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# EFFICIENCY OF REGIONAL NETWORKS OF HIGHER EDUCATION ORGANIZATIONS IN A COMPETITIVE ENVIRONMENT

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- Leshukov O., Gromov A., Platonova D., Evseeva D. G. "Assessment of the Contribution of Regional Higher Education Systems to the Socio-Economic Development of the Russian Regions" (translation from Russian). Russian Education and Society, 2017, no. 59, pp. 68-93.
- Leshukov O.V., "Model of federal-regional relations in the governance of higher education in the Russian Federation: challenges and development trends." Economics of Regions, 2020 vol. 16, no. 1, pp. 201-212.
- Agasisti T., Egorov A., Zinchenko D., Leshukov O., "Efficiency of regional higher education systems and regional economic short-run growth: empirical evidence from Russia." Industry and Innovation 2020, pp. 1-28.
- Leshukov O. V., Lisyutkin M. A., "Governance of regional higher education systems in Russia: possible approaches." University Management: Practice and Analysis, 2015, no. 6, pp. 29-40.
- Gabdrakhmanov N. K., Leshukov O. V., Platonova D. P., "Provision of budget places for regional higher education systems considering demographic trends." University Management: Practice and Analysis, 2019, vol. 23, no. 4, pp. 32-45.

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- Conference of the Comparative and International Education Society (San Francisco, 2019). Talk: "Comparative analysis of the models of national-regional relationships in higher education in 'federal type' systems"
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- International Conference of the Consortium of Higher Education Researchers (Lisbon, 2015). Talk: "Does competition matter? Efficiency of regional higher education systems and the role of competition: the case of Russia"
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**Introduction**

Over the last few decades, most countries in the world have witnessed a sharp expansion in the higher education segment [Cantwell, et al, 2018]. An increasing number of people are striving to improve their educational level for obtaining future positive returns [Kuzminov et al., 2019; Kapelyushnikov, 2013]. This has led to an increase in the number of universities worldwide, including the emergence of new providers of higher education services (corporate universities, massive online course platforms, etc.). The increasing complexity of the organizational landscape raises the question of the efficiency of governance models in the higher education sector, which does not have clear and uniform assessment metrics. Criteria for assessing the educational sector include the quality assurance of education, the accessibility of educational services, research productivity, etc. There may also be other metrics for assessing higher education among its different stakeholders - students, employers and the state.

The development of the public administration of higher education over the past decades is considered in the context of the transfer of market models and practices to the sphere of public regulation. It reflects the basic principle of the theory of new public management. However, most of the research papers analyzing the introduction of new public management was carried out for countries marked by the evolutionary development of market relations. This issue has been much less studied for countries that have historically evolved from the model of state control over all aspects of society (first and foremost, the countries of the former socialist camp). The administrative-command system was based on the principle of direct state administration of all aspects of the development of higher education in response to the demands of the country's economy and social sector.

While post-Soviet transformations have made it possible to use market mechanisms to coordinate the development of public sectors of the economy, the legacy of the Soviet model of command economics affects the success of current reforms [Kuzminov et al., 2013]. Therefore, the introduction of such concepts inherent in the theory of new public management as efficiency and competition is still important in the context of substantiating managerial measures for coordinating the higher education system in Russia. In addition, the higher education segment is undergoing a mixed development at the present stage. On the one hand, university education is regarded as a private good with all the inherent market characteristics (primarily, the restricted access to the good). On the other, higher education also has the traits of a public good (non-competitiveness and/or non-exclusion), which is not produced for profit [Marginson, 2017]. This view is particularly important when it comes to obtaining positive external effects from education – the general literacy of the population, innovative developments, crime reduction, etc. Therefore, it is proposed to evaluate the relevance of the applicability of such market constructs as efficiency and competition for analyzing the higher education segment from the standpoint of both private and public goods.

The search for a model of governance of higher education that integrates the instruments of direct regulation by the state and of the creation of conditions for the formation of a higher education market, which is based on competition between universities, remains relevant for Russian policy. This is justified by the fact that the development of a competitive environment in the educational services market has a positive impact on the efficiency of individual universities [Agasisti, 2009]. However, in the scholarly debate about possible ways of developing higher education in the regions of the Russian Federation, the question of the role of competition in the development of higher education at the level of regional networks of higher education organizations, rather than the level of individual organizations, remains open. This has led us to undertake an analysis from the perspective of public administration in this thesis.

An analysis of the development of university networks is embedded in the discourse of educational policy related to selecting the optimal level of regulation (centralization) of educational systems to ensure the quality of education. Traditionally, states directly regulate educational organizations by licensing, accreditation, quality assessment systems, staff appointments, the introduction of uniform educational standards, etc. However, the issues of effective governance models turn out to be especially relevant for large countries with a large number of universities and more complex management schemes with several levels of regulatory bodies. Attempts to analyze the relationship of such regulatory models and the quality of education are presented in the studies [Carnoy, et. al, 2018; Brown, et al, 1991], yet the task of finding an effective model of governance for higher education systems at the regional level remains topical for the Russian Federation.

**Elaboration of the problem**

The study of the concept of efficiency in higher education draws upon a vast bibliography of foreign and domestic research literature. The list of principle authors includes Abankina I.V., Alekserov F.T., Belyakov S.A., Gromov A.D., Gokhberg L.M., Zinkovsky K.V., Klyachko T.L., Kuzminov Y.I., Lunev A.P., Sandler D.G., Titova N.L., Froumin I.D., Agasisti T., Bru T., Bukeart Z., Jones J., Kocher M., Campkes J., Luptasik M. , McDaniela O., Noth J., Paul K., Pollith K., Payne E., Rabb R., Sibiano P., Sutter M., Horta H., and others. Most of the research of these authors measure and analyze the efficiency of individual educational organizations. The ideologists of a different approach are Hannan, Freeman [Hannan, Freeman, 2013] and Scott [Scott, 2015], who proposed a model for studying populations of organizations rather than individual organizations. The efficiency of the network of organizations in this case is not analyzed as the combined efficiency of individual organizations but is a comprehensive assessment of the network of organizations as an independent research object. Moreover, the presence of competitive forces determines selection in the population of organizations, the characteristics of their development and the patterns of internal self-regulation of the population (including even the practice of isomorphism of

organizations). No attempt to apply a similar theoretical framework to the analysis of higher education systems in the Russian Federation has been made so far. At the same time, the study of the formation of a competitive organizational ecology in higher education at the regional level was carried out in the USA [Stevens, et al., 2008]. Efficiency analysis at the level of the totality of organizations in education was considered in [Sibiano, Agasisti, 2013], [Agasisti, 2011], and [Aghion, et al., 2010]. In these studies, the efficiency of a network of organizations was not taken as the sum of the performance indicators of its individual organizations, insofar as analysis at the aggregate or system level suggests the presence of interconnections that determine the level of efficiency of the totality of objects.

A study of the research literature and an analysis of the development of higher education systems in the Russian Federation in the present dissertation show that the industrial (sectoral) educational model of governance of higher education is being replaced by a regionalized model, which should also involve the expansion of decentralization processes [Froumin, Leshukov, 2015]. Regional models for the development of networks of higher education organizations are needed in order to improve human capital. Moreover, to design tools for the development of higher education in the regional context with its high territorial heterogeneity, it is necessary to determine the criteria for the successful functioning of educational systems.

The evaluation of efficiency at a systemic level, which depends on state policy in the higher education sector, requires the development of special approaches that involve an analysis of the effects of the higher education system in a particular territory. Moreover, the task of analyzing the efficiency of higher education at the regional level in the Russian Federation should also take into account the features of regional development, such as the high heterogeneity of socio-economic regional systems, cultural and demographic differentiation, the level of interregional migration [Froumin, Leshukov, 2015; Leshukov, Lisyutkin, 2015], etc.

### 3. The purpose and objectives of the study

Thus, **the research question is to what extent the development of competitive forces in the higher education sector of the Russian Federation, with its historically high degree of direct government control, can be related to the efficiency of regional networks of higher education organizations.**

The purpose of this study is to analyze the relationship between the efficiency of regional networks of higher education organizations and the level of intra-regional competition in higher education.

Achieving this goal involves the following tasks:

- Justifying the use of the concept of regional networks of higher education organizations as an object of research.

- Proposing a methodology for assessing the efficiency of regional networks of higher education organizations in order to evaluate the efficiency index of each region of the Russian Federation.

- Characterizing the landscape for intraregional competition in higher education and assessing the level of intraregional competition in higher education using the Herfindahl-Hirschman index for each region.

- Proposing a model for assessing the relationship between the index of efficiency of regional networks of higher education organizations and the index of intra-regional competition.

- Proposing public policy measures in the Russian Federation for the development of competition aimed at improving the efficiency of regional networks of higher education organizations.

A review of the articles in the bibliography suggests that one of the main factors for increasing efficiency in the public sector is the creation and support of a competitive environment between organizations. Indeed, higher education systems with a more competitive environment are characterized by more efficient university behavior [Pollitt and Bouckaert, 2011]. Therefore, in the framework of this study, the question arises about the extent to which the development of competitive forces can be related to the performance indicators of regional networks of higher education organizations. **Our hypothesis is that the level of competition of higher education organizations within a region is related to the level of efficiency of regional networks of higher education organizations.**

**Research methods** used in the dissertation include data analysis, regression analysis, data envelopment analysis, and the analysis of regulatory documents that determine the development of networks of higher education organizations.

**The theoretical framework of the research** is based, on the one hand, on the main constructs of the theory of new public administration (and the work includes an analysis of their applicability to the higher education sector in the Russian Federation). On the other hand, the analysis of regional networks of higher education institutions is based on the theory of the population ecology of organizations [Hannan and Freeman [Hannan, Freeman, 2013], Scott [Scott, 2015].

Following this framework, the presence of competitive forces determines the characteristics of selection in the population of organizations, the patterns of their development and internal self-regulation (up to the practices of isomorphism of organizations). Such an integrated approach at the junction of several scientific fields and disciplines makes it possible to supplement the academic discourse on models of governance of complex educational systems. Current research is complementing academic discourse with insights into the genesis of management models in higher education in such a large and heterogeneous educational system as the Russian Federation.

**Assertions for the thesis defense**

- A regional network of higher education organizations can be described as the set of higher education organizations localized within a constituent entity of the Russian Federation (that was forced by the change in the sectoral principle of organization of the higher education system to the federal-regional).

- Analysis of the level of intraregional competition for students has shown that more than 50% of regional networks of higher education organizations are highly concentrated.

- The results of linear and tobit regressions show that the state of the competitive environment is associated with the efficiency of regional networks of higher education organizations and that this relationship is significant. It has been shown that the correlation between the level of intraregional competition and the efficiency of regional networks of higher education is equal to 0.2 (which means that an increase in the level of competition between universities by 1 p.p. makes the efficiency index of regional networks of higher education organizations increase by 0.2 p.p.). Efficiency is considered through the prism of public policy objectives, such as the availability of higher education, the attractiveness of higher education and its quality assurance. The model has a list of control variables, some of which reflect the socio-economic characteristics of each region as possible determinants of the efficiency of networks of higher education institutions.

- The indicator of the efficiency of regional networks of higher education organizations is correlated with parameters of the total reduced student population and the rate of growth of the gross regional product (GRP). The parameter of "the share of budget financing in the total amount of financing of higher education organizations" by region can be considered to be significant with a negative sign. This means that the efficiency of regional networks of higher education organizations is higher in regions with a high solvent demand of the population for education.

**Research methodology**

At the beginning of work it is presented the concept of regional networks of higher education organizations as the set of higher education organizations localized within regions (constituent entities) of the Russian Federation (it was a consequence of the change if the sectoral principle of organizing the higher education system to the federal-regional).

The next chapter describes the concept of the efficiency of regional networks of higher education organizations from the standpoint of public administration. Current state policies try to increase the efficiency of the entire national network of higher education organizations in response to the challenges of the massification of

higher education and its quality assurance [Froumin, Kuzminov, 2015]. Moreover, an analysis of efficiency is also required for regional networks of higher education organizations [Breu, Rabb, 1994, Kocher, Luptácik, Sutter, 2001].

We use the concept of technical efficiency in our study. It relates to the use of the given resources in the most efficient way, i.e., based on the principle of maximizing results for the given input parameters [Worthington, 2001]. To assess the efficiency of regional networks of higher education organizations, the method of data envelopment analysis (DEA) was chosen. It is a nonparametric technique in which each regional network of higher education organizations is considered as an object that makes use of input parameters for the optimal production of output parameters. It employs a performance-oriented specification with variable scale returns.

We analyze the efficiency of regional networks of higher education organizations for achieving public administration objectives for the education system. The following efficiency indicators of regional networks of higher education organizations are used (table 1).

Table 1 - list of parameters and description of their calculations for assessing the efficiency of regional networks of higher education organizations

| | Parameter | Calculation |
|---|---|---|
| Input 1 | Public funding | $\dfrac{PubF}{NormStud}$, where PubF is expenditures from federal, regional and municipal sources on higher education, thousand rubles NormStud is the adjusted number of students in the region (number of full-time students + number of mixed part-time students * 0.25 + number of part-time students * 0.1) |
| Output 1 | Higher education accessibility | The ratio of the number of students in the region's universities to the population of the region aged 17–25 years |
| Output 2 | Attractiveness | The ratio of the number of full-time students entering their 1st bachelor's/specialty program in a higher education organization located in the Russian region to the number of high-school graduates in the region |
| Output 3 | Quality characteristic | The ratio of the number of students (adjusted contingent) in universities with "signs of inefficiency" according to the Monitoring of the Performance of Higher Education Organizations to the total number of students in the region |

In the next part we define the basis of competition in the higher education system and justifies the relevance of the analysis of its relationship with the efficiency of regional networks of higher education organizations. Foreign practice shows the general trend of the development of governance mechanisms in the public sector according to the principle of "managed competition" in which government intervention is limited to financing and regulating the quality of

educational services provided by universities [Agasisti, Catalano, 2006]. In such a case, the task of stimulating competition in the higher education market is a priority for the state [Horta, et al., 2008].

In the Russian case, universities compete with each other on several markets – the markets of high-school graduates, teachers, research grants, and additional forms of support through targeted state programs. The competition is most pronounced at the level of attracting applicants. This is due to the fact that income from educational activities predominates in the income makeup of Russian universities. Nevertheless, the bases of competition are different for different groups of universities. Scholars most often write about the division into two types of competition – into the elite and mass segments of higher education markets [Polishchuk, Livni, 2005]. In the first segment, universities compete for students through the quality of educational services [Romero, del Rey, 2004]. Elite universities do not compete with other universities on the market of entrants but focus solely on talented students with high scores on entrance examinations. This determines the bilateral direction of competition: applicants fight each other to get into an elite university, while the university itself competes with other elite universities for a limited group of talented applicants.

The bases for competition for applicants to mass higher education are different, being related to the accessibility and price of studying at universities. At the same time, the quality of education provided is not always the main competitive advantage. However, universities behave dynamically in the context of demographic recession and of state policy to increase the efficiency of higher education organizations. As a result, cohorts of applicants partially overlap between universities focused on elite and mass educational segments. In the equilibrium between these segments of higher education, there is competition for funds and potential students [Polishchuk, 2012]. The intensity of this competition is not the same in different parts of the country due to the limited mobility of students [Polishchuk, Livni, 2005], which requires analysis to be conducted at the regional level.

We assess the competition for high-school graduates in regional networks of higher education organizations using the Herfindahl-Hirschman index. The index is calculated as follows:

$$D_j = \sum_i \left( \frac{x_{ji}}{X_j} \right)^2 \qquad [1]$$

*where* $x_{ji}$ is the number of full-time students at the i-th university in region j, and Xj is the total number of full-time students in region j. The index ranges between 0 and 1, where 1 means a low level of competition (monopoly).

Finally after the main calculations a model is proposed for assessing the relationship between the efficiency of regional networks of higher education organizations and the index of intraregional competition, taking into account the list of control variables. The main databases include the results of the Monitoring

of the performance of higher education organizations in the Russian Federation, data from the Federal State Statistics Service, and the Unified Information System for Supporting the Activities of the Ministry of Education and Science of Russia. The data for the model for assessing the relationship between the efficiency of regional networks of higher education institutions and the index of intraregional competition are presented in the form of a pooled sample (for 2013-2014).

**Research results**

The following basic features of the development of regional higher education networks were highlighted in the first chapter of the study:

*A) The high heterogeneity of the size of regional networks of higher education organizations [Froumin, Leshukov, 2015].* Historically, the greatest concentration of universities has been found in Moscow and St. Petersburg - a third of all universities in the country are located in these two regions of the Russian Federation. Moreover, the policy of streamlining the higher education sector (which has led to a general reduction in the total network of higher education organizations by 47% in the Russian Federation over the past few years) has affected the level of competition between universities in many other regions of the Russian Federation. The current university network is primarily facing the challenge of ensuring access to higher education in the conditions of the high spatial heterogeneity of the development of higher education in the country and of its growth caused by the struggle against the segment of low-quality higher education.

*B) The high level of centralization of higher education governance in the Russian Federation.* The concentration of administrative power at the federal level is a unique feature of the Russian higher education system, which differs significantly from the governance models of universities in countries with similar characteristics. In federal states that have at least two levels of governance of educational organizations, the majority of issues in higher education regulation are delegated to the regional level [Carnoy, et. al, 2018]. Nevertheless, the following limited range of channels of influence of regional government on the development of universities in Russia can be identified [Froumin, Leshukov, 2015]:

• Approval of the rector's candidacy upon appointment
• Approval of university requests for admission quotas
• Membership of regional officials on the boards of trustees of universities
• Targeted training for students and the commission of R&D work
• Property support for universities
• Accounting for the opinions of regions when evaluating the results of monitoring studies of the performance of higher education organizations
• Practices of direct social support for regional students and teachers (for example, governor prizes or scholarships)
• Tax benefits for taxes pertaining to regional government

Our study shows that the current regulatory conditions and high centralization of governance of the higher education system do not promote favorable conditions for close cooperation between regional executive bodies and universities subordinated to the federal government. Exceptions are regions with traditionally large educational systems (for example, the Tomsk and Novosibirsk Oblasts) and regions which have declared the regional research and education complex to be a regional development priority.

*C) The budget system of the Russian Federation limits opportunities for regional participation in co-financing regional higher education networks.* The budget system of the Russian Federation is designed in such a way that the regions do not receive funds from the federal government for the organization or provision of higher education. Moreover, the presence of universities funded exclusively from the federal budget is economically profitable for regional governments, which benefit from the presence of universities that are funded from a different level of the budget system [Leshukov, Borisova, 2014]. This means that the current model of university funding does not sufficiently stimulate the involvement of regions in university development processes, either.

*D) Regional networks of higher education organizations are spatially localized within the constituent entities of the Russian Federation.* An important feature of the development of regional networks of higher education organizations in the Russian Federation is their territorial "isolationism" [Pavlyutkin et al., 2010], especially within "home" markets of high-school graduates. The data of the Federal State Statistics Service indicates that the intra-regional migration of university students is much higher than the inter-regional migration [Gabdrakhmanov, Nikiforova, Leshukov, 2019], because migration is restrained by the financial constraints of high-school graduates and their families [Prakhov, Bocharova, 2016]. Low migration is also characteristic of HE teaching staff due to the high level of inbreeding [Yudkevich et. al, 2015].

In addition, an analysis of the employment of graduates indicates that universities primarily work to provide personnel for regional labor markets. According to a monitoring study of the employment of graduates of higher education organizations (2014-2017), about 70% of university graduates on average are currently employed on the labor market of the region where the university is located [Kozlov et al., 2017].

Another trend in the development of higher education in the Russian Federation relates to the fact that the regionalization of universities resulted from the abandonment of the Soviet system of the compulsory distribution of graduates after the loss of the sectoral specialization of most universities managed by government ministries. Most universities, with the exception of medical and higher education institutions of culture and the arts, have gone from specializing in particular industries to offering a broader range of study programs, including programs in areas outside their specialization such as economics, social sciences and humanities [Semyonov, Platonova, 2014]. Such diversification of sectoral

universities was due to the solvent demand of the population for higher education mainly on local markets [Kuzminov et al., 2013]. The Soviet sectoral principle of organizing higher education gave way to a new approach in which universities strive to meet the needs of the new economy (increasing the human capital of regions, scientific and innovative development, and social missions) and the popular demand for education.

The main effects of the existence and activities of universities are localized at the level of cities and regions. Indeed, the contribution of higher education to the development of some Russian regions amounts to over 3.5% of the GRP [Belyakov, Klyachko, 2016]. The article [Agasisti, et al., 2020] analyzes the efficiency of regional networks of higher education organizations and its relation to the level of socio-economic development of regions in the Russian Federation. The authors corroborate the thesis that the efficiency of regional networks of higher education organizations have a positive and statistically significant effect on the economic growth rate of the region.

The regional higher education development trends and the transformation of the educational system in the post-Soviet era described in the first chapter allow us to formulate the concept of a regional network of higher education organizations as the *set of higher education organizations localized within a region of the Russian Federation* (that was forced by the change in the sectoral principle of organization of the higher education system to the federal-regional). A certain level of interaction may exist between the universities that form these networks. Such a set of universities can be considered as a network of educational institutions of higher education based on trends in the expansion of isomorphism practices of universities located on the territory of one region [Maskaev et al., 2017], as well as due to the expansion of cooperation formats of universities and promoting a unified regional policy for the development of higher education in some regions of the Russian Federation.

The results of evaluating the efficiency of regional networks of higher education organizations by Russian region show that the leaders in efficiency indicators include both regions with large networks of higher education organizations (e.g., Tyumen Oblast, Tomsk Oblast, Khabarovsk Territory, Moscow and St. Petersburg, etc.) and Russian regions with a limited supply of educational services (e.g., Chuvash Republic, Astrakhan Oblast, etc.). Such results should be interpreted quite carefully. The method of shell analysis involves comparing relative indicators from the boundary of maximum production capabilities. Considering that the input parameter in the model is the level of budget funding of higher education based on the number of students, this means that regions with the highest relative returns on invested public funds are the most effective. Therefore, many regions with developed higher education systems in absolute terms (number of students, research productivity, financial capabilities, etc.) are characterized by average efficiency values. On the contrary, regions with small educational systems are in the lead due to their high comparative returns on invested budget funds. In other

words, the calculation results show that even universities and regional educational networks with less government support can obtain large relative effects.

Further, the study presents the results of the analysis of the index of the intraregional competitive environment. The calculations (see Fig. 1) show that over 50% of the regional networks of higher education organizations may be called highly concentrated.
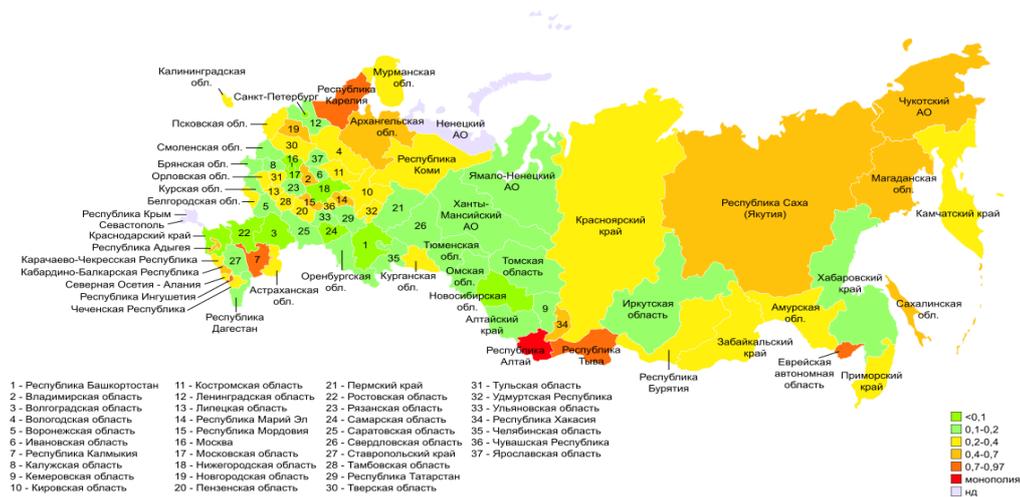
Figure 1. Distribution of regions by the level of intra-regional competition (average values for 2013 and 2014)

It is noteworthy that the level of competition can vary significantly between regions with similar populations and numbers of students. This indicates the existence of different structures of regional higher education markets in the Russian Federation.

The following formula for evaluating the relationship between the efficiency of regional networks of higher education organizations and the intra-regional competition index can be proposed as a result of our study:

$$EFF = \beta_0 + \beta_1 \times HH + \beta_2 \times STD + \beta_3 \times BUD + \beta_4 \times GRP + \beta_5 \times GRPP + \beta_6 \times PUB + \beta_7 \times PRIV + \beta_8 \times CME + \beta_9 \times IS + \beta_{10} \times DS + \beta_{11} LEAD + e \ , \quad [2]$$

where

- EFF is the efficiency of regional networks of higher education organizations

- HH is the intraregional competition index
- STD is the total number of students (adjusted number of students)
- BUD is the share of public funding in public higher education organizations
- GRP is the GRP per capita (rubles) at current basic prices
- GRPP is the GRP growth rate x 100%
- PUB is the share of the public sector in the GRP

- PRIV is share of the private sector in the GRP
- CME is the share of mining in GRP
- IS is the share of manufacturing in the GRP
- DS measures the remoteness from Moscow
- LEAD is the presence of "leading" universities (dummies)

The model has a list of control variables, some of which reflect the socio-economic characteristics of each region as possible determinants of the efficiency of networks of higher education organizations.

The results of linear and tobit regressions (with the replacement of outliers) are presented in Table 2.

Table 2. Linear and tobit regression results with the replacement of outlier values

|  | Linear regression | Tobit regression |
| --- | --- | --- |
| Intraregional competition index | *-0,201\** *(0,0907)* | *-0,188\** *(0,092)* |
| Total number of students (adjusted number of students) | *0,000\*\** *(0,000)* | *0,000\*\** *(0,000)* |
| Share of public financing at public higher education organizations | *-0,632\*\*\** *(0,186)* | *-0,662\*\*\** *(0,190)* |
| GRP per capita (thousand rubles), at current basic prices | 0,000 (0,000) | 0,000 (0,000) |
| GRP growth rate x 100% | *0,014\*\*\** *(0,002)* | *0,014\*\*\** *(0,002)* |
| Share of the public sector in the GRP | -0,001 (0,0049) | -0,001 (0,004) |
| Share of the private sector in the GRP | -0,000 (0,003) | 0,0002 (0,003) |
| Share of mining in the GRP | -0,001 (0,002) | -0,002 (0,002) |
| Share of manufacturing in the GRP | -0,000 (0,002) | -0,000 (0,002) |
| Remoteness from Moscow | 0,000 | 0,000 |

| | (0,000) | (0,000) |
|---|---|---|
| Presence of "leading" universities | -0,065 (0,037) | -0,072 (0,038) |

Significance level: . - p-value<0.1; *- p-value<0.5; **- p-value<0.01; *** - p-value<0.001

Determination coefficient (R-squared): 0.4502, Adjusted R-squared: 0.4104

The results of linear and tobit regressions show that the state of the competitive environment is related to the efficiency of regional networks of higher education organizations and that this relationship is significant. This means that a higher level of competition among universities in the region corresponds to a higher efficiency of the regional network of higher education organizations (it is worth noting that this is not a causal correlation). Efficiency is examined through the prism of public policy objectives, such as the accessibility of higher education, the attractiveness of higher education and the quality assurance of education.

In addition, the values of the parameters of the general reduced student population and the growth rate of the gross regional product (GRP) turned out to be significant for the indicator of the efficiency of regional networks of higher education organizations. With a negative sign, the parameter "the share of public funding in the total amount of financing of higher education organizations" by Russian region turned out to be significant. This means that the efficiency of regional networks of higher education organizations is higher in regions with high solvent demand for higher education.

**Practical relevance of the study**

The results of the study indicate that the policy of supporting competition in regions may be important for the public administration of higher education. Developing recommendations on creating competitive conditions for improving the efficiency of regional networks of higher education organizations should consider the principle of "managed competition" that involves the creation of institutional conditions by the state to support competition between education organizations. In addition, the results of the study can be used to develop federal and regional measures aimed at strengthening the processes of regionalization of higher education, including

- Amendments to regulatory acts at the federal (and regional) levels, aimed at removing barriers to the participation of regions in the development of universities (providing opportunities for co-financing higher education from the regional budget, consolidation of regional innovation infrastructure based at universities, etc.).
- Testing fiscal instruments of public policy aimed at developing competition between universities. The regulator's experimental introduction of new

instruments to support competition between universities accompanied by extensive data collection will make it possible to check for causal links between the level of competition and the efficiency of regional higher education networks, which shall serve as a basis for the selection of state policy priorities. Examples of such fiscal instruments include, in particular, the introduction of new models for the distribution of budgetary resources among universities (for example, introducing a pilot system for issuing personal educational certificates using the experience of state registered financial obligations).

- Developing a public monitoring system for the higher education system, including the adaption of statistical and informational education system databases involving the analysis of the efficiency of regional networks of higher education organizations. As we noted above, one of the main management tools for the public regulator in recent years has been monitoring the performance of higher education organizations. Such monitoring is used to make decisions on the reorganization of universities and personnel issues and to analyze organizations' overall development. Our analysis shows that it would be expedient to supplement monitoring of university performance with a regional section presenting the efficiency assessment of regional-level data. In addition, the results of our study call into question the very model of monitoring the performance of higher education organizations for evaluating universities. The results of this model showed that universities and regional educational systems that are characterized by modest performance (and are most often located in remote regions of the country) can have relatively high efficiency values in terms of returns on invested budgetary funds.

The results of the study also indicate that the reorganization and merger of educational organizations should be accompanied by an analysis of the potential consequences for the efficiency not only of the reorganized organizations themselves but also of the entire regional network of higher education organizations. Finally, the collected empirical data can be used to formulate strategies for the development of regional networks of higher education organizations in the Russian Federation.

**Bibliography**

1.  Agasisti T. Market forces and competition in university systems: theoretical reflectio and empirical evidence from Italy // International Review of Applied Economics,  2009, 23:4, 463-483
2.  Agasisti T., Catalano G. Governance models of university systems—towards quasi-markets? Tendencies and perspectives: A European comparison // Journal of Higher Education Policy and Management, 2006, Vol. 28 , Iss. 3.

3.  Agasisti T., Egorov A., Zinchenko D., Leshukov O. Efficiency of regional higher education systems and regional economic short-run growth: empirical evidence from Russia // Industry and Innovation. 2020. P. 1-28.

4.  Aghion P., Dewatripont M., Hoxby C., Mas-Colell A., Sapir A. "The Governance and Performance of Universities: Evidence from Europe and the US." // Economic Policy, 2010, 25 (61): 7–59.

5.  Belyakov, S. A., Klyachko, T. L. (2016), Assessment of the contribution of higher and secondary vocational education to the economy of the Russian regions / S.A. Belyakov, T.L. Nag - M .: Publishing house "Delo" RANEPA, 82 p. - (Scientific Papers: Education)

6.  Breu T., Raab R. 'Efficiency and perceived quality of the nation's "Top 25" national universities and national liberal arts colleges: an application of data envelopment analysis to higher education' Socio-Economic Planning Sciences, 1994, 28(1) pp. 33-45

7.  Brown D., Cazalis P. and Jasmin G. (eds.), Higher Education in Federal Systems: Proceedings of an international colloquium held at Queen's University, .Ottawa: Renouf Publishing, 1991

8.  Cantwell B., Marginson S., Smolentseva A. (eds). High Participation Systems of Higher Education. Oxford University Press, 2018, 496 p.

9.  Carnoy M., Froumin I., Leshukov O., Marginson S. (2018), Federalism and higher education: a comparative study, 2018, Sage Publishing

10. Froumin I., Kuzminov Y. I. Supply and Demand Patterns in Russian Higher Education, in: Higher Education in the BRICS Countries: Investigating the Pact between Higher Education and Society. Springer, 2015. P. 97-123.

11. Froumin I., Leshukov O. "National-Regional Relationships in Federal Higher Education Systems : The case of Russian Federation" // Higher education forum Hiroshima University, 2015, No. 12. P. 77-94.

12. Gabdrakhmanov N. K., Leshukov O. V., Platonova D. P. Provision of budget places for regional higher education systems considering demographic trends // University Management: Practice and Analysis. 2019.Vol. 23. No. 4. P. 32-45.

13. Gabdrakhmanov N. K., Nikiforova N. Yu., Leshukov O. V. « "From the Volga to the Yenisei ... ": educational migration of youth in Russia /; National Research University Higher School of Economics, Institute of Education. - M .: NRU HSE, 2019, (Modern education analytics. No. 5 (26)). 48 p.

14. Hannan Michael, Freeman John, Population Ecology of Organizations // Economic Sociology, 2013, No2. (translatied by Yudin G.B.)

15. Horta H., Huisman J., Heitor, M. Does Competitive Research Funding Encourage Diversity in Higher Education? // Science and Public Policy, 2008, 35(3), 146–158.

16. Kapelyushnikov R. I. How much is the human capital of Russia? // Issues of economics. 2013. No. 1. P. 27-47.

17. Kocher M., Luptácik M., Sutter M. 'Measuring productivity of research in economics: a cross-country study using DEA' Vienna University of Economics & B.A., Department of Economics Working Paper, 2001, No. 77.

18. Kozlov D. V., Platonova D. P., Leshukov O. V. Where to study and where to work: interregional mobility of students and university graduates; National Research University Higher School of Economics, Institute of Education. - M.: HSE, 2017. - 32 p., Modern Education Analytics, No. 4 (12).

19. Kuzminov Ya. I., Semenov D.S., Frumin I.D. The structure of the university network: from the Soviet to the Russian "master plan" // Issues of education. 2013, No. 4. p. 8-63.

20. Kuzminov Y. I., Sorokin P. S., Frumin I. D. General and special skills as components of human capital: new challenges for the theory and practice of education // Forsyth. 2019.Vol. 13. No. 2. p. 19-41.

21. Leshukov OV, Borisova LV Higher educational institutions in the socio-economic space // Higher education today. - 2014. - No. 12. - p. 34-40.

22. Leshukov O. V., Lisyutkin M. A., Governance of regional higher education systems in Russia: possible approaches // University Management: Practice and Analysis. 2015., No. 6., p. 29-40.

23. Marginson S. Public goods produced in higher educational institutions of Russia (translated from English by E. Shadrina) // Educational studies, 2017, No3.

24. Maskaev AI, Savko PO, Oganesyan AA Comparative analysis of institutional innovations in universities: federal vs basic // Issues of economic regulation. 2017, Vol. 8 (number 4), p. 67-79

25. Pavlyutkin I.V., Andrushchak G.V., Novikov A.V., Regional Atlas of Higher Education Economics (market indicators). Yoshkar-Ola: Center Printing Center LLC., 2010

26. Polishchuk L. I., Collective reputation in higher education: analysis of the equilibrium model // Journal of the New Economic Association. 2012, No. 7. p. 46-69.

27. Polishchuk L. I., Livni E., The quality of education in Russia: The role of competition and the labor market // Educational Issues. No. 1. 2005, p. 70-86.

28. Pollitt C., Bouckaert C. Continuity and Change in Public Policy and Management, Cheltenham, Edward Elgar, 2009, 232 p.

29. Prakhov I., Bocharova M. Socio-Economic Predictors of Student Mobility / National Research University Higher School of Economics. Series WP BRP 34/EDU/2016 "Higher School of Economics Research Paper". 2016.

30. Romero L. and del Rey E. Competition between public and private universities: quality, prices and exams, Working paper 04-64, 2004, Economics Series 23, Departamento de Economía Universidad Carlos III de Madrid

31. Scott. W. R. Organizational theory and higher education // Journal of Organizational Theory in Education, 2015

32. Semyonov D., Platonova D. Program Diversification and Specialization in Russian Higher Education Institutions / NRU Higher School of Economics. Series EDU "Education". 2014, No. 17/EDU/2014.

33. Sibiano P., Agasisti T. "Efficiency and Heterogeneity of Public Spending in Education among Italian Regions." // Journal of Public Affairs, 2013, 13(1):12–22.

34. Stevens, Mitchell L. and Armstrong, Elizabeth A. and Arum, Richard, Sieve, Incubator, Temple, Hub: Empirical and Theoretical Advances in the Sociology of Higher Education // Annual Review of Sociology, 2008, Vol. 34

35. Worthington A.C. An Empirical Survey of Frontier Efficiency Measurement Techniques in Education // Education Economics, 2001, Vol. 9 , Iss. 3.

36. Yudkevich Maria, Altbach Philip, Rumbley Laura Academic Inbreeding and Mobility in Higher Education: Global Perspectives edited by . New York: Palgrave Macmillan, 2015. 280 pp.