

Knowledge-Based Development of Russian Regions and Growing Inequality

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Abstract. The article contains an analysis of the Russian knowledge-based economy at the meso-economic (regional) level in the period from 2005 to 2015. Authors assess the main parameters of the development of the constituent entities of the Russian Federation, including the regional innovation system and the education system, ICT infrastructure and environmental conditions of life. It has been proven that the background of the knowledge-based economy in Russia (ICT and the ecological environment) is characterized by a converging trend, and the core of the knowledge-based economy (the educational system and the innovation system) is characterized by a divergent trend. Differentiation of education systems in the Russian regions increases during 10 years of analysis, therefore, the ability of peripheral regions to switch to knowledge-intensive is steadily decreasing. The gap between leaders and outsiders (the overwhelming majority of regions) of the development of a regional innovation system is maximum. Authors conclude that the preservation of a liberal-oriented meso-economic policy in Russia will contribute to the formation of an asymmetric model of the knowledge-based economy.

1. Introduction

An unevenness of regional development is characteristic for all countries in the world and all historical periods. An origin of that unevenness is related to historical, geographical and socio-economical factors [1-3]. Unfortunately, Russia is not an exception to the regional unevennesses. So, the most part of a population and productive capacity is located in the centre and in the south of European part of Russia's territory, but the most part of natural resources – in the north-east of European part and in Asian part of the territory. These regions may be defined as regions with rigorous climate, huge economic costs and poor infrastructure's development [4].

A scale of regional disproportions in Russia can be described with a help of one statistical illustration. According to gross regional product (GRP) per capita index, the most prosperous Russian regions are similar to the developed countries. In opposite to this fact, the most unsuccessful regions have the same indexes as the least developed countries in Africa and Asia. For example, GRP per capita indexes of oil-producing Russian regions (Nenets, Yamalo-Nenets and Khanty-Mansi Autonomous Areas) corresponds to GNP per capita indexes of the first 20 countries in the world rating. Indexes of two most problematic Russian regions (Chechnya and Ingushetia Republics) and

two new federal subjects of Russia (Crimea Republic and Sevastopol, the city of federal importance) are less than 2000 USD, so it corresponds with the least developed countries of the world like Congo, Ghana and Pakistan. Thus it is possible to say that regional differentiation of economic development in Russia has global scales [5-7].

Well known that regional unevennesses are sensitive to the factors of global economic development. Currently one of this type factor's geneses occurs in the frame of socio-economic transformation in developed countries. According to our opinion, these processes can be well-described with a usage of knowledge-based economy conception [8-11]. The wide-sense knowledge-based economy can be described as an economy, in which humans create, distribute and use scientific knowledge for a self-development in harmony with Nature, Society and State.

2. Methodology and methods

Quantitative evaluation of knowledge-based regional development can be done with the help of *knowledge-based economy index (KBEI)* method. KBEI calculation bases on factor methodology and includes four factors: *education, environmental conditions of life, information and telecommunication (ICTs) infrastructure and regional innovative system*. Each of these factors includes few indicators, which was chosen according to existing methodological approaches to evaluation of an innovation process in the economy. Choosing of these indicators also reflects the capabilities of the Russian system of state statistics. The value of KBEI and subindexes $\in [0; 10]$, where "0" refers to a hypothetical region with the lowest value of every single indicator, and "10" refers to a hypothetical region with the highest value of every single indicator.

The main goal of this work is research of the differentiation of Russian regions' economy in the context of it knowledge-based aspects and defining the main trends of regional differentiation' changes from 2005 to 2015. For the aims of analysis, we used values of KBEI and its subindexes for Russian regions in between 2005 and 2015.

The analysis of regional unevennesses of the knowledge-based economy includes calculation of four *quintile coefficients* $Q_i(X_j)$, which characterizes the ratio between average value of subindexes of education, environmental conditions of life etc. (X_j) of the first 20 percent of regions rated by the value of corresponding subindex and an average value of the next i percent regions

$$Q_i(X_j) = \frac{\bar{X}_{Q_{1j}}}{\bar{X}_{Q_{ij}}} \quad (1)$$

where X is a j -subindex of the knowledge-based economy, i is a number of quintile, $\bar{X}_{Q_{ij}}$ is an average value of j -subindexes of regions of i quintile.

The value of quintile coefficient $\in [1; +\infty)$. If $Q_i(X_j) \rightarrow 1$, the differentiation between the first ($i=1$) and the i group of regions is insufficient and vice versa.

The quintile coefficients for years between 2005 and 2015 were calculated based on the rating of regions in the year 2005. This method allows estimating not only structural but dynamical aspect of differentiation.

3. Results

Cross-regional proportions of knowledge-based economy' development in Russia are relatively stable in the past 10 years of analysis (figure 1). KBEI grew up from 3.7 (2005) to 3.9 (2011) and then fell above the original level to 3.6 (2015). KBEI is a complex index so it smoothes the heterogeneity of the dynamic of four directions, aspects of the knowledge-based economy. But values of subindexes of these directions show the heterogeneity of levels and dynamics.

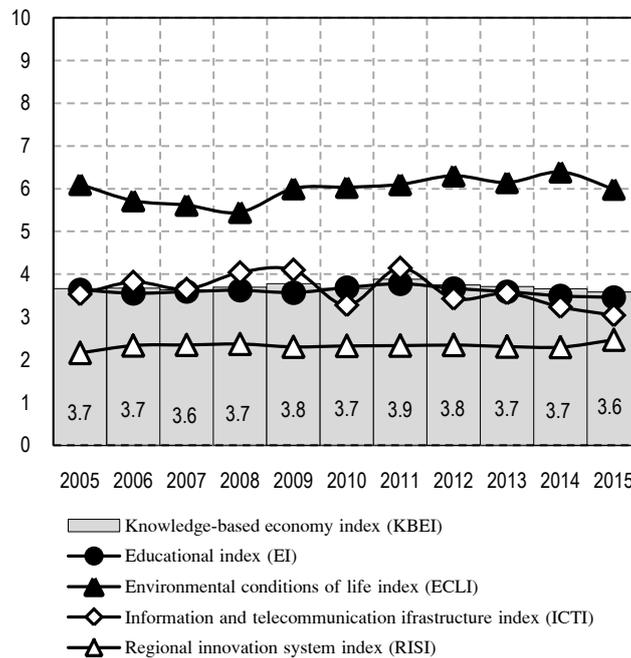


Figure 1. The dynamic of average values of the knowledge-based economy index and its subindexes for Russian regions from 2005 to 2015.

The highest values correspond to Environmental conditions of life index (ECLI). It demonstrates stable growth between 2008 and 2014 (the pike value is 6.4) and then falling in the year 2015 (to 6.0). Comparatively lower values correspond to Educational index (EI) and ICTs infrastructure index (ICTI): the first index hesitates in the interval 3.5–3.8, the second index – in the interval 3.0–4.1. These indexes repeat the dynamics of KBEI with a slow growth between 2005 and 2010 and following decline between 2010 and 2015. The lowest value corresponds to Regional innovation system index (RISI) and equals to 2.2–2.5. The dynamics of RISI has a stable positive trend (minimal value corresponds to the year 2005 and maximum value – to the year 2015).

An average value of KBEI and its subindexes can be interpreted as indicators of knowledge-based economic development differentiation. In other words, it is a deviation of the vast majority of regions from two hypothetic models: a positive and a negative.

Real referents of a positive model in Russia are two cities of federal importance: Moscow and Saint-Petersburg. Average value of KBEI for Moscow in the last 10 years equals to 7.7, for Saint-Petersburg – 7.0 (table 1). Relative development of the knowledge-based economy in these cities twice surpasses an average development of other Russian regions. Two megapolises have well-developed educational and scientific infrastructures, households and firms are secured to modern ICTs, a knowledge is used in the production of goods and services. These aspects represent well the concept of knowledge-based development be used.

Chukotka Autonomous Area and Tuva Republic can be contingently named as outsiders of knowledge-based regional development. The first region has low-developed educational and scientific infrastructure, but a relatively high standard of living (GRP per capita equals to 21 000 USD). Per contra GRP per capita value in Tuva Republic equals to 2100 USD, but education and science are more developed in the region.

Comparison an average value of KBEI for subjects of Russian Federation (and its subindexes) with values of regional leaders and outsiders of knowledge-based development allows concluding that on average Russian regions are much closer to the periphery of knowledge-based economy (the distance is equal to 1.5 units of maximum 10) than to its center (the distance is equal to 3.7 units of maximum

10). The maximal gap between Moscow, Saint-Peterburg and the vast majority of Russian regions reveal in the development of regional innovation systems. Thus the economic aspect of knowledge-based economy practically absent in the most regions.

Table 1. Values of KBEI for leaders and outsiders of knowledge-based development in Russia.

Subject of Russian Federation	Value of KBEI			
	2005	2010	2015	An average value, 2005–2015
Moscow	7.7	7.6	7.9	7.7
Saint-Petersburg	6.8	6.8	7.1	7.0
<i>An average value for subjects of Russian Federation</i>	3.6	3.6	3.5	3.6
Chukotka Autonomous Area	2.3	1.9	2.8	2.1
Tuva Republic	2.2	2.5	2.0	2.3

More detailed analysis of regional differentiation available through using of quintile indexes method (figure 2).

Educational systems’ differentiation. According to figure 2, Russian regions are highly differentiated by the level of educational systems’ development. It should be borne in mind that EI includes only comparative indexes not quantitative or qualitative. In the case of accounting of quantitative and qualitative indexes, the scale of the differentiation would be much larger. Herewith, positions of Russian regions in the context of educational system’s development are stable; scales of educational systems in first 80 percent of regions grows linearly (according to values of quintile coefficients Q2-Q4), so there are four groups with different development levels; the differentiation of educational systems in Russian regions increases within 10 years of analysis, leaders in the base period (2005) develops more dynamically than outsiders.

Environmental conditions of life’ differentiation. It can be noted that the differentiation of Russian regions by the environmental conditions of life (like air purity, water quality etc.) is minimal among four analysed aspects of the knowledge-based economy. Herewith, positions of regions in environmental context are stable, the differentiation of the first 80 percent of regions is minimal (values of quintile coefficients Q2, Q3 and Q4 do not exceed 1.3). Also, the level of the differentiation is stable in all analysed period of time.

ICTs infrastructures’ differentiation. The shaping of ICTs infrastructure in Russian regions less-differentiated than educational systems. Herewith, positions of Russian regions relative to each other in the context of ICTs infrastructure are unstable; the development of ICTs infrastructure has small differentiation because values of quintile coefficients Q2, Q3 and Q4 do not exceed 1.3. Also, the differentiation between leaders and outsiders dynamically shrinks.

Regional innovation systems’ differentiation. Systems of reproduction and economical utilization of knowledge in Russian regions are characterized by the huge level of the differentiation, the most similar to differentiation in educational systems’ development. Figure 2 shows, that positions of Russian regions relative to each other in the context of regional innovations systems are unstable. The gap between the first 20 percent of regions and other 80 regions (values of quintile coefficients Q2–Q5) is maximal.

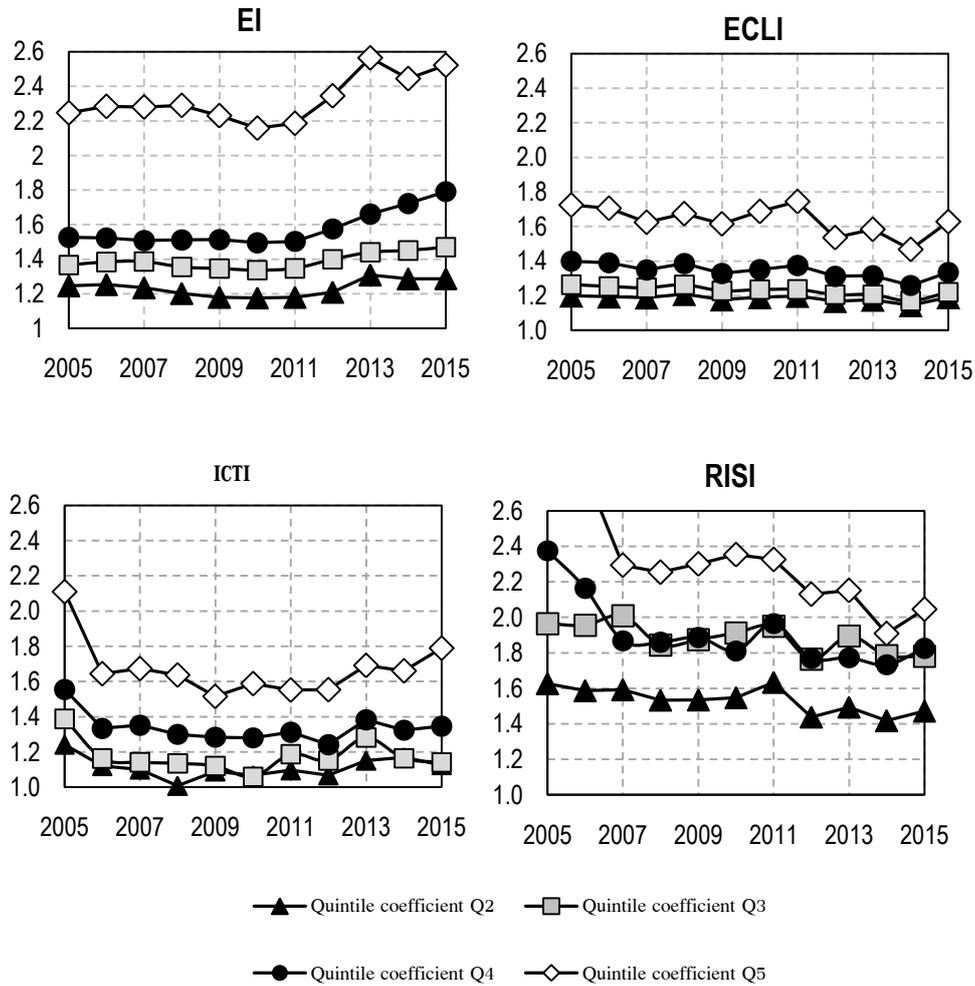


Figure 2. The dynamic of quintile coefficients of knowledge-based economy subindexes (EI, ECLI, ICTI, RISI) for Russian regions from 2005 to 2015.

4. Conclusions

According to regional section Russian knowledge-based economy is extremely ambivalent. From the one hand, the background of the knowledge-based economy (ICTs and ecological environment) is characterized by the convergent trend, because cross-regional differences shrink between 2005 and 2015. From another hand, the core of knowledge-based economy (educational system and innovation system) is characterized by the divergent trend. The differentiation of educational systems in Russian regions increases within 10 years of analysis, so peripheral regions’ possibilities of shifting to the knowledge-intensive development steadily decline. The gap between leaders and outsiders (the vast majority of regions) in regional innovation system’s development is maximal. The productiveness and effectiveness of leaders’ and outsiders’ regional innovation systems are incommensurable.

The analysis of regional dynamics of the knowledge-based economy in Russia shows that the home market effect [12-14], path-dependence [15-17] and same effects rules here. These effects leads to the conservation of inequality [18-19]. Since the territories rich in natural resources are deprived of incentives for the development of high-tech sectors of the economy, this may contribute to the conservation of the existing sectoral structure in these territories [20]. Therefore, it is safe to say that the conservation of liberal-orientated regional economic policy in Russia will contribute to the shaping of asymmetrical model of knowledge-based economy, in which the minority (of regions, population or social groups) will have an access to knowledge-based development advantages, but the majority will

have to be content with diminishing abilities and goods of industrial economy and bear socio-economic costs of knowledge-based economy becoming.

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