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Inequality of Spatial Development of Higher Education in Russia*

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***Abstract*—Regional higher education systems are closely linked to the economic, — innovative and cultural development of the regions. Its effectiveness, in turn, contributes to the country's economic growth and international competitiveness. These trends are actualized by studies aimed at assessing the effectiveness of higher education systems. The purpose of the article is to identify the regional differences in the concentration of students and revenue in the regional systems of higher education of the Russian Federation. The article uses the methods of economic and statistical analysis, calculated the Herfindahl — Hirschman index to assess the concentration of the number of students and the value of revenue in regional higher education systems. The applied value of the research results lies in the possibility of creating a typology of regional systems of higher education in the regions of Russia by the level of concentration of universities. The assessment of territorial differences in the level of concentration of students and university revenue in the regions of Russia allowed identifying the prospects of regional higher education systems as a source of economic, innovative and socio-cultural development of the region.**

Keywords—education; regional higher education system; regional economy; Herfindahl — Hirschman index; efficiency

I. INTRODUCTION

There is no doubt that the reasons for the uneven regional economic development are largely due to differences in the level of education. Regional higher education systems are closely linked to the economic, innovative and cultural development of the region [1], [2], [3].

Low efficiency and quality of higher education leads to lower rates of growth of new technological structures and low innovative activity. The decrease in the competitiveness of innovative companies affects the level of budget revenues, the standard of living of the population. This is determined by the processes of migration of young people to more economically prosperous regions of the country. Thus, the regions are deprived of their most valuable human capital [4], [5].

From these positions, the analysis of regional systems of higher education is highly relevant. At the same time, attention is drawn to the insufficient development of the methodology for assessing the effectiveness of regional higher education systems. This applies not only to the surface performance criteria (for example, the number of bachelors, masters, doctors of science), but also indirect criteria. Among the latter, we note the spillover effects in relation to innovation, quality of management, development of the socio-cultural sphere, etc. [6], [7], [8].

The national system of higher education consists of regional systems of higher education. Its effectiveness, in turn, contributes to the economic growth and international competitiveness of the country. These trends are actualized by studies aimed at assessing the effectiveness of higher education systems.

The purpose of the article is to identify regional differences in the concentration of students and revenue in the regional systems of higher education of the Russian Federation.

The objectives of the article:

- substantiation of the methodological approach by using the Herfindahl — Hirschman index to assess the level of concentration of some indicators of regional higher education systems;
- analysis of territorial differences in the concentration of students and revenue in regional systems of higher education of the Russian Federation;

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- building a typology of regional higher education systems according by the concentration of universities in them.

The methodological basis of the study is the testing of the author's methodology for identifying differences in the concentration of key indicators in regional systems of higher education.

The article uses the methods of economic and statistical analysis, calculated the Herfindahl — Hirschman index to assess the concentration of students and the value of revenue in regional higher education systems.

II. THEORETICAL ANALYSIS

In the modern studies indicated that for the functioning of innovative-technological economy needs the investments, well developed infrastructure, effective development institutions, security of intellectual and scientific-technical potential [9], [10]. But the quality of human capital is the main engine of economic growth.

The importance of higher education in the formation of the human capital determines the relevance of studies of the regional educational systems and its impact on the effectiveness of regional economics and economic growth. The contribution of higher education to the regional economy, training, knowledge generation, diffusion of innovation, the formation of new technological structures and socio-economic development is considered as a new and significant factor of economic growth at the regional and national levels in all countries.

Through the education system, inequality in society and the economy is reproduced in the first place. The high degree of disproportions in the development of Russian regions causes a decrease in the competitiveness of the country as a whole and its individual subjects, the heterogeneity and imbalance of the socio-economic space of Russia and is a deterrent to sustainable development.

Due to the huge differences in the distribution of natural resources among the actors and the peculiarities of their geographical location, it will not be possible to achieve economic "equalization" of regional development. Non-equality of regions in the level of development of research activities, in the effectiveness of research contributes to the inequality of the level of innovative development.

The concentration of intellectual resources in the central regions leads to further degradation of the peripheral regions. In these conditions, it is necessary to reduce the differences in the level of human capital accumulation between the subjects of the Russian Federation.

The Russian higher education system is a relevant object for the analysis of such problems. As of 2018, there were more than 1400 educational organizations and its branches in the Russian Federation, there were 4.6 million students studied in 28 enlarged groups of specialties and 440 areas of training, 88% of students studied in state and municipal universities and 12% of students studied in private universities [11].

All of them are characterized by spatial inequality and very significant differences in a number of parameters. Different number of universities, number of students, cost of education, size and structure of revenue and level of economic development of different Russian regions has an impact on the organization and functioning of regional higher education systems in the regions.

III. RESEARCH METHODOLOGY

A. Data and Indicators

The information base of the study is the data of the Federal service of the state statistics of the Russian Federation, the materials of Monitoring of graduates employment and the Ministry of science and higher education of the Russian Federation, a Single inter-departmental information and statistical system.

To calculate the comparative characteristics and level of concentration of the regional higher education systems, a sample of data on all of 769 universities at the time of this study in 2017 from 79 regions of the Russian Federation was formed using information of official statistical reporting of universities on the base of indicators of each university [12], [13]. Then we aggregate this to estimations by regional higher education systems.

B. Model

The functioning of regional higher education systems is largely determined by the number and effectiveness of its constituent universities. We used the Herfindahl — Hirschman concentration index (HHI) to analyze the concentration. It is used in international practice to quantify the level of concentration of objects.

To determine the concentration of the distribution of higher education institutions in terms of the number of students and the amount of revenue in the regions of Russia, the Herfindahl — Hirschman concentration index was calculated using the following formula (1):

$$HHI = \sum Yi2, \quad (1)$$

где Yi — the share of students of all forms of education of the i-th university in the total number of students in the region.

The same formula (1) was used to calculate the distribution of universities revenue from all sources between them in the region.

The economic interpretation of the index is as follows. The closer the value of the HHI index is to 0 — it is the more evenly the studied feature is distributed across the region (between the universities represented in it), the closer to 1 — it is the more significant its concentration in one of the universities in the region.

C. Results

HHI values was calculated for the distribution of the number of students and revenue by institutions of higher education in the regions of Russia. As a result on the data of 79 regional systems of higher education, the following estimates of HHI index for regional systems of higher education were obtained, presented in the "Fig. 1".

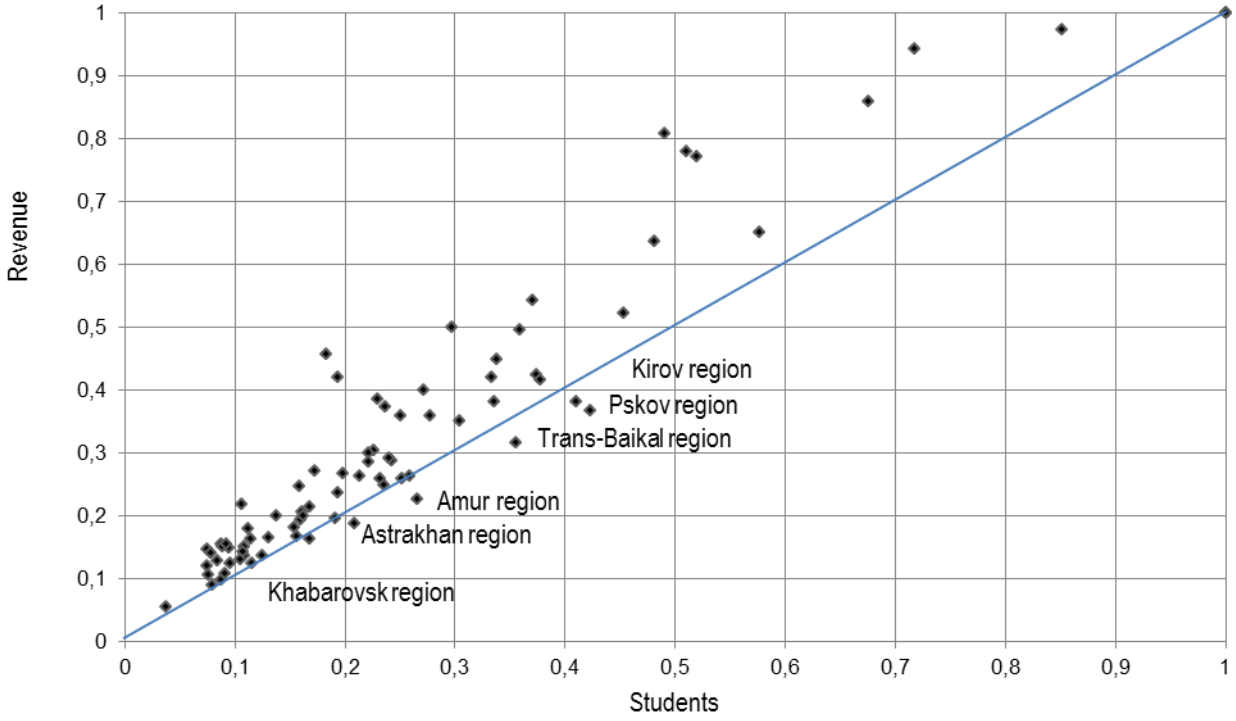

Fig. 1. Distribution of regions of the Russian Federation according to the HHI, calculated on the base of and amount of students and revenue, 2017.

What conclusions can be drawn from the graph? First of all, the differences between HHI in student and revenue distribution are important. The bisector on the chart shows the possible equal values of the index for the two indicators under consideration. In the vast majority of regions, HHI is higher in revenue than HHI in students. This situation is quite justified, since the potential for revenue generation by HPE institutions, including through research activities, is concentrated in a smaller number of institutions, compared with the potential of teaching. Only a few regions stand out from the general background (they are signed on the chart). Note that these regions are not the most populated and they accommodate a relatively small number of universities.

Starting from HHI values of more than 0.3 by revenue, there is a group of regions where the concentration of university revenue is significantly higher than the concentration of students. Particularly notable are Mari El Republic, Primorsky region, and Magadan region.

A significant difference in the values of HHI suggests a significant inequality in the distribution of revenue and students in universities. At the upper right end of the bisector, there is a point that represents the value of HHI for three regions at once. This is Republic of Altai, Jewish Autonomous region, Chukotka Autonomous district. Because they represented only one institution of higher professional education and the values of the HHI will be equal to one.

IV. Discussion and Conclusion

The applied value of the calculations is the possibility of creating a typology of regional systems of higher education in the regions of Russia in terms of the concentration of universities.

We have identified five groups of regions with different HHI ratios in terms of number of students and revenue (see "Table I").

TABLE I. GROUPING OF REGIONS BY THE LEVEL OF HHI IN REGIONAL SYSTEMS OF HIGHER EDUCATION BY REGIONS, 2017

Type of region	Regions of the Russian Federation
Type I ***The relatively low level of concentration of students and revenues of the universities with the region-ahead revenue concentration***	Saint-Petersburg; Omsk region, Kemerovo region, Novosibirsk region, Chelyabinsk region, Samara region, Yaroslavl region, Voronezh region, Irkutsk region, Smolensk region, Volgograd region, Kaluga region, Rostov region, Nizhny Novgorod region, Saratov region, Bryansk region, Ivanovo region, Orenburg region, Lipetsk region, Kursk region, Ryazan region, Sverdlovsk region, Ulyanovsk region, Orel region, Kurgan region, Tyumen region, Tver region, Tomsk region, Vologda region, Tambov region, Leningrad region, Tula region, Penza region, Murmansk region, Kaliningrad region, Belgorod region, Vladimir region, Kostroma region, Arkhangelsk region, Stavropol region, Altai region, Krasnodar region, Perm region, Krasnoyarsk region, Kamchatka region, Primorsky region, Republic of Dagestan, Republic of Tatarstan, Republic of Bashkortostan, Republic of Karachay-Cherkessia, Republic of Mari El, Republic of Kabardino-Balkaria, Republic of Yakutia, Republic of Chechnya, Republic of North Ossetia, Republic of Udmurtia, Republic of Buryatia, Republic of Chuvashia, Republic of Komi, Khanty-Mansi autonomous region, Yamalo-Nenets autonomous region
Type II ***Relatively low concentration of students and revenues of universities in the region with a higher concentration of students***	Pskov region, Kirov region, Astrakhan region, Amur region, Trans-Baikal region, Khabarovsk region
Type III ***The relatively high concentration level of students and revenues of the universities in the region-ahead revenue concentration***	Novgorod region, Magadan region, Sakhalin oblasts, Republic of Karelia, Mordovia region, Republics of Adygea, Republics of Kalmykia, Ingushetia, Republics of Tuva, Republics of Khakassia
Type IV(HHI value=1) ***Monopolistic regional systems of high education***	Republic of Altai, Jewish autonomous oblast, Chukotka autonomous okrug
Type V ***Relatively high concentration of students and revenue of universities in the region with a higher concentration of students***	Not represented

The assessment of territorial differences in the level of concentration of students and revenue of universities in the regions of Russia allows us to identify the prospects of regional higher education systems as a source of increasing the innovative potential of the region. The most relevant to this task are those regional higher education systems, in which, firstly, the HHI value in terms of the number of students and the amount of revenue will be less than 0.3, and secondly, the differences between the same indicators will not differ more than 2 times.

It is assumed that such a diagnosis of higher education systems in the territorial context on an annual basis will determine the direction of the dynamics of the concentration of key indicators of education and will contribute to regional innovation development.

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