

- business qualities (education, special knowledge, skills, and abilities, etc.);
- intelligence and culture;
- purposefulness of the activity motivation;
- character (attitude to work, to others, to oneself, to things, etc.);
- ability to manage the emotions;
- sociability.

Based on the selected competitive advantages, we can assume that the key factors affecting personal competitiveness in the labour market are: employee competence, motivation, and personal qualities.

The objective of the study was to identify the motivation of employment as a factor of personal competitiveness. In order to achieve it, the questionnaire contains the following question: «What are the goals of your future employment? (Point the most important option for you)». The results are as follows:

- permanent income (45.9%);
- the opportunity to self-actualization (37.2%);
- start own business (11.6%);
- other (5.3%).

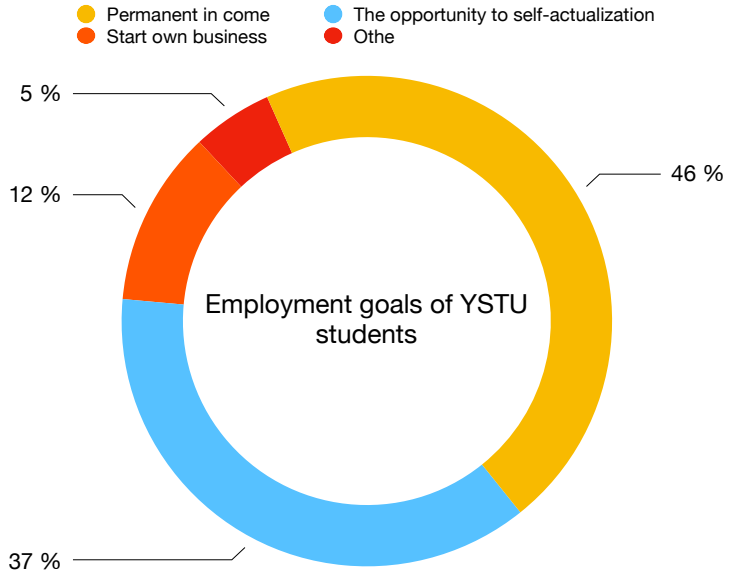

Figure 2. Employment goals of YSTU students (% of the number of respondents)
Source: composed by authors

At the second stage, the importance of the self-actualization factor decreases. And occurs an

understanding of the relevance both theoretical and practical trainings. The assessment of the quality of this training gives students an idea of personal competitiveness and occupies one of the first places among the acquired personal competitive advantages. To obtain such an assessment, the questionnaire contains an indirect question: «What, in your opinion, most depends on the development of students' desire to work in the profession?» (the amount is more than 100% because the respondents could choose all the necessary options). The results are in descending order:

- on the quality of teaching special disciplines, when the classes show the connection of the acquired knowledge with the future profession (79.4%);
- on the possibility of employment on the profession (64.7%);
- on the possibility of career growth on the profession (60.0%);
- on the quality of teaching of all disciplines at the university (45.9%).

The results obtained allow us to conclude about understanding of the majority of YSTU students which competitive advantages in the labour market they will need.

The task of revealing the perceptions of students' needs for gaining competitiveness skills was accomplished with the help of the question: «What is important (not important) for you while studying at the university?» according to the option «important»:

- develop your abilities (92.5%);
- learn something new (90.1%);
- personal growth (88.4%);
- interest in the profession (84.3%);
- preparation for the future profession (83.2%);
- preparation for self- actualization in the profession (73.9%);
- interest in academic disciplines (69.3%);
- the opportunity to work by profession while studying (59.5%).

Indeed, 56.0% of students studying the discipline think about whether this knowledge will be needed in their future profession, which indicates their understanding of the personal competitiveness factors. Note, all the top ranked factors are attributed to acquired ones. Therefore, students expect the development of their competitive advantages from the conditions of study at the university.

To identify students' perceptions of the employment process, the questionnaire contains the following question: «What difficulties do you think you might encounter in finding a job?»

- absence of work experience (66.3%);
- lack of work opportunities in the labour market (9.8%);
- labour conditions at the enterprise (8,7%);
- poor self-presentation skills (11.6%);
- incompetence (10.5%).

According to the results, the students of all courses, including junior ones, are aware of discrimination against young people in the labour market due to the insufficient work experience. In order to assess the proportion of students solving the problem of their personal competitiveness in the labour market independently, the questionnaire contains the following options on the reasons that make them work: «I work in my future specialty, I gain experience» and «after graduation I will stay at this place to work». We summarize the similar in meaning answers; according to them, 35.6% of respondents have found a way out of the current unfair competition and are solving the issue of personal competitiveness without waiting for help from the state or the university.

The objective of the study was to compare the role of personal and acquired competitive advantages as perceived by the students. The structure of personal competitive advantages in the labour market was assessed using the question: «What requirements do you think employers impose on hired employees?» (the amount is more than 100% because the respondents could choose three options)

- responsibility (71.6%);
- diligence, efficiency (69.8%);

- ability to communicate, sociability (57.4%);
- personal professional motivation (43,8%);
- initiative (30.2%);
- self-confidence (24.9%);
- perseverance (21.3%).

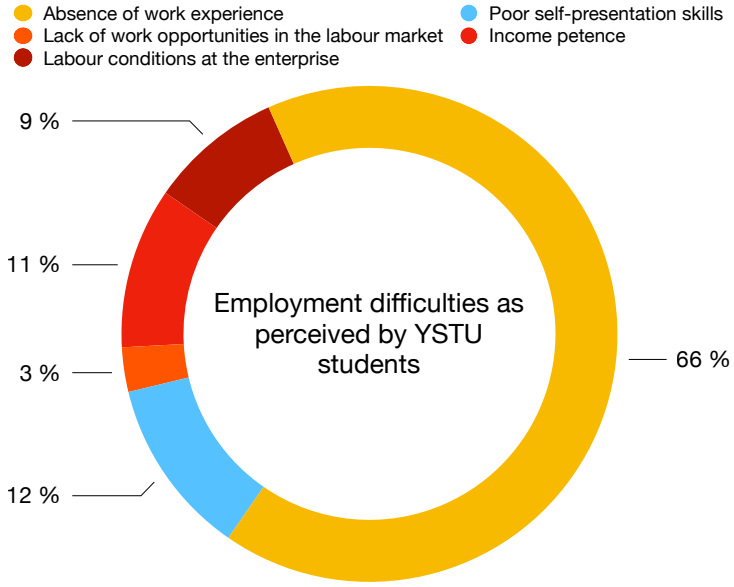

Figure 3. Employment difficulties as perceived by YSTU students (% of the number of respondents)
Source: composed by authors

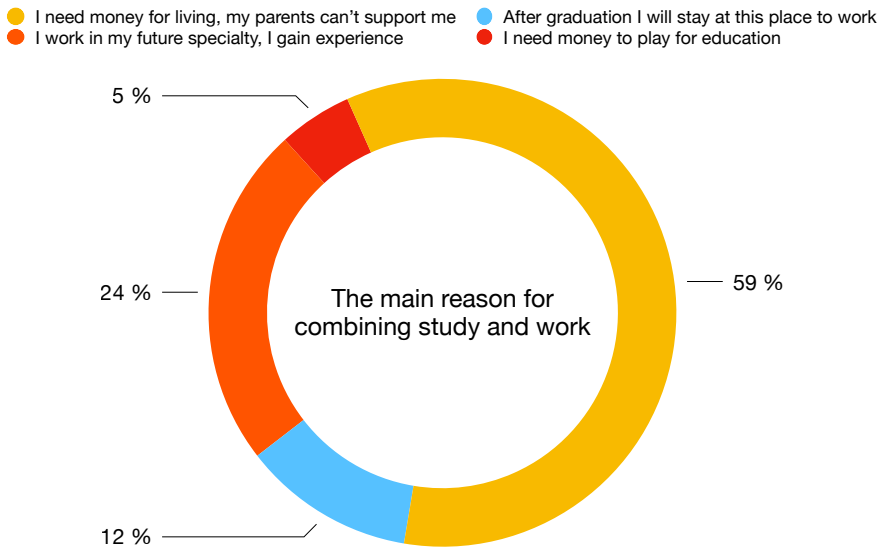

Figure 4. The main reason for combining study and work (% of the number of respondents)
Source: composed by authors

The Russian labour market characteristic feature is imperfect competition, which was formed during the period of transition to market relations in the economy. «In the evolution (development) of the Russian labour market, two clearly defined stages are easily distinguishable: the first (1991-1998) was a reflection of a deep transformational recession, the second (1999-2008) – a vigorous post-transformational recovery. But on both, its behavior was «non-standard» (Kapelyushnikov, 2009). In the modern labour market, this type of competition is expressed by imperfect competitive behaviour of labour market actors on the one hand, and imperfect competitive conditions of the labour market on the other. The imperfection of competitive

behaviour on the labour market is caused by unfavourable conditions in which its participants act. It infringes the interests of the other actors. As the specifics of the labour market, the labour force is a commodity and the characteristic feature of an employee. Imperfection of competitive conditions in the labour market has a similar nature of its formation as imperfect competitive behavior and consists in non-fulfillment of the condition of mutual profitability of competition (Kravtsevich, 2018). In the Russian labour market, imperfect competition is characterising by the non-compliance of employees with the requirements imposed. The main indicative factors of imperfect competitive conditions are such components as salary, number of jobs, accumulated period of work, etc.

The objective of the study was to identify students' assessment of the imperfect competitive conditions existing in the local labour market. To obtain such an assessment, the questionnaire contains a question: «What is the main obstacle for you in order to make the profession you receive your own?» (the amount is more than 100% because the respondents could choose all the necessary options).

- salary (51.7%);
- number of jobs in the labour market, it is difficult to get a job in the specialty (44.8%);
- the quality of training in the specialty, lack of practice (27.6%);
- the quality of training in the specialty, the lack of theoretical knowledge (10.3%).

Market economy practice demonstrates the competitiveness and competence of a modern specialist are the fundamental qualities on which his or her personal and professional success entirely depends. Future workers' perceptions of career development in the profession additionally contribute to the opportunity to gain understanding of the YSTU students personal competitiveness level. To obtain such an assessment, the questionnaire contains a question: «What, in your opinion, can play a decisive role in your career growth?» (the amount is more than 100% because the respondents could choose all the necessary options). The following hierarchy is obtained:

- personal qualities, character traits (71.9%);
- qualifications, diploma of YSTU (59.4%);
- personal relations (34.4%);
- personal achievements during university studies (28.1%);
- work experience during study (28.1%);
- industrial practice, allowing to show themselves at the future place of work (28.1%).

To understand the students' motivation for a successful career, we present the results of a survey of YSTU graduates [8, p. 68]. The questionnaire contains a question: «What is an important condition for you for a successful career in the profession?»

Table 1 – Respondents' motivation for a successful career in the profession

Index	According to the index «very important»(% of the number of respondents) in descending order
Responsibility	84.3
Efficiency, diligence	78.1
Professionalism, competence	78.1
Personal professional motivation	68.7
Job interest	68.7
Striving for self-development	65.6
Purposefulness	65.6
Self-confidence	53.1
Communicative skills	50.0
High level of knowledge	46.8
Initiative	40.6

Index	According to the index «very important»(% of the number of respondents) in descending order
Readiness for innovations	40.6

Source: composed by authors

As can be seen, there is an increase in motivation to maintain a high level of personal competitive advantages in building a career in the profession after graduation when entering the labour market. Professional training ranks third, after responsibility and efficiency; a high level of knowledge occupies the penultimate position in the hierarchy. The explanation is that professional competitive qualities can be acquired during adaptation to the company's requirements for a young specialist, while personal competitive advantages will be paid attention to immediately and the company itself will not undertake their formation. According to the results obtained, most of the YSTU graduates understand it and develop the advantages of personal competition by themselves. However, it can also be interpreted as an assessment of the university's activity in developing graduates' readiness for the employability.

Conclusions

The study of the personal competitiveness level of university students is an important, but not sufficiently studied problem. The research allows us to confirm the main hypothesis. Therefore, at the stage of employment, among the factors determining the competitiveness of YSTU graduates, the main one is the level of personal competitiveness. The results obtained allow us to conclude about understanding of the majority of YSTU students which competitive advantages in the labour market they will need. According to the results, the students of all courses, including junior ones, are aware of discrimination against young people in the labour market due to the insufficient work experience. Therefore, we identify students' assessment of imperfect competitive conditions existing in the local labour market and obtain their hierarchy. It is as follows: salary – 51.7%; the number of jobs in the labour market, difficulty in getting a job in the specialty – 44.8%; the quality of training in the specialty, lack of practice – 27.6%; the quality of training in the specialty, lack of theoretical knowledge – 10.3%.

Awareness about the criteria determining the university graduates competitiveness in the labour market and the degree of their influence on the employment process. Indeed, it is possible to form a unified system of adaptation which increases the competitiveness of the individual. It will make the employment of graduates more effective. Taking into account the influence of economic, political, social, and other factors affecting the labour market, it is necessary to correct the objectives to manage the situation with the employment of university graduates in the local labour market. The main objective of competition development and employment of young specialists remains the creation of better conditions for professional and career implementation, as well as increasing the role of personal competitiveness in the labour market.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Irina V. Popova – writing – original draft.
Marina B. Abramova – data curation, formal analysis, validation.
Elena O. Stepanova – conceptualization, project administration, writing – review & editing.

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