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HOW TO ASSESS ADVANTAGES OF ECONOMIC-GEOGRAPHICAL POSITION FOR RUSSIAN REGIONS?¹

The category of economic-geographical position (EGP) was formalized based on a review of the scientific literature. The developed method of international and interregional EGP potential assessment was based on the use of gravity models; it can further be widely used in regional studies to explore the benefits of the spatial location of objects (countries, regions, cities, etc.). These calculations for Russia's regions showed significant spatial differentiation. The maximum potential of interregional EGP potential have the regions located near Moscow and St. Petersburg agglomerations, the potential decreases uniformly to the east. The maximum international EGP potential concentrated in regions on the coast of the Black Sea, the Baltic Sea and the Sea of Japan. The potential of the Kaliningrad region 5.6 times higher than it is for the Tyva Republic. In addition, it was revealed a significant increase in the total EGP potential in the 2000s, and its shift to the southern regions of the Far East due to the growth of the Asia-Pacific economies. The results were also used to identify connections between the EGP potential and indicators of socio-economic development. It was found that favourable EGP is one of the factors for GRP growth, investment, foreign trade, migration growth and spread of new technologies. Formalizing EGP as a category allows using it to predict the spatial changes in the socio-economic development of Russia.

Keywords: economic-geographical position, market potential, Russian regions, gravity models, regional development

Introduction

“Economic-geographical position” (EGP) is one of the basic categories of regional studies in Russia. Moreover, we can assume that this is one of the few concepts originally appeared and developed in Russia and it is rarely used in other countries.

Numerous recent studies of regional inequality in Russia (e.g. [1–3]) refer to significant differences between the regions in their geographical position. The strategies of socio-economic development in some regions have a special item about its geographical position². These documents mainly provide a qualitative characteristic of a “favourable” or “unfavourable” economic-geographical position of a region³. However, there is still a lack of a formal model for quantitative assessment of the potential of an EGP.

Nowadays, costs of interactions between economic agents are rapidly falling with the acceleration of transport and information technology development⁴ [4]. Nevertheless, there is still a strong differentiation in living conditions in regions and countries, and remote and underdeveloped areas are still less attractive to migrants and investors [5]. One of the factors of spatial differentiation is an EGP.

One of the main tasks of regional studies is to establish connections between different objects in space. Therefore, the EGP concept is one of the keys to a system of regional science (economic geography, regional and spatial economy), as it allows to explain many properties of spatial objects and predict their development.

An economic-geographical position of a region is a historically evolved, but varying set of spatial relationships between economic agents of this region and external factors potentially influencing regional development⁵. The spatial relationship between objects, in this case, is primarily associated with a distance between them.

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² Geographical position includes physical-geographical characteristics of a region, so the EGP is often associated with agro-climatic resources, coastal location and the availability of natural resources, which is inconsistent with the original understanding of this category.

³ In most cases, we are talking about a major transport route passing through regional territory, or proximity to major markets.

⁴ F. Cairncross [6] describes in detail the processes in his book “The Death of Distance.”

⁵ Determining the EGP category we can impose an additional constraint associated with the need to use an object in space in a ratio of only those that would have the characteristics of the system, and were similar in terms of their system characteristics. That is geographical

Any object as part of the space-time continuum is able to change its position, striving to achieve the most favourable location in space⁶, in other words, it is trying to reach the point, where the potential impact of external conditions would be the most favourable for its development⁷. The actions of the object can be modelled as a movement in phase space to a certain stable point, which is called an attractor. In this case, a favourable *EGP* is an attracting set of economic agents' positions in space, where their relationship is optimal. Thus, a regional *EGP* is a dynamic category.

Changes of an object location may have a significant impact on it. Novosibirsk was founded on the intersection between the Trans-Siberian Railway and the Ob River and became the largest city in Siberia due to the substantial gains of the location on the route between the European part of Russia and the Far East [7]. As a modern example, the new automobile factories in Russia are located in the regions (Kaluga, Leningrad region) close to the largest and growing in 2000th regional consumer markets (Moscow and St. Petersburg, respectively). Poor development of distant Russian regions, as the Republic of Altai and Tuva Republic, is related to their unfavourable landlocked position away from the main traffic flows and major economic centres. It is common for other large countries, e.g. in China, economic activity is concentrated mainly in the coastal zone, where export costs are lower.

The aim of this work is to formalize and assess the benefits (potential) of the economic-geographical position of the Russian regions.

Thus, "*EGP*" is a probabilistic category, and its potential benefits can be or can be not realized depending on the regional policy, development of infrastructure and other factors. In fact, it is important to assess what the advantages of location are in a particular region for economic agents (firms, employees, regional economies as a whole, etc.); first, these advantages are associated with the proximity and the availability of large markets.

An empirical assessment of an *EGP* potential of a region should take into consideration dynamic features, because an *EGP* is depending on dynamics of economic processes outside the region, e.g. changes in traffic and trade flows as a result of the new roads construction. Giving a dynamic component to the concept will significantly expand the scope of its application.

Theoretical Basis

According to one of the authors of the term N.N. Baranskiy, the economic-geographical position is "an attitude of any place, area or city to other outside lying givens, which have a particular economic significance... It is extremely important to a country (or region, or city) to be in a short distance to the main routes, markets and large centres (industrial, commercial, administrative, cultural)" [10, p. 129]⁸. N.N. Baranskiy allocated three following *EGP* levels [10]: micro- (within the region, city), meso- (within the country) and macrolocation (between countries). Initially, the concept was applied to studies of cities' position at the mesolevel. This work is devoted to the research of meso- and macrolocation of the Russian regions.

I.M. Maergoiz [11–13], Yu.G. Saushkin [14] Ya.G. Mashbits [15], Ye.Ye. Leizerovich [16, 17] and many other Soviet and Russian scientists made a significant contribution to the concept.

"Geographical position" as a qualitative characteristic of an object can be central, peripheral and neighbour. [11] A central position of an object within a larger territorial system brings additional economic and social benefits: lower transport costs, trade and migration flows concentration, and so on. Moscow position in the centre of the transport and the settlement system of the European part of

position of economic agents, such as firms, should be considered only in relation to economic entities (companies, markets, etc.). In this case, methodologically wrong to regard the average temperature as a component of the *EGP* for an enterprise, which often can be seen in economic researches. Estimation of the *EGP* potential may indirectly include environmental characteristics through such economic categories as income, expenses, damages, efficiency, etc.

⁶ B. Rodoman [8] proposed a "positional pressure principle", meaning the force that causes the object to move, if its position is not optimal.

⁷ This condition can be carried out directly to cities at early stages of their development, for example, Orenburg three times changed its location [7], but moving for large areas such as countries and regions is limited. This raises the question of the category applicability to them. Changes of *EGP* potential of specific localities (districts) within a region affect economic agents, which by moving transform the internal structure of a region. That is, a region (as a socio-economic system) does not change its location and configuration, but optimizes the internal territorial structure. For example, according to W. Christaller, regional settlement system strives for optimum hexagonal structure [9].

⁸ A similar definition: "*EGP* is a kind of geographical location, defined as a set of spatial relations of companies, localities, areas, regions, individual countries and its groups to external sites of economic importance to them," [18].

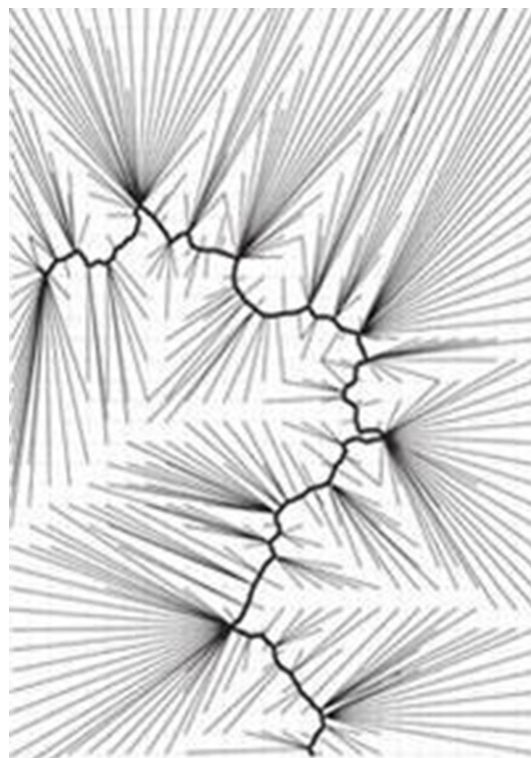


Fig. 1. Scheme of the major channel bends of the Volga river with straight lines that indicate the potential interaction zones [19]

Russia can be a good example. Otherwise, a peripheral⁹ position of economic agents, which is deep and remote from a centre, in general carries additional costs.

Central position, in this case, is rather a number of potential connections than a location in the geographical centre of any territory. A historical development of many cities along the Volga River was determined by their advantageous position in the bend of the river. Convex portions of any river (Fig. 1), *ceteris paribus*, are more profitable for a city, because such position is able to serve more vast territory, and therefore have a greater number of potential connections. During the period of water transport dominance, this location was one of the cities' competitive advantages.

The rarely used, but the highly formalized method of a geographical position analysis is a technique from the theory of central places, developed by V. Kristaller and A. Lösch (see [9, 20]), which allows to determine a position of a city in the hierarchy of a settlement system.

The neighbouring position of two territorial systems, *ceteris paribus*, usually acts as a favourable factor for their development. Proximity to a large neighbour can bring benefits of cooperation, economic transfer and new technologies diffusion, e.g. location of shopping centres in the Moscow region near Moscow [21]. However, this proximity may inhibit a development of various sectors of weaker neighbours. Less developed regions, in this case, can be converted into agrarian and raw material appendages and suppliers of labour resources. A classic example is an inner periphery with low population density between Moscow and St. Petersburg. [22] By using the concept of "neighbourhood" [12], it is important to distinguish neighbours of first (direct), the second (neighbours of neighbours) and subsequent orders.

"Geographical position" can be classified by functions [15]: geodesic, environmental, economic-geographical (*EGP*), politico-geographical, geopolitical, etc. In this paper, we examine only an economic component (as the first step towards an integrated estimation), which itself can be divided into market-, transport-, industrial-, agricultural-geographical position, and so on. An *EGP* of a region is associated with its proximity to markets, traffic flows, industrial centres and other facilities, which affecting or potentially able to exert influence on it.

⁹ Considering the global trade flows, which are carried out mainly by sea, we should consider landlocked position as a peripheral and seaside as central.

“Proximity” as a category can be estimated using various distance measures [23]¹⁰. The most simple is a measurement of the geodesic distance in a straight line. More economically viable is to measure an actual distance by the length of railways, motor roads, navigable rivers, etc. In addition, the distance can be measured based on the time interval, which is widely used in isochrones maps [21]¹¹.

Transport-geographical position (TGP) is measured in the cases, when benefits of regional geographical position are related to a remoteness or a proximity of a region to main routes, a position of a region in a transport system and associated costs for goods and people delivery [23]. A significant number of works is dedicated to TGP studies of regions and cities (e.g. [17, 24]). One of the most operational and developed methods of a TGP assessment is to measure an economic distance in terms of transport costs (tariffs) [25–27].

Topological distance is an often-used method for assessment of an object centrality in a transport network, where a distance is measured by a sum of the Koenig numbers from one centre to all others: the lower the number of edges connecting the centre with others, the more neutral and the more favourable position it has in a system. There are other applied methods of the graph theory [28, 29]. However, these estimations not always provide an information on potential economic benefits.

Many empirical works about “EGP” in Russia are devoted to studies of cities [11, 12, 30–32], and most of them are descriptive and are not sufficiently formalized [33–35].

In [35], a method of EGP scoring was devoted to an assessment of integration potential of the Russian Far Eastern regions in the Asia-Pacific Region. Studied variables of the EGP index were land areas, distances to other Russian regions and Asia-Pacific countries, coastlines and indicators of transport infrastructure. The disadvantages of this approach are weak formalization, a subjective selection of the indicators and weights.

In [36, 37], a method for an EGP potential calculation, associated with a proximity to major innovation centres, was proposed:

$$EGP_i = Capital_i + Agglom_i + Coast_i + Moscow_i + Fed_distr_i, \quad (1)$$

where i —is a region, *Capital*, *Agglom*, *Coast*, *Moscow*, *Fed_distr* are binary variables (0 or 1), describing respectively special status of a region (Moscow, St. Petersburg, Moscow and Leningrad Region), presence of an agglomeration with over 1 million residents, presence of ice-free ports, proximity to the Moscow and presence of a Federal District capital.

According to the calculations¹², the EGP potential (Fig. 2) is concentrated in the largest metropolitan areas and on the coast. The study also confirmed the importance of the favorable EGP position for regional innovation potential. Proximity and availability of large markets of innovative products is an important factor for new technologies development. The disadvantages of the approach are the same as described above for the scoring.

Gravity models, which serve to analyse potential social and economic interactions, were applied in many studies to assess the benefits of the geographical position. A prerequisite for this model usage has come from physics law, which states that an interaction between two objects depends on their size and a degree of closeness [39–41].

Applications of gravity models include an assessment of market [42–50], demographic [32, 51–57] and innovation potential [58–59], trade [60–67] and migration flows [68–73]. The model may be described by the following relation:

$$V_{ij} = \sum \frac{P_i^\alpha \times P_j^\beta}{R_{ij}^a}, \quad (2),$$

where V is a number of potential interactions between regions i and j , P is a size of a region, for example, gross regional product, population, number of scientists, etc., R_{ij} is a distance between regions, α , β are empirical coefficients, a is a coefficient of proportionality, showing a speed of interaction decrease between regions, caused by increasing distance between them.

¹⁰ In the current regional studies, ‘proximity’ can be determined not only as a geographical phenomena, but also institutional, organizational, cognitive, etc. [38].

¹¹ Isochronous is a line connecting the point of concurrency of any phenomenon.

¹² On the map, the contours of the EGP index was offset in the northern direction, as there are no points for extrapolation. Schematic map serves only the purposes of visualization, technical features of a software, will not reflect on calculations.

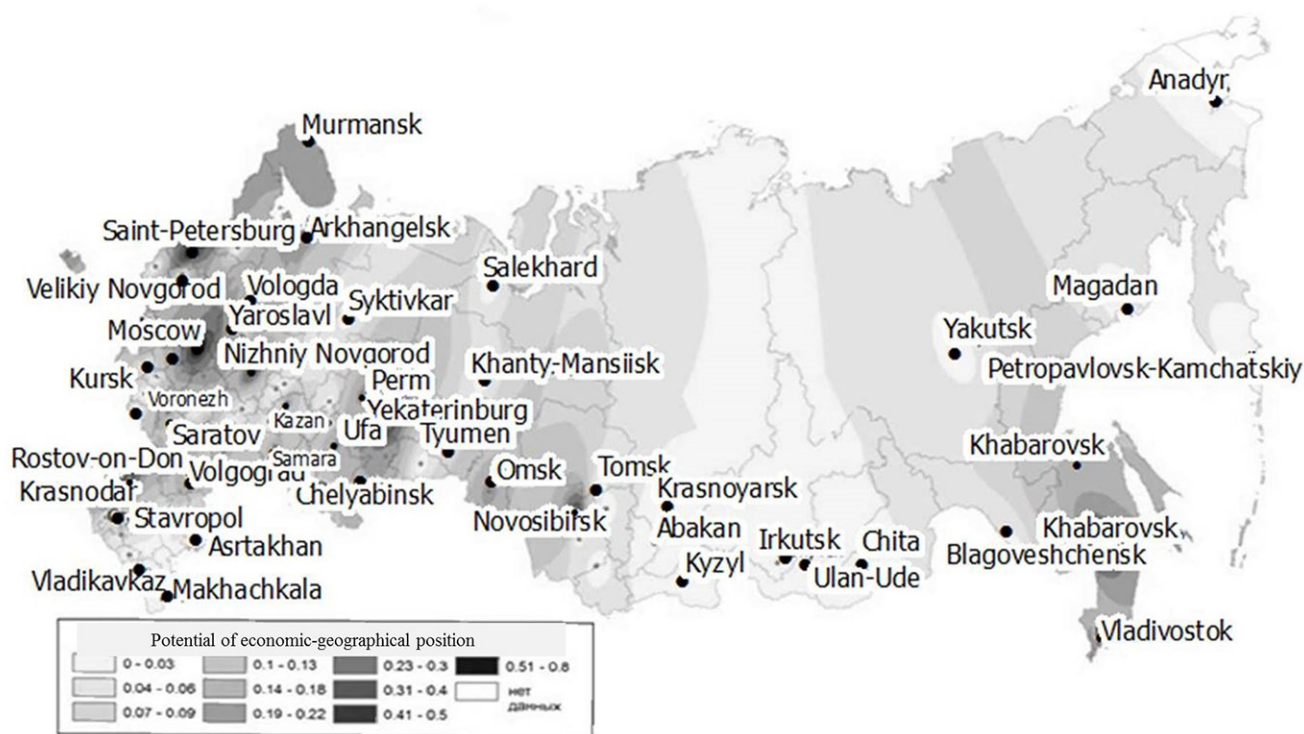


Fig. 2. Assessment of the potential of economic-geographical position of the Russian regions [35]

An actual number of interactions (V), for example, trade or migration flows, patent citations, etc. can be used to calculate the empirical coefficients. Then, we obtain the logarithm of (1):

$$\ln V_{ij} = \text{const} + \alpha \ln P_i + \beta \ln P_j - a R_{ij} + \varepsilon, \quad (3)$$

where const is a constant, and ε is a random variable, or unexplained residue.

For the purposes of our work, the market potential models, estimating proximity to potential markets, can be used. The classical model of cooperation between two regions was developed by Charles Harris in 1954 [43]:

$$V_{ij} = \frac{MV_j}{R_{ij}}, \quad (4)$$

where V_{ij} is a trade turnover between regions i and j ; MV_j is a market volume indicator, such as gross regional product (GRP) in a j -th region; R_{ij} is a distance between regions. However, this form does not allow for "multilateral resistance" [60; 67], when trade between two regions is affected by market volumes of all other regions.

Another model to determine the market potential of a region in Russian literature was called "induced potential" [57]¹³:

$$MP_i = MV_i + \sum \frac{MV_j}{R_{ij}}, \quad (5)$$

where MP_i is a market potential of a region i , MV_i is a market volume indicator.

It was used to calculate the market potential of Russian regions [49], taking into account that

$$R_{ii} = \frac{2}{3} \times \sqrt{\frac{S_i}{\pi}}, \quad (6)$$

where S is an area of a region i . As a variable describing the size of a market, gross regional product (GRP) was used. Unfortunately, the result of the calculation is virtually identical to GRP because of the large distances between the Russian regions.

¹³ The model is 'induced', as it allows to measure the potential of a particular region, in contrast to the model J. Stewart [51], which was applied for mapping spatial distribution of "settlement-field potential" [53, 55].

The mentioned models can also be used to solve very specific problems. In particular, the authors used it to assess [59] the innovation potential of the Russian regions. The number of patents per 100 thousand citizens was used as a "market" variable¹⁴.

In [62, 63], a model was derived from a type of Cobb–Douglas utility functions [74]:

$$MP_i = \sum_{j \in J} MV_j \times e^{-R_{ij}}. \quad (7)$$

In [45–48], it was showed based on (7) that profitability of firms in a region i depends on its market potential and classical production factors (capital and labour). In addition, production factors according to the Cobb-Douglas model [74] have declining returns to scale, while a market potential has growing returns:

$$Profit_i = -\alpha \ln w_i - (1 - \alpha) \ln v_i + (\sigma - 1)^{-1} MP_i + \ln A_i, \quad (8),$$

where *Profit* is revenues of firms in a region i ; w is a cost of labour; v is other factors of production; MP_i is a market potential of a region i ; A is a total factor productivity; α is a share of labour costs; σ is a single product elasticity of substitution [75].

In [50], it was shown that a high percentage of fast-growing manufacturing companies in Russia depends positively on the market potential of the regions.

All the described research methods of *EGP* assessment can be reduced to four main approaches (Table 1).

Table 1

The basic approaches of the *EGP* analysis

Approach	Methods	Disadvantages
Analysis of location in space or network	Topological distance, proximity matrix, methods of the theory of the central places	The approach do not give quantitative characteristics of potential economic benefits. 'Centrality' is not always beneficial
Calculation of economic distances	Calculation of transport costs, isochronous	The approach considers transportation costs, but does not take into account potential benefits of cooperation
Calculation of an integral index	Construction of indices	The subjective evaluation of a set of variables and weights. The approach assesses relative capacities of <i>EGP</i>
Calculation of potential interactions	Gravity models	The approach often do not take into account the actual distance, specific types of positions (such as the seaside)

Methods and data

In this paper, we used the last of the discussed approaches (table 1), since it allows us to take into account potential benefits for economic agents in a region, derived from possible interactions. Our approach is based on the formula 5. The calculation of the *EGP* potential (*EGP*) of a region includes an assessment of the potential of inter-regional, or national (*EGP^{Reg}*), and international, or external (*EGP^{World}*), geographical position:

$$EGP_i^{All} = EGP_i^{Reg} + EGP_i^{World} = \sum_{j=1}^n \frac{MV_j}{R_{ij}^a}, \quad (9)$$

where MV_j is gross regional product of a region j , or gross domestic product of a country j ; R_{ij} is an actual distance between the capital of a region i and capitals in other regions or countries j ; a is an empirical coefficient, showing a speed of potential socio-economic interaction decrease between regions with increasing distance between them. The higher the *EGP* potential is, the more intensive interactions can be and the higher benefits for regions will be.

The calculations required to determine the value of the coefficient a , which will be different within the country and between countries. Unfortunately, accurate estimation of the coefficients for inter-regional and international trade does not fully reflect the potential of the *EGP*, and will include effects of trade barriers and other factors¹⁵. Obtaining such estimates is time-consuming [67]. Besides,

¹⁴ Regional innovation potential depends on the possible interregional flows of knowledge, or knowledge spillovers [76].

¹⁵ In [67], distance coefficient a , which influence on product import in a region i from country j by maritime transport, is about 2 if coefficient for *GRP* of a region i is 0.6 and for the *GDP* of country j is 0.34.

a favourable *EGP* includes externalities of many economic relations, not only trade. That is why we proposed another approach.

Let us assume there is a critical distance $Dist_{crit}$, after which an interaction between the regions becomes insignificant, and δ is the threshold number of interactions, for example, a single interaction¹⁶. P is an equivalent of a market potential.

$$\frac{Mean(P_j)}{Dist_{crit}^a} \leq \delta, \quad (10)$$

$$\frac{Mean(P_j)}{\delta} \leq Dist_{crit}^a, \quad (11)$$

$$\ln\left(\frac{Mean(P_j)}{\delta}\right) \leq a \ln Dist_{crit}, \quad (12)$$

$$a \geq \frac{\ln\left(\frac{Mean(P_j)}{\delta}\right)}{\ln Dist_{crit}}. \quad (13)$$

Here is an example of the coefficient calculation bases on an average *GRP* in 2000-th in Russia: an average *GRP*¹⁷ was nearly 64,597,810,000 rubles. And an average transport distance of one tonne of goods by rail (the most used in Russia) to the end of the period has reached 1.5 thousand km. We assumed that a minimal interaction between two distant regions, situated at a distance of 8000 km from each other (for example, the Amur and Arkhangelsk region), that can occur in a year is 1000 rubles, then

$$a = \frac{\ln 64597810}{\ln 8000} \approx 2. \quad (14)$$

If we do the calculation for the countries in the same period, an average *GDP*¹⁸ amount was 10,779,445,240,000 rubles, and the maximum distance, which still allows the carriage of goods by sea (the main form of transport for international trade.) is about 25 thousand km (for example, Dudinka—Melbourne). If we assume, that a minimum necessary for communication at this distance should cost about one million rubles, then:

$$a = \frac{\ln 10779445}{\ln 25000} \approx 1.6. \quad (15)$$

The potential of an interregional *EGP* can be calculated by the following formula:

$$EGP_i^{Reg} = \sum \frac{GRP_j}{R_{ij}^2} \quad (16),$$

where i – is a region, *GRP* is gross regional product (calculated by the index of physical volume) (million rubles), j is other regions (83), R is a distance (km) by rail; for regions where there are no railways, we used data on automobile road and river routes.

To calculate the potential of an international *EGP* we have identified nine Russian regions, where foreign trade activity is concentrated. It is regions (p) with nonfreezing major ports, which have connected to other regions by year-round infrastructure¹⁹: Arkhangelsk, Kaliningrad, Leningrad, Murmansk, Rostov, St. Petersburg, Krasnodar and Primorsky regions. Other Russian regions may carry

¹⁶ For example, it is known that the number of patent citations decreases rapidly with increasing distance between its inventors. In [77], it was shown that after 120–150 miles researchers cite each other in patents rarely, most likely, they do not interact. For Russia, this critical distance presumably is lower due to less mobility and greater isolation of scientific schools.

¹⁷ *GRP* is in prices of 1998, adjusted for inter-regional price index.

¹⁸ *GDP* is calculated by purchasing power parity, translated into rubles using the official data on exchange rates of the Russian Central Bank

¹⁹ Regions surrounding the Arctic Ocean, as well as Sakhalin, Kamchatka and Magadan region have been excluded due to the above conditions.

out foreign trade relations with distant countries mainly through these regions. This does not exclude the possibility of foreign trade with neighbouring countries.

Economic ties on land are less intense than ones on the sea due to higher transport costs [78]. Therefore, the coefficient a is lower for international relations than for inter-regional²⁰. The general formula for calculating the potential of an external EGP ²¹:

$$EGP^{World}_i = \sum \left(\frac{GDP_q}{\min(R_{i,p}^2 + R_{p,q}^{1,5})} \right) + \sum \left(\frac{GDP_n}{(R_{i,e}^2 + R_{e,n}^2)} \right), \quad (17)$$

where i is a region; GDP is gross domestic product (million rubles); q is a distant country (170); $R_{i,p}$ is a distance from a region i to the Russian port region p (km); $R_{p,q}$ is the distance from a port region p to the distant country q (km); n is a border country: economic interrelations with n are carried out mainly by land through the regions e (Table 2).

Table 2

Countries and regions, which are preferential for land interaction

Country (n)	Regions (e)
Armenia	The Republic of North Ossetia — Alania
Azerbaijan	The Republic of Dagestan
Belarus	Smolensk and Pskov regions
Estonia	Pskov and Leningrad oblast
Finland	The Republic of Karelia and Leningrad region
Georgia	The Republic of North Ossetia — Alania
Kazakhstan	Orenburg and Astrakhan region
Kyrgyzstan	Orenburg and Astrakhan region
Lithuania	Smolensk region
Latvia	Smolensk and Pskov regions
Mongolia	The Republic of Buryatia
Tajikistan	Orenburg and Astrakhan region
Turkmenistan	Astrakhan region
Ukraine	Kursk, Bryansk and Belgorod region
Uzbekistan	Orenburg and Astrakhan region

Compiled by the authors according to the Federal Statistical Service of Russia.

The data of the Russian Federal Statistics Service was used for calculations. The data on GDP by purchasing power parity was collected from the statistics of the International Monetary Fund (<http://www.imf.org/>).

Results

1. Assessment of a potential of economic-geographical position of the Russian regions

The maximum potential of an interregional EGP in 2012 (Fig. 3) was in regions near the Moscow and St. Petersburg agglomerations. The EGP potential decreases from them in all directions with a significant excess in the Ural regions (Yekaterinburg, Perm, Ufa, Chelyabinsk agglomerations) and in the highly profitable Tyumen region. The Russian Far East (Magadan, Yakutsk, Kamchatka regions), the most remote from the central regions, have the least potential for interregional cooperation.

The EGP potential is an estimation of possible benefits (in terms of value), which regional economy can receive due to its proximity to other major markets through inter-regional interactions (exchange of goods, services, investment, etc.). This natural advantage of a particular region is not directly related to activities of economic agents in that region.

²⁰ Company significantly increases its revenues when it starts exporting [79].

²¹ The EGP potential, as measured by the proposed method, allows to calculate the potential volume of foreign trade activities in the case of the maximum development of infrastructure and the development of adequate institutions (investment climate, trade barriers, etc.).



Fig. 3. Interregional potential of EGP of Russian regions in 2012

For interpretation reasons, we assumed that there is a company with revenues of 64 billion rubles per year²² (average GRP in Russia) in the Moscow region. It could earn by exporting products to neighbouring regions to 484 million rubles a year more than the same company located in the Chukotka Autonomous District²³ only because of its location. The benefit from the EGP will be 0.75 % of the revenue of the enterprise, but small and medium enterprises can realize their EGP more easily, and this proportion may be higher.

If we assume that all enterprises, located in the Moscow region, will concentrate in one conventional point, and the Moscow region GRP 4.3 times more than the average GRP, then the absolute value of the benefits of economic agents can be more than 2 billion rubles per year. But the potential of an EGP is calculated for the capital city of each region, and the economic agents are located in different settlements. Therefore, the combined effect can be a little lower for the Moscow region, as there are remote from Moscow businesses.

There is a divergence of the potential of interregional EGP (Fig. 4). If the potential in a region *i* in 1998 was 1 % higher than it is in the region *j*, this region had 0.4 % higher rate of increase during 1998–2012. The potential of an interregional EGP grew up more than 2.5 times in St. Petersburg, Moscow, Leningrad, Novgorod, Moscow, Tver region due to the growth of GRP of two largest agglomerations and in the Krasnodar region due to the significant growth of GRP of the North Caucasian republics. The lowest growth rate (less than 1.8 times) was observed in Sverdlovsk (city Yekaterinburg), Novosibirsk and Omsk regions due to the high base effect and low growth of GRP in Siberian oil and gas producing regions.

According to our methodology, there are two main reasons of the EGP potential dynamics: the growth of GRP in the neighbouring regions or GDP of neighbouring countries (which is almost independent from any activities of regional authorities) and the construction of highways and port facilities, allowing essentially to bring foreign markets. For example, if the plan to build the Northern latitudinal line, which will connect Tomsk and Khanty-Mansiysk, was implemented in 2012, the

²² To solve the problem with the dimension (million rubles / sq. km), it is assumed that it is located on an area of 1 sq. km.

²³ It is also possible that we are talking about the industry average enterprise, which has all industries as well as the average for the regions of Russia, but it is clear that the EGP potential will also be different for enterprises of different specialization. It is higher for enterprises producing consumer products.

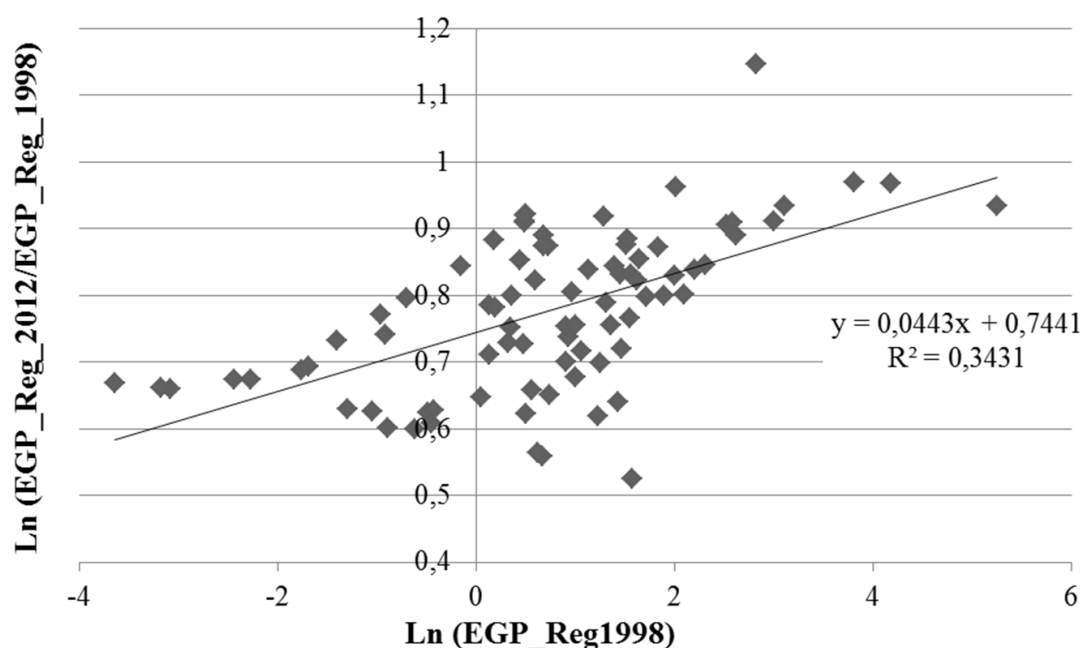


Fig. 4. The relationship between the potential of an interregional EGP in 1998 and its growth over the period 2012–1998

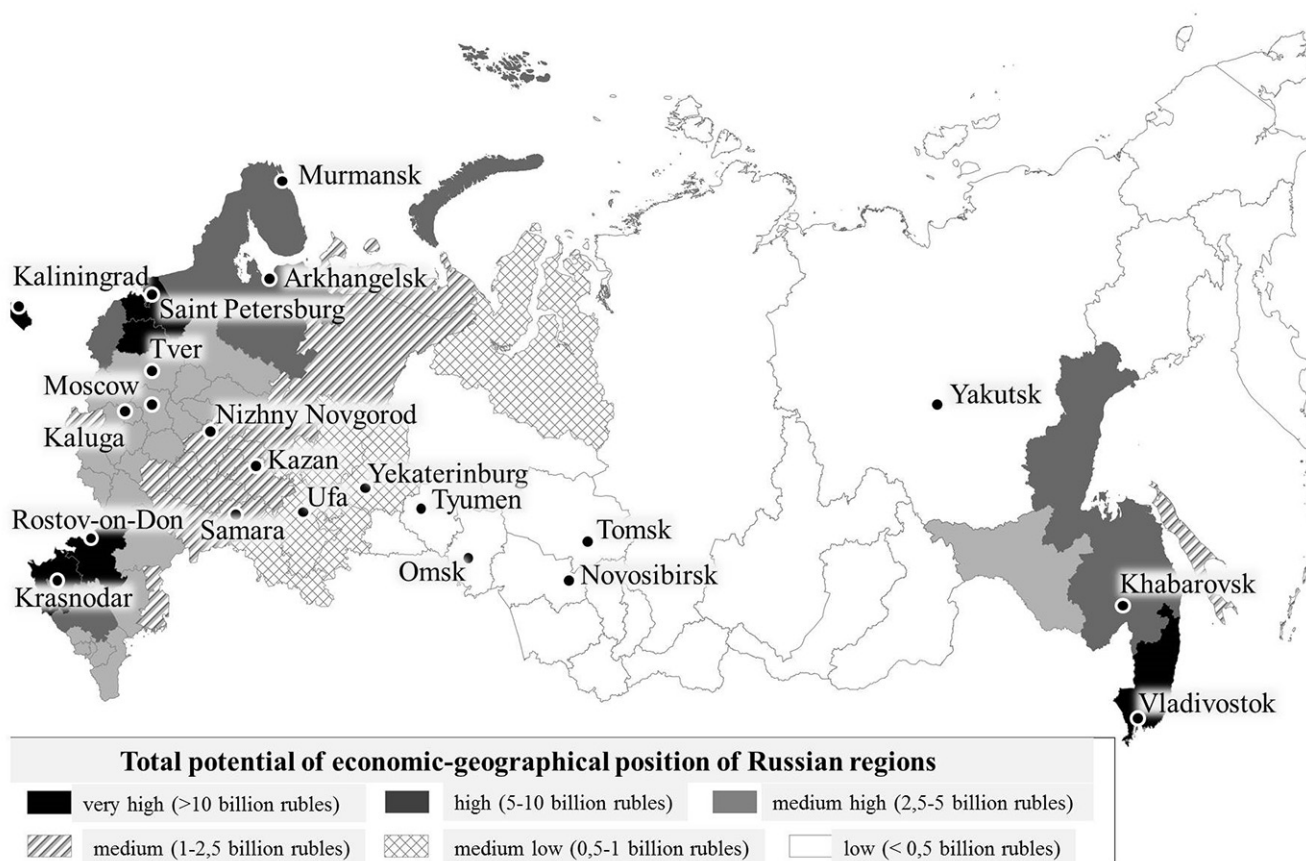


Fig. 5. The total potential of interregional and international EGP of the Russian regions in 2012

potential of an interregional EGP of Tomsk region have been already increased from 3.05 up to 5 million rubles, i.e. 60 %.

The maximum potential of the international EGP (more than 10 billion rubles) is concentrated in the regions of the Baltic Sea (Kaliningrad and Leningrad region, St. Petersburg), the Black Sea (Krasnodar Territory and Rostov Region), the Sea of Japan (Primorsky region) and in close proximity to

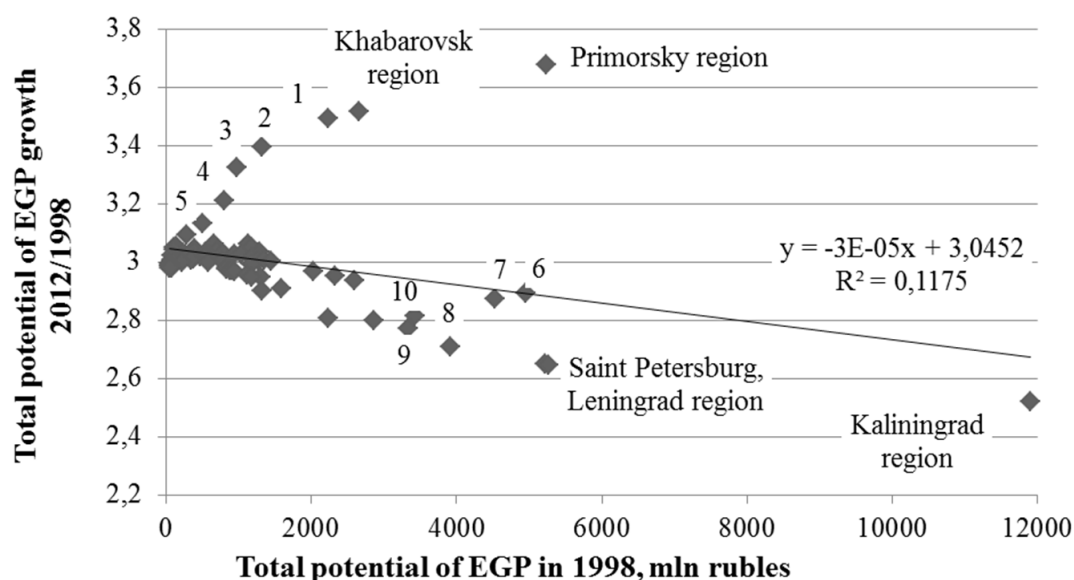


Fig. 6. The relationship between the total potential of EGP in 1998, the base and its growth over the period 2012–1998.

Note: The numbers on the graph show 1 — Jewish Autonomous Region, 2 — Orel region, 3 — the Republic of Dagestan, 4 — Amur Oblast, 5 — Sakhalin region, 6 — Krasnodar region, 7 — Rostov region, 8 — Novgorod region, 9 — Murmansk region, 10 — Arkhangelsk region

them (Novgorod region). The worst international *EGP* (capacity less than 50 million rubles) are in the Chukotka Autonomous District and the Republic of Tyva.

The maximum international *EGP* potential growth (more than 3.5 times) was observed in the southern regions of the Far East: the Primorsky and Khabarovsk regions and the Jewish Autonomous Region. The uniqueness of the Russian Far Eastern regions position is that they are on the periphery of economic activity in Russia (Fig. 3) but close to the rapidly growing markets of Asia-Pacific countries [13, 80]. The lowest growth rates (less than 2.5) were demonstrated by the regions close to the slow-growing Nordic countries: St. Petersburg, Leningrad and Kaliningrad regions.

The potential of an interregional *EGP* increased by 2.2 times in 1998–2012, and the potential of an international *EGP*—by 3 times²⁴. In other words, it was more profitable for economic agents to focus on a foreign trade in this period.

The total potential of *EGP* comprises interregional and international components (Fig. 4). The total potential is mainly concentrated near the major port centres of Russia. The leaders in 2012 were Primorsky, Krasnodar, Leningrad, Rostov region and St. Petersburg. Moscow region, the leader of the interregional *EGP* potential, ranks only 21st place on the total potential.

There is a weak convergence of the total *EGP* potential (Fig. 6) with a strong division of trends between Far Eastern regions and the regions of the European part of Russia. If the first is characterized by the divergence (the higher the capacity in 1998, the faster it will grow due to increased economies of Asia-Pacific countries), the situation is reversed for the second (regions with smaller potential grew slower). In the southern regions of the European part of Russia, the *EGP* potential has increased more significant in spite of the negative trends in the economies of the southern countries of the European Union (EU).

Comparing of the total *EGP* potential with an existing *GRP* of regions can show how they realize the advantages of their positions (Fig. 7).

The potential benefits of economic cooperation with other regions and countries for the Republic of Ingushetia, the Jewish Autonomous Region, Republic of Kalmykia, the Kaliningrad region, Karachaevo-Circassian Republic are higher than their real *GRP*. The Republic of Ingushetia underutilized benefits from its position near the port facilities in the Krasnodar region and the main traffic arteries in the Caucasus because of the weak development of the economy, institutional and social barriers and poor

²⁴ Note that in dollar terms inflation is not taken into account for the countries of the world.



Fig. 7. The ratio of the total potential of EGP and GRP of Russian regions in 2012

infrastructure²⁵. Kaliningrad region²⁶ is located near the largest European market, but the *EGP* potential is not fully realized because of high trade barriers and isolation from the rest of Russia.

The total *EGP* potential of Kaluga region amounted to about 2.6 billion rubles, or about 20 % of the *GRP*, despite the rapid growth of auto industry cluster, the *EGP* potential is not fully used.

At the same time, the regions of Siberia, the Urals, the Republic of Tatarstan and Bashkortostan, as well as Moscow and St. Petersburg is almost fully utilized the potential.

2. The relationship between the *EGP* potential and indicators of socio-economic development of regions

To test the hypothesis about the influence of the *EGP* potential on socio-economic development of Russian regions, the correlation coefficients with a number of indicators were calculated (Table. 4, Fig. 8–9).

The higher total *EGP* potential is in the region, the higher proportion of imports in *GRP* is, as well as technology import, a number of enterprises per 1,000 employees, a share of employment in trade, mobile communication and the Internet development. The high interregional *EGP* potential is related to higher population density, *GRP*, investment, including FDI, and export of goods and technologies.

The relationship between the *EGP* potential and other indicators changed over time (Fig. 8–9).

In the early period, the proportion of people employed in trade was significantly higher in regions with high total *EGP* potential, that is close to the foreign markets in a period of “shuttle” trade, but then the connection with the potential of interregional *EGP* grew up. In the late 90’s, the migration indicator was higher in regions with the high total *EGP* potential, but the regions of the European part of Russia with a high potential of interregional *EGP* became more attractive due to its economic development. At the end of the 2000s, the implementation of large investment projects in seaside regions (Sochi Olympic games 2014, APEC Summit 2012 and others) have led to an increase in the correlation coefficient between the total *EGP* potential and shares of investments in the *GRP*.

²⁵ We note that the *EGP* potential does not include infrastructure constraints of mountainous and remote areas.

²⁶ A detailed description of Kaliningrad region *EGP* is given in [33].

The correlation coefficients between the *EGP* potentials and indicators of socio-economic development of the Russian regions in the period 1998–2012

Indicators of socio-economic development of the Russian regions	Total potential of EGP, million rubles	Potential of interregional EGP, million rubles
GRP, million rubles		0,21
Growth of GRP, %	0,06	
Investments in fixed assets, million rubles	0,14	0,33
Ratio of fixed investment to GRP, %	0,15	
Export, million rubles		0,18
Ratio of imports to the GRP, %	0,56	0,18
Foreign direct investments, million rubles		0,33
Number of enterprises per 1,000 employees	0,24	0,2
Share of employment in wholesale and retail trade, %	0,24	0,15
Population density, persons per km ²	0,11	0,41
Urbanization, %	0,07	0,16
Net migration, migrants per 10 thousand citizens	0,11	0,16
Technology export, million rubles	0,1	0,24
Technology and technical services import, million rubles	0,23	0,23
Number of mobile phones per 1000 citizens	0,26	0,18
Number of personal computers with Internet access per 100 employees	0,22	0,12

Note: all the coefficients are significant at the 5 % p-value.

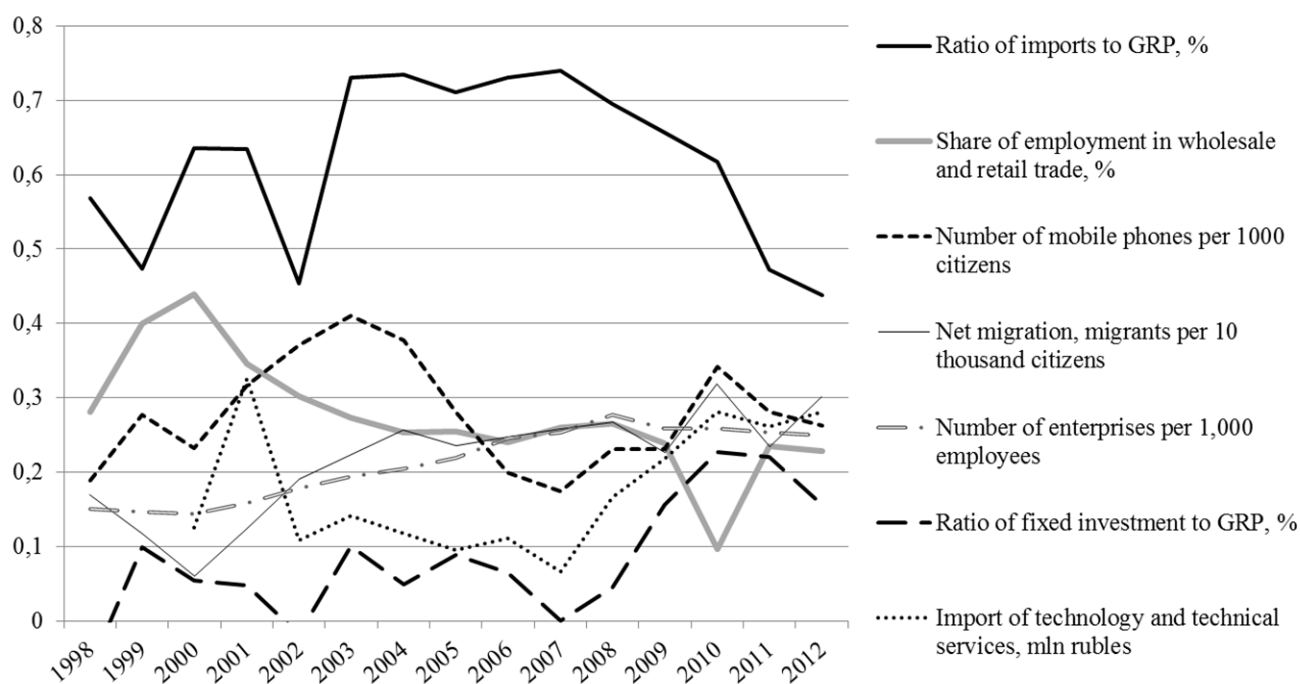


Fig. 8. Dynamics of the correlation coefficient between the potential of an interregional EGP and several indicators of socio-economic development of the Russian regions

Conclusions

Based on the review of the literature the category of economic-geographical position (*EGP*) was formalized, which is a historically evolved, but varying set of spatial relations between economic agents in a region and external factors, potentially influencing the regional development.

The developed method the *EGP* potential assessment, based on the use of gravity models, can further be widely used in regional studies to explore the benefits of the different locations of spatial

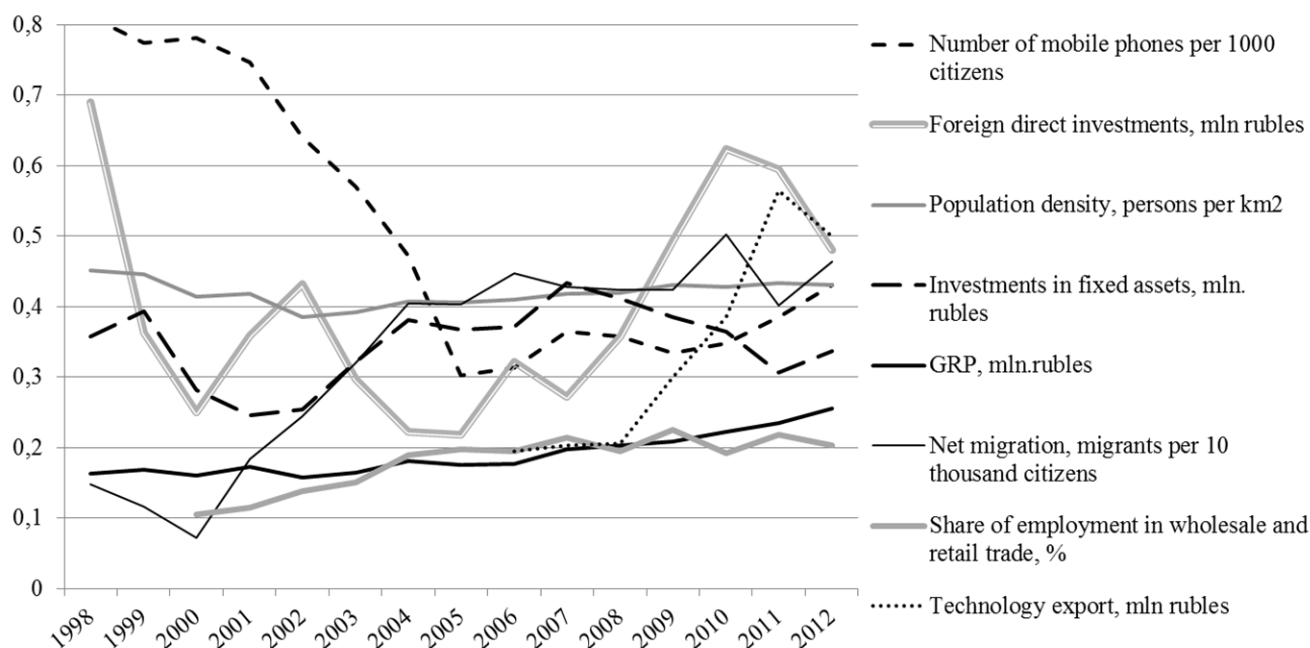


Fig. 9. Dynamics of the correlation coefficient between the total potential of EGP and several indicators of socio-economic development of the Russian regions

objects (countries, regions, cities, etc.). Calculations of the potential of the international EGP of the Russian regions have been carried out for the first time.

These calculations for the Russian regions showed a significant spatial differentiation. The maximum potential of interregional EGP have the regions located near the Moscow and St. Petersburg agglomerations, the potential decreases uniformly to the east. The maximum potential of the international EGP is concentrated in the regions on the coast of the Black Sea, the Baltic Sea and the Sea of Japan.

The total EGP potential of the Kaliningrad region is 5.6 times higher than in distant inland region—the Republic of Tyva, that is 5.6 times more profitable for economic agents located on the Baltic coast near the large EU market than within the continent away from the sea and major markets.

A significant change in the total EGP potential was found in the 2000s. It shifts towards the southern regions of the Far East due to the growth of the economies of the Asia-Pacific region. There is a divergence of the potential of the interregional EGP, while the potential of the international EGP has two trajectories for the Far Eastern regional group, which is characterized by divergence and other regions with weak convergence.

When comparing total EGP potential with the existing GRP, regions with high and low utilization efficiency of its EGP were identified. The Kaliningrad region, the North Caucasus republics have more opportunities to build the regional economy by harnessing the benefits of their position. The regions of Siberia, the Urals, the Republic of Tatarstan and Bashkortostan, as well as Moscow and St. Petersburg, is almost completely using their EGP potential.

It was found that the favourable EGP is one of the factors of GRP growth, investment growth, foreign trade, migration increase and diffusion of new technologies.

Formalizing EGP allows using it as a method for externalities evaluation of infrastructural projects and to predict the spatial changes in the socio-economic development of Russia.

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