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Funding the Higher Education System: International Experience and Russian Practice

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ABSTRACT

Relevance. Education is a significant factor in economic growth. However, the discussion about the principles for distributing higher education funding is still open, and the cases of individual countries are not sufficiently covered in research literature.

Research objective. The study aims to determine the principles of financing based on the case studies of Russian universities. Foreign financing mechanisms are analyzed and compared with Russian practice that has similar foundations. Financing mechanisms are classified according to their distribution principle.

Data and methods. The statistical base for the study is the data of a large-scale higher education monitoring project of 2019-2021. The study was conducted in more than 650 Russian universities. In order to determine the principles of financing, a correlation analysis is carried out to identify the correlation between the indicators. Universities are grouped by regions with different socio-economic characteristics, subgroups of universities within the regional division were identified.

Results. The distribution of funding among Russian universities is based on the principles of quasi-competition and equalization. Universities located in regions with low indicators of socio-economic development are mainly financed to achieve equalization of educational activities, and, as the socio-economic situation in the region improves, funding is channeled into equalization of research activities. Another more obvious conclusion is that research activities of universities that participate in state programs are funded based on competition, while other universities have lower correlation between indicators, which leads us to the assumption that other universities' research activities are funded based on the principles of equalization.

Conclusions. The novelty of the study is the results that enrich the understanding of the principles for funding distribution in the Russian higher education system. Contrary to most studies of the concentration of resources around a limited number of institutions, the study concludes that resources and funding are distributed based on equalization, supporting the less competitive units of the system, and directing funding to regions with less stable socio-economic characteristics.

KEYWORDS
higher education, financing higher education; competition; equalization; development of universities, funding universities

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Финансирование системы высшего образования: международный опыт и российская практика

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АННОТАЦИЯ

Актуальность. Образование является значимым фактором экономического роста. При этом открытой остается дискуссия в части принципов распределения финансирования высшего образования, и в то же время менее изученным вопросом с точки зрения освещения кейсов отдельных стран.

Цель исследования. Исследование направлено на определение принципов финансирования на примере кейсов российских вузов. Проанализированы зарубежные механизмы финансирования и представлено их сравнение с российской практикой, которая имеет схожие основы. Механизмы финансирования классифицированы по принципу их распределения.

КЛЮЧЕВЫЕ СЛОВА
высшее образование, финансирование высшего образования; конкуренция; выравнивание; развитие университетов, финансирование университетов

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Данные и методы. Статистической базой исследования служат данные мониторинга высшего образования за 2019-2021 гг. Исследование проведено более чем по 650 российским вузам. С целью определения принципов финансирования проводится корреляционный анализ на предмет выявления взаимосвязи между показателями. Произведена группировка вузов по регионам с различными социально-экономическими характеристиками, выделены подгруппы вузов внутри регионального деления.
Результаты. Распределение финансирования среди вузов РФ основывается на принципах квазиконкуренции и выравнивания. Вузы, расположенные в регионах с низкими показателями социально-экономического развития, финансируются преимущественно по принципу выравнивания в большей части относительно образовательной деятельности, по мере улучшения социально-экономического состояния региона, финансирование на условиях выравнивания направлено на научную деятельность вузов. Другой вывод, более очевидный, научная деятельность вузов-участников государственных программ финансируется на условиях конкуренции, в то время как остальные вузы имеют меньшую зависимость между показателями, в результате чего, можем предположить, что финансирование научной деятельности остальных вузах основывается на принципах выравнивания.
Выводы. Новизной исследования являются результаты, расширяющие представление о принципах распределения финансирования в системе российского высшего образования. В противовес большинству исследований о концентрации ресурсов в кругу ограниченного количества вузов, в исследовании делается вывод, что распределение также осуществляется на условиях выравнивания, поддерживая менее конкурентоспособные единицы системы, и направляя финансирование в регионы с менее устойчивыми социально-экономическими характеристиками.

БЛАГОДАРНОСТИ
Исследование выполнено при финансовой поддержке Министерства науки и высшего образования Российской Федерации в рамках Программы развития Уральского федерального университета имени первого Президента России Б.Н. Ельцина в соответствии с программой стратегического академического лидерства «Приоритет-2030»

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高等教育融资：国际经验与俄罗斯实践

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摘要
现实性：教育是经济增长的一个重要因素。然而，关于高等教育资金分配原则的辩论仍未结束，同时学术界在个别国家的相关案例研究也较少。
研究目标：本研究旨在以俄罗斯大学为例确定融资原则。文章对国外的融资机制进行分析，并将其与具有类似基础的俄罗斯案例进行比较。融资机制将根据其分配原则进行分类。
数据与方法：该研究的统计基础是2019-2021年的高等教育监测数据。研究对象是650多所俄罗斯高等教育机构。为了确定融资原则，文章进行了相关分析，以确定各指标之间的关系。高等教育机构按区域不同社会经济特征进行分组，并确定区域中的高等教育机构子群。
研究结果：俄罗斯大学之间的经费分配遵循准竞争和均等的原则。位于社会经济发展指标较低地区的高等院校在教育活动方面主要按照均衡化原则获得经费，随着该地区社会经济状况的改善，均衡化融资被导向高等院校的科学活动。另一个更明显的结论是，参与专项国家计划的学校的研究活动资金是通过竞争获得的，而其他大学对该项目的依赖性较小，因此我们可以假设其他大学的研究活动资金是基于均衡化原则。
结论：该研究的新颖之处在于扩大了对俄罗斯高等教育系统资金分配原则的理解。与大多数关于资源集中在有限数量的高等教育机构圈子的研究相反，该研究的结论是，分配是在均衡的基础上进行的，国家项目支持系统中竞争力较弱的单位，并将资金引向社会经济特征不那么持久的地区。

关键词
高等教育、高等教育经费；竞赛；均衡性; 大学发展、大学融资

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Introduction

Education is a significant factor in economic growth. Many studies have proven a positive correlation between investment in a country's human capital and its economic development (Hanushek, 2015). Countries that recognize the importance of knowledge, flourish, whereas those that do not - hinder their own socio-economic development. However, these conclusions are not unanimous, worth noting are studies that give other arguments (Benos, 2013). Nevertheless, many national (Kolosnitsyna, 2021) and foreign (Maneejuk, 2021) researchers have come to the conclusion that investment in education has a positive effect

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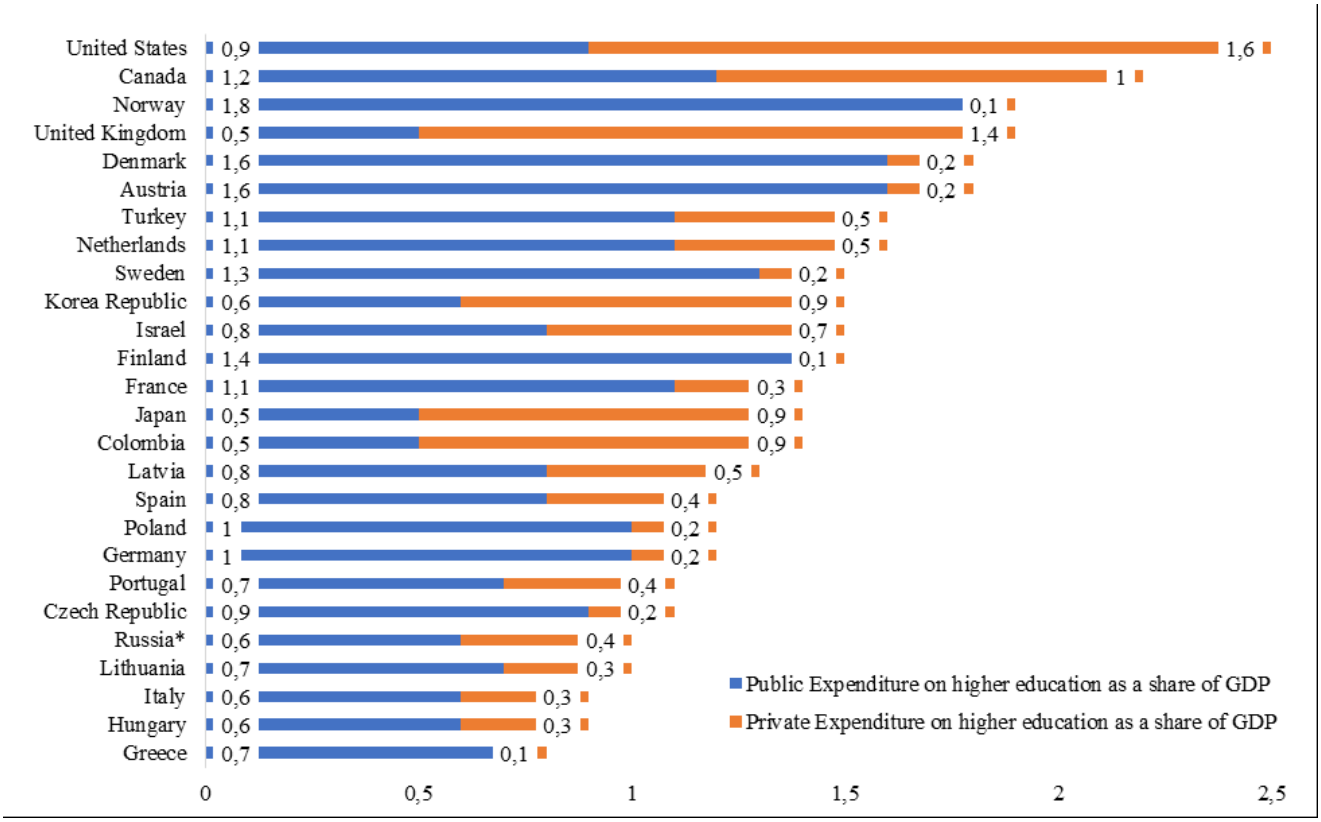

Figure 1. *Higher education spending as a share of GDP worldwide 2019*
Source: Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/*; OECD (2022). Resourcing Higher Education in Portugal. OECD Publishing, Paris. 170 p.* https://doi.org/10.1787/a91a175e-en.

on developed countries. Developing and maintaining regional higher education systems allows regions to develop and prevent the outflow of the younger generation (Maneejuk, 2021). Conversely, increased public spending on higher education in developing countries with low levels of primary education does not have a positive effect.

At the same time, the discussion about the principles for distributing higher education funding in different types of economy is still open. On the one hand, there are arguments for basing funding on competition and quasi-competition (Agasisti, 2020), leading to differentiation of universities within the system. On the other hand, it is noted that "in poorer developing countries, competition and market mechanisms will not work, and it is necessary to invest in higher education as a public good" (Marginson, 2006: 36). Musgrave R.A. drew attention to this much earlier (Musgrave, 1969): he advocated higher levels of public investment in higher education for countries with lower levels of economic development, and lower levels of public investment for countries with higher levels of economic development. Yonezawa A. and Kaiser F. also support the idea of state control, arguing that "only through actions taken at the state level, specific recommendations set out in the corresponding documents of the 1998 World Conference on Higher Education, are implemented" (Yonezawa, 2003).

Figure 1 shows public spending on higher education in relation to GDP. Total public and private expenditure on higher education in Russia is about 1% of GDP, which is 2.5 times less than the maximum value shown in the figure.

If these costs are recalculated per student, the gap is even wider: it is twice less than the average for the Eurozone countries, 2.1 times less than in Germany; 2.3 times less than in Japan; 3 times less than in Great Britain; and 3.5 times lower than in the USA (Figure 2).

Within the framework of this study, we will outline the following challenges for the higher education system: the need to invest in education as a factor in the development of the country's and the region's economy, the dependence of higher education in many countries on state funding, and for the Russian Federation in particular, we can note the lack of financing in comparison to international practice.

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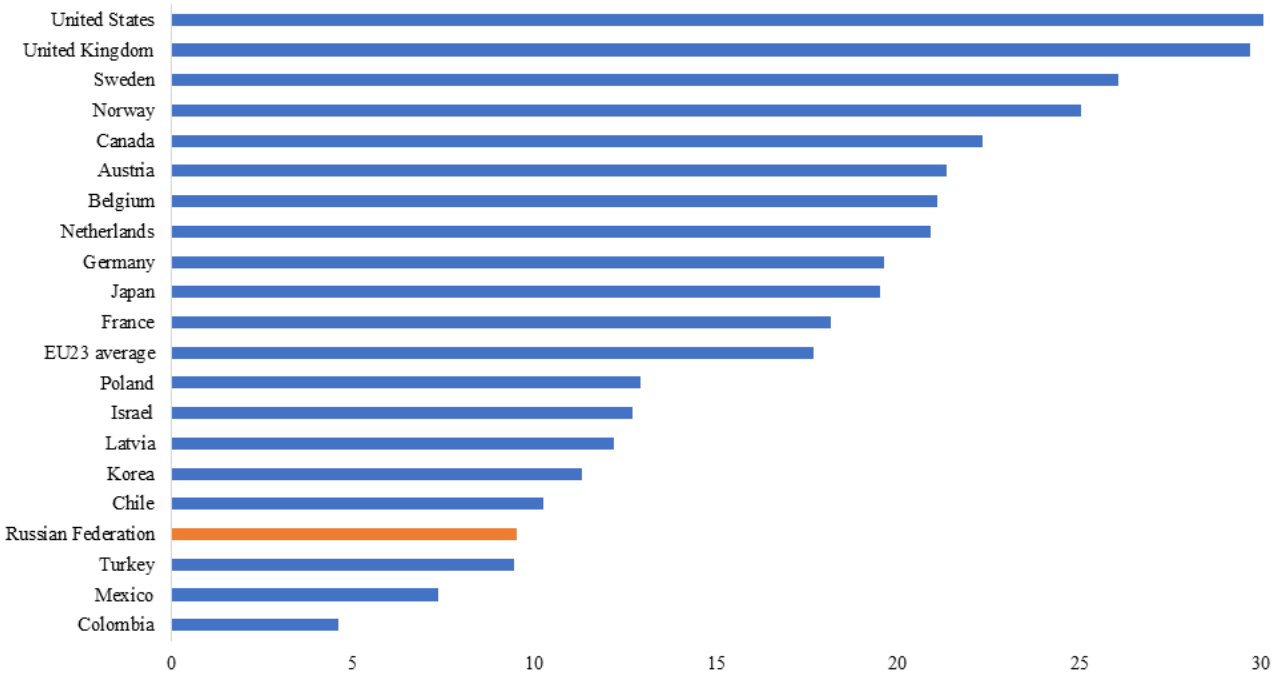

Figure 2. *Total expenditure on tertiary educational institutions per full-time equivalent student, 2019*
Source: Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/*; OECD (2022). Total Expenditure on Educational Institutions per full-time Equivalent Student (2019): In Equivalent USD Converted Using PPPs for GDP, Direct Expenditure within Educational Institutions, by Level of Education, in Education at a Glance 2022: OECD Indicators, OECD Publishing, Paris,* https://doi.org/10.1787/80998d78-en.

The objective of the study is to analyze foreign and Russian experience in financing the higher education system, to identify the principles of financing in the Russian higher education system.

Based on their experience in the field of higher education research, the authors hypothesize that the mechanisms for distributing funding are based on two principles: on the principle of competition and on the principle of supporting less competitive units of the system.

Theoretical basis

The main sources of funding for higher education are: public, private and foreign funds. However, this list can be detailed further. Thus, Chernova E. (Chernova, 2017) distinguishes 8 sources, identifying subgroups in each main group (private funds: donations, funding received from companies, self-financing, etc.).

For a long time, public expenditure was the main source of funding for universities in most countries (US universities (Geiger, 2004; Becker, 1993), except for countries in South and East Asia and Latin America (Varghese, 2021). However, public funding still plays an important role: based on surveys, it can be noted that "in Europe, public expenditure is much more significant than in the US (Varghese, 2015: 209)", and remains the dominant source of funding, accounting for 50 to 90 % of university income (Estermann, 2013). Thus, in Germany core funding from state grants accounts for about 80% of the universities' institutional income (Estermann, 2022: 33); French universities receive 80% of their income as public funding (Foret, 2021), Portuguese universities this figure reaches an average of 64%, including R&D grants from public funds (OECD, 2022b: 71[1]) (Figure 3).

Higher education institutions in Russia, including private universities, receive 61% of their finances from public funds, (public universities – 63%). This distribution of funding between private and public sources reflects the position of Marginson S., Musgrave R. - in developing economies, public funding gives a positive return. Until recently, state programs of financing science and higher education brought positive effects - an increase in publication activity (Prakhov, 2021; Matveeva, 2021), a change in the researchers' migration trajectory, an increase in their mobility (Sudakova, 2021), higler positions of universities in international rankings etc. However, the latest destructive geopolitical events allow us to

[1] OECD (2022b). OECD Statistics – Education and Training, OECD. Stat, https://stats.oecd.org/

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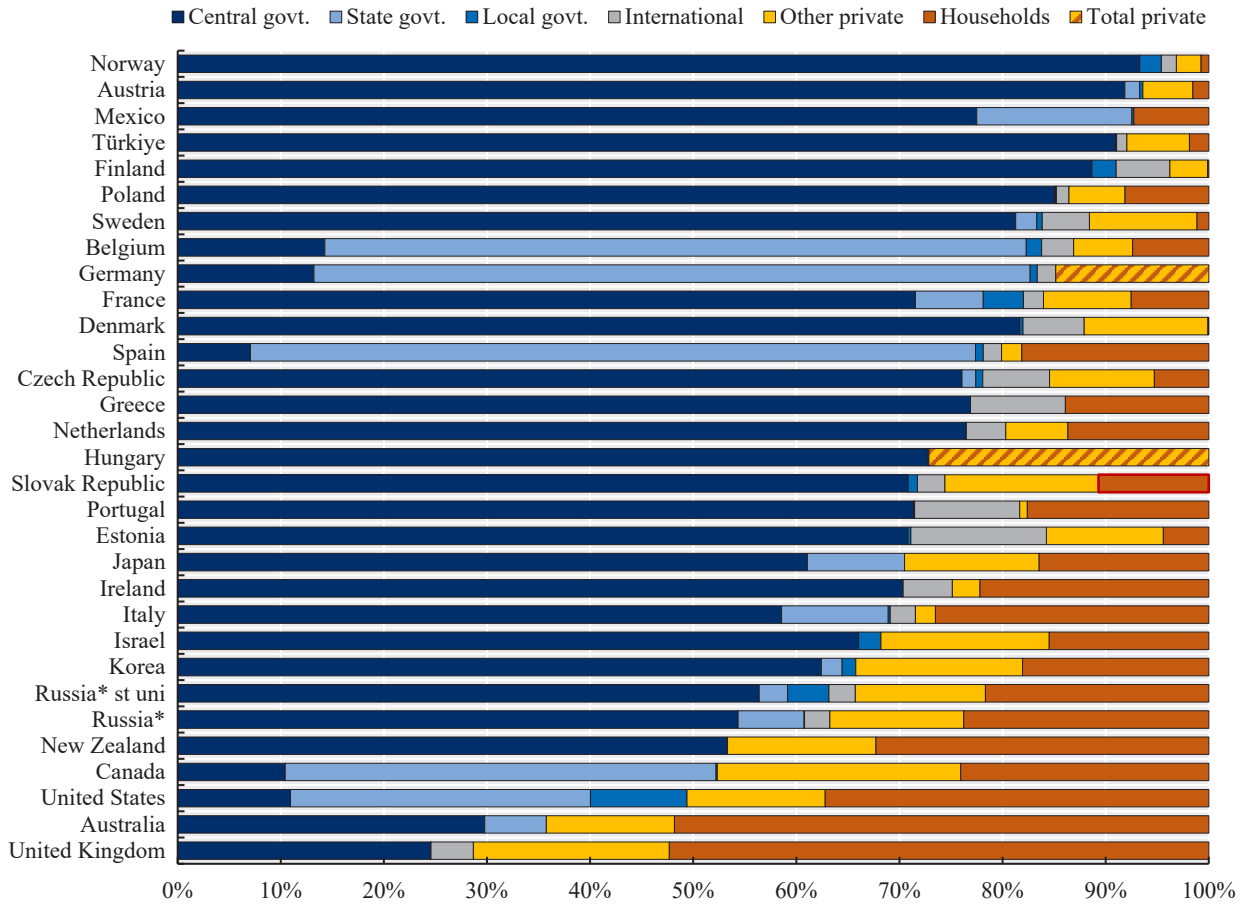

Figure 3. *Expenditure on higher education institutions by source (Share of expenditure on public and government-dependent HEIs by source, 2018)*

*Source: Data on Russia taken from Form № VPO-2 (2021). URL:*https://minobrnauki.gov.ru/action/stat/highed/*; OECD (2022): OECD Indicators – Education at a Glance 2022. 462 p.* https://doi.org/10.1787/3197152b-en

form only evaluative conclusions about the new challenges brought by these changes.

So, despite the fact that almost all countries have the same sources of funding, in different countries they are, firstly, presented in different proportions, and secondly, there are different mechanisms for distributing this funding (Table 1).).

Table 1

Mechanisms for distributing higher education funding

Mechanisms for distributing funding	Characteristic	Countries
Block grants, including:	Include three components: on a historical basis, via a funding formula or through a performance contract	European countries
1) Performance-based funding	Distribution of a fixed amount of money among institutions based on their relative performance. Performance or development contracts, and goal-setting agreements whereby certain goals are agreed between the sponsor and the university, also related to performance-based funding, although they do not always have a direct impact on funding and vary in nature.	
2) Funding Formula	Input indicators are used (the number of students enrolled); in addition, other indicators, with less weighting, are used in the formula, and they differ between countries (doctoral degrees, international activities, etc.)	
3) Performance Contracts	The amount allocated for a specific purpose as a result of negotiations between universities and distributed by the university. In some countries (Germany - 2% and 5%, the Netherlands - 7%, Denmark - 1%, the Netherlands, Austria, Finland, Latvia - up to 100%), the legislation sets the minimum percentage of the total university funding. Evaluation of the achievement of results is not always strict, sometimes it serves as a tool for regulating the university management policy.	13 countries-members of OECD, some states of the USA (OECD, 2019a)

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Mechanisms for distributing funding	Characteristic	Countries
Excellence Programs	Funding is channeled into research and supporting large initiatives. The amount of allocated funds and directions are much wider than with research grants (research initiatives, campus construction, establishing doctoral schools, regional integration of universities, etc.).	The standard is the programs of Germany and France. Similar programs exist in China, Russia, and other countries.
Itemized distribution of funding	Funds are allocated strictly according to the items of expenditure, there is a tight restriction on the redistribution of funds between budget items. Such a mechanism results in a high level of financial control and transparency for the central budgetary authorities, but drastically limits the ability of institutions to take responsibility for resource management and make strategic decisions on resource prioritization.	Rarely in European countries; remain the main mechanism in Greece (OECD, 2018), Korea, state universities in Mexico (OECD, 2019), public universities of the Russian Federation (Agasisti, 2020)
Competition-based (grants, projects)	Funds are allocated on a competitive basis, as a rule, from research foundations, for a limited period, aimed at supporting research, human resources, and infrastructure.	The majority of countries, including Russia

Source: Budget Code of the Russian Federation No. 145-FZ of July 31, 1998 (as amended on December 28, 2022), article 161; OECD (2018). Education for a Bright Future in Greece, Reviews of National Policies for Education, OECD Publishing, Paris. https://dx.doi.org/10.1787/9789264298750-en; *OECD (2019). The Future of Mexican Higher Education: Promoting Quality and Equity, Reviews of National Policies for Education, OECD Publishing, Paris.* https://dx.doi.org/10.1787/9789264309371-en; *OECD (2019a). University-Industry Collaboration: New Evidence and Policy Options, OECD Publishing, Paris,* https://dx.doi.org/10.1787/e9c1e648-en.

Figure 4 shows the relationship between mechanisms and classification characteristics. This study distinguishes three principles for financing higher education:

- competition/quasi-competition-based: the more competitive units of the system are financed. However, the mechanisms for distributing finances based on competition lead to high differentiation within the system and compression of the number of units of the system;
- based on equalization: all units of the system are financed, including the less competitive ones; the principle can be carried out through allocating places at universities paid for by state subsidies, maintaining competitive wages, developing infrastructure in order to preserve and evenly distribute human capital across regions;
- based on investment: funding can be used to develop the infrastructure of higher education, to enhance universities' competitiveness, and to develop promising areas of training.

In European countries, funding is a block grant (Pruvot, 2015; OECD, 2020)[2] (table 1) which includes three components; the ratio between these three components is different in different universities, and funding in some European countries is long-term, i.e. the funding budget is set for up to four years (Pruvot, 2017).

The considered mechanisms correlate with the mechanisms of financing higher education in the Russian Federation. Performance-based funding and funding formula are represented in the Russian Federation by subsidies provided to universities as part of the implementation of the government assignments[3]. The founders determine the volume of public services for organizations when devising the state assignment for the provision of public services for the next financial year and planning period, and when assessing the achievement of indicators of the volume of public services in the reporting financial year. Permissible deviations from the target indicators of the state

[2] OECD (2020). Resourcing Higher Education: Challenges, Choices and Consequences. Higher Education. OECD Publishing, Paris, https://doi.org/10.1787/735e1f44-en.

[3] Order of the Ministry of Science and Higher Education of the Russian Federation of October 28, 2021 No. 989 "On approval of the methodology for the formation of the government assignment for the provision of educational services in the field of higher and secondary vocational education for the next financial year and planning period"

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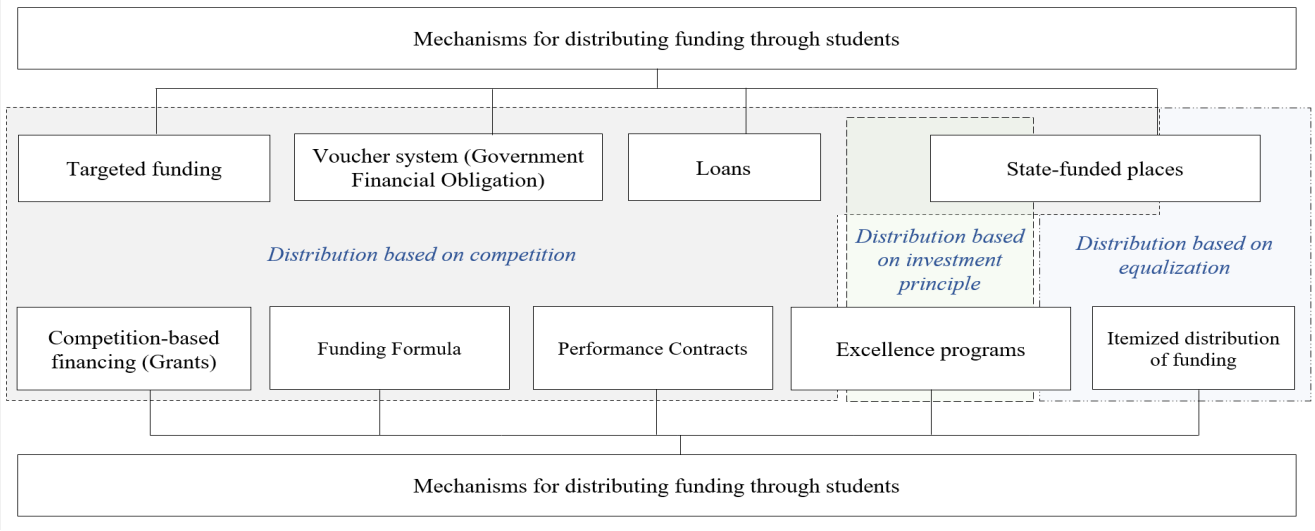

Figure 4. *Correlation between mechanisms for financing higher education and principles of distribution*
Source: compiled by the authors[4]

assignment are set[5]. Funding formula manifests itself in the cost of providing one unit of service and achieving absolute values. For example, the target admission figures determine the number of places (hereinafter referred to as TAF) for which the university can attract students with the appropriate exam scores; later on, the university receives state funding based on the number of enrolled students, but not more than the TAF.

Excellence programs are implemented not only in European countries, but are also a tool for supporting universities' development in China (the "211" and "985" projects, etc.), and Russia (5/100 Program, Priority 2030, campus construction programs). In the Russian Federation, programs are implemented based on competition, on achieving roadmap indicators, i.e. set target indicators with certain funding: funding for the next financial year is distributed based on the achievement of the current year indicators.

With regard to the distribution of funding through research foundations, the distribution mechanism is also based on competition, with the focus on achieving the set targets.

Higher education in the Russian Federation is funded through the students' (their households') finances as follows:

- targeted funding - a small share in the structure of Russian universities' income (4% of all funds for educational activities in general for universities of the Russian Federation[6]): tuition is paid by an organization in which a university graduate must work for a predetermined period (3 years, as a rule) after graduation. Financing is provided by agreement between households and the organization, to a specific university or a university of their choice, the choice of the degree field is carried out in the same way;
- household funds (private funding) are the main source of funding in some areas of training;
- public funds through the provision of the number of "state-funded" places which are determined by the admission targets and represent a complex mechanism[7]. This mechanism can

[4] The figure was updated on August 16, 2023 (the content remained unchanged).

[5] Order of the Ministry of Education and Science of the Russian Federation of March 15, 2021 No. 172 "On approval of the procedure for determining and applying the permissible (possible) deviations of the values of quality indicators and (or) volume from the established values of quality indicators and (or) the volume of public services when devising government assignments for the provision of public services for a federal state budgetary or autonomous for which the Ministry of Science and Higher Education of the Russian Federation exercises the functions and powers of the founder"

[6] VPO-2 form "Information on the material, technical and information base, financial and economic activities of an educational organization of higher education" // Ministry of Education and Science of Russia. 2022.

[7] Order of the Ministry of Science and Higher Education of the Russian Federation of November 1, 2021 No. 996 "On approval of the Procedure for conducting the competition for the distribution of target admission figures by areas of training and (or) enlarged groups of specialties and areas of training for studying in educational programs of higher education, and also by groups of research specialties and (or) research specialties for training programs for the training of research and pedagogical personnel in post-graduate school in state-funded places financed from the federal budget" // Official Internet portal of legal information. URL: http://publication.pravo.gov.ru/ Document/View/0001202111250038 (accessed on 05.02.2023)

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combine all the three principles (Figure 4). We assume that the equalization principle manifests itself when state-funded places are provided to remote regions with less competitive units of the system in order to preserve human capital in the regions, and investment principle is used for developing promising areas of training, or those that are important for the socio-economic sphere, but are less popular with applicants.

Thus, different mechanisms for financing higher education form different systems and their characteristics: increasing the gap between universities (Agarkov, 2019; Abankina, 2013), monopolizing the units of the system (Sudakova, Sandler, 2022), creating competitive universities and world-class universities, ensuring equal opportunities for higher education (allocating quotas for applicants from low-income families (Dill, 1997), developing infrastructure. Building a full picture of the state of higher education will make it possible to respond to the socio-economic, technological and global challenges of our time in a timely manner.

Despite the fact that there are a large number of studies focused on diagnosing the state of higher education (Sandler, 2020; Sandler, 2021), on assessing the degree of differentiation of the units within the system (Kuzminov, 2014), in our opinion, they overlook an important characteristic of the higher education system - principles for the distribution of funding.

Methods and data

The principles of distribution of resources, in particular public funding in the Russian higher education system, are identified through economic and statistical analysis methods. The statistical base for the study is the data of a large-scale higher education monitoring project of 2019-2021 (Education in Russia, 2021)[8],[9].

The database has statistical information for the period of 2019-2021, consisting of indicators for more than 650 public and private Russian universities (2019 - 681, 2020 - 670, 2021 - 662 universities). The indicators used for the study include the number of students, the university's income, the number of faculty members, and publication activity. All indicators are detailed by funding sources, mode of education, etc.

The study tests the hypothesis about the distribution of funding shown in Figure 4, assuming that universities located in regions with less competitive socio-economic characteristics, are funded according to the principle of equalization, i.e. universities in these regions are financed with less reference to qualitative indicators (for example, a decrease in the average USE score; number of students in state-funded places; funding is equal to that of more competitive universities), in order to enhance their competitiveness. Universities were divided into groups and subgroups for the analysis.

To assess the socio-economic state of the region, the following indicators for express analysis were selected: the share of gratuitous revenues

[8] Information and analytical materials based on the results of monitoring the activities of educational institutions of higher education // MIREA - Russian Technological University. The main information and computing center. URL: www.miccedu.ru

[9] Education in Russia - 2021. Statistical Bulletin. Moscow: MIREA Russian Technological University, 2021. 363 p.

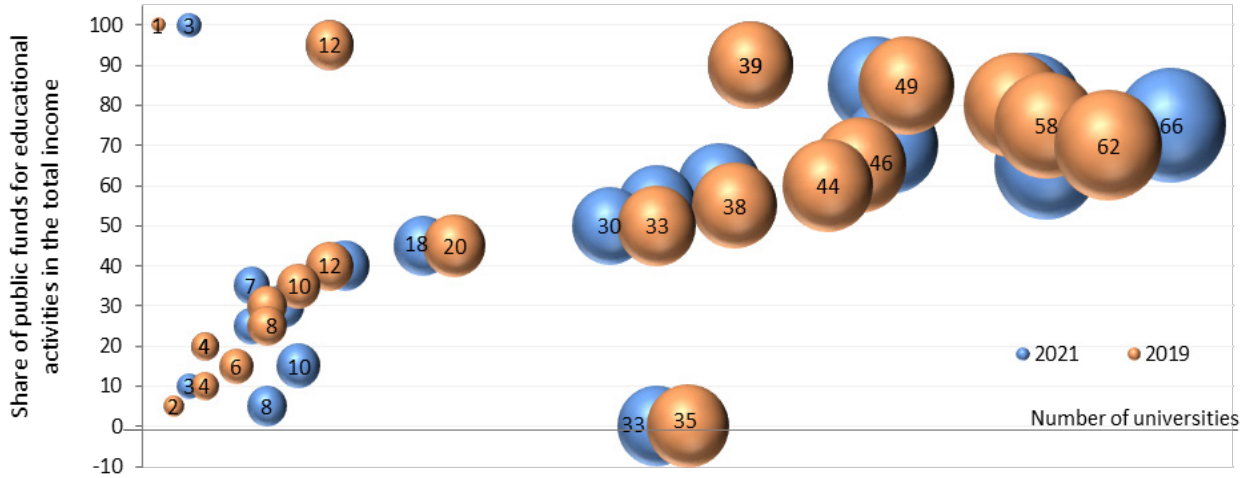

Figure 5. *The share of public funds for educational activities in the total income of public and private universities*

Source: compiled by the authors based on the «Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/»

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in the structure of budget income - shows how independent the budget is; GRP per capita – shows how rich the region is; migration growth - we assume that the negative value of this indicator evidences the unattractiveness of the region.

In order to identify the equalization mechanism, it seems relevant to analyze revenues from budgets of all levels, since income from educational activities accounts for 66% of the total income of universities (2021), while the volume of finances for educational activities from the budgets of all levels accounts for 43% of the total income of universities. Figure 5 shows the grouping of universities according to the share of public funds for educational activities in their total income, the intersection of the X and Y values shows how many universities have a similar share. For example, in 2019, one university was 100% funded from the state budget, and all funding was directed to educational activities; the share of public funding for educational activities of 35 universities was 0. The graph for the share of federal funds in the structure of university income looks similar. Since the study reveals that university financing is based on equalization, of interest are only those universities that have a share of federal funding in their budget structure.

One of the first objectives of the study is to distinguish groups of regions according to their socio-economic characteristics: GRP per capita; migratory inflow; income structure of the consolidated budget; priority regions for development[10]. The regions of the Russian Federation are highly differentiated, and the support of some regions is already reflected in the level of distribution of inter-budgetary transfers (Sudakova, Agarkov, 2022). Thus, the indicators allow us to rank the objects of study, and categorise them into several groups. Using the SPSS software application, the subjects of the Russian Federation are divided into 4 clusters - Figure 6 shows data visualization in three-dimensional space. Table 2 presents the quantitative description in each group.

[10] If we focus on the state program "Balanced Regional Development", then it covers a relatively small number of the constituent entities/subjects of the Russian Federation: the Kaliningrad region, the North Caucasian region, the Far Eastern Federal District, the Republic of Crimea and the city of Sevastopol. Universities located in these subjects of the Russian Federation will be analyzed separately.

Table 2

Characteristics of subjects (regions) by groups

Group number	Migration inflow, thousands of people				
	Average value	Minimum value	Maximum value	Number of subjects	
				Negative value	Positive value
1	10,7	- 2,9	23,9	2	4
2	9,4	- 4,3	113,0	10	23
3	1,0	- 7,6	15,4	19	21
4	2	-1,5	9,3	2	2
Group number	GRP per capita, thousand rubles/person				
	Average value	Minimum value	Maximum value	Number of subjects *	
				Below the average value in the RF	Above the average value in the RF
1	1 112	9542	1 568	0	5
2	555	454	757	3	30
3	325	142	425	40	0
4	2 790	1 994	5 072	0	4
Group number	Share of gratuitous receipts (subsidies, donations), %				
	Average value	Minimum value	Maximum value	Number of subjects**	
				under 10%	11-39%	over 40%
1	18,9	2,7	52	2	3	1
2	23	5,8	48	2	29	1
3	47	17	87	0	16	24
4	13	4,5	35	3	1	0

*Note: * to indicate the boundaries of the indicator, the average value for the Russian Federation is used, however, the indicators of the super-rich subjects of the Russian Federation (Moscow, YNAO, KhMAO, Magadan, Sakhalin regions) are excluded; average value - 467 thousand rubles (2021); ** the boundaries of the level of gratuitous receipts are presented in accordance with paragraph 3 and paragraph 4 of Article 130 of the Budget Code, the designated boundaries provide for a different level of authority of the subjects.*

Source: compiled by the authors based on the gks.ru

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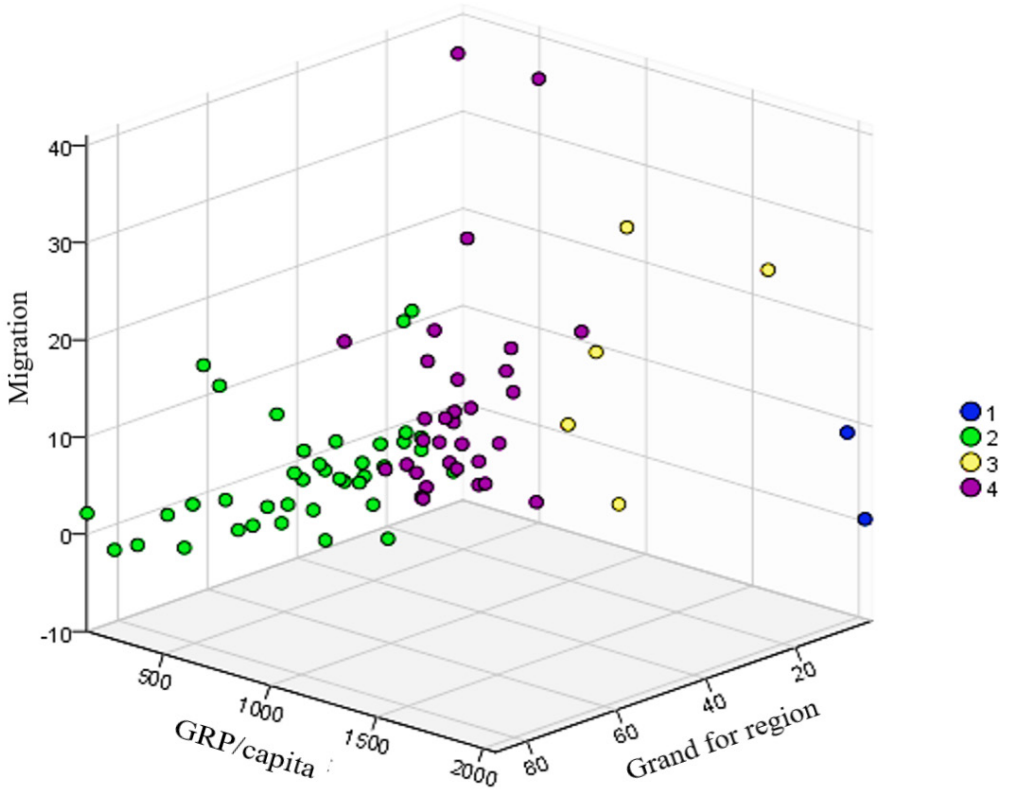

Figure 6. *Visualization of groups in 3D space*
Source: compiled by the authors based on the gks.ru in SPSS

Table 3 shows the regions included in the group, and the characteristics of each group. Thus, in terms of the identified socio-economic characteristics, the regions of groups 4 and 1 are the most favorable, and the subjects of group 3 have the worst characteristics.

Table 3

Characteristics of groups of regions

Group	Group description	Number of subjects in the group, representatives
1	Most subjects are characterized by a positive migration balance (for 4 out of 6), GRP per capita is several times higher than the average level in the Russian Federation, while the share of gratuitous receipts has a different value in the group, but mostly no more than 39%.	6 subjects Moscow, Krasnoyarsk Territory, St. Petersburg, Murmansk Region, Republic of Sakha, Kamchatka Territory
2	Most of the subjects in the group have a positive migration balance (23 out of 33), the average GRP per capita is slightly higher than the average for the Russian Federation, the share of gratuitous receipts is in the range of 11-39%.	33 subjects, Belgorod Region, Republic of Tatarstan, Perm Territory
3	GRP per capita is the lowest in the country, and the value is below the average for the Russian Federation; 50% of the subjects in the group have a negative balance; for 50% of the subjects the share of gratuitous receipts is mainly in the range of 11-39%, for the rest it is more than 39%.	40 subjects, Pskov region, Republic of Kalmykia, Dagestan, Chechnya
4	Positive balance of migration growth (with the exception of Yamal-Nenets Autonomous Okrug and the Magadan region), a low share of gratuitous receipts, GRP per person is several times higher than the average - the highest values in the Russian Federation.	4 subjects, Khanty-Mansi Autonomous Okrug, Yamal-Nenets Autonomous Okrug *, Sakhalin Region, Magadan Region

*Note. * Yamalo-Nenets Autonomous Okrug is included in group 4; however, the region is excluded from further analysis, as it does not include universities that have students studying in state-funded places.*

Source: compiled by the authors

Figure 7 shows a cartographic visualization of the distribution of regions (subjects) by groups.

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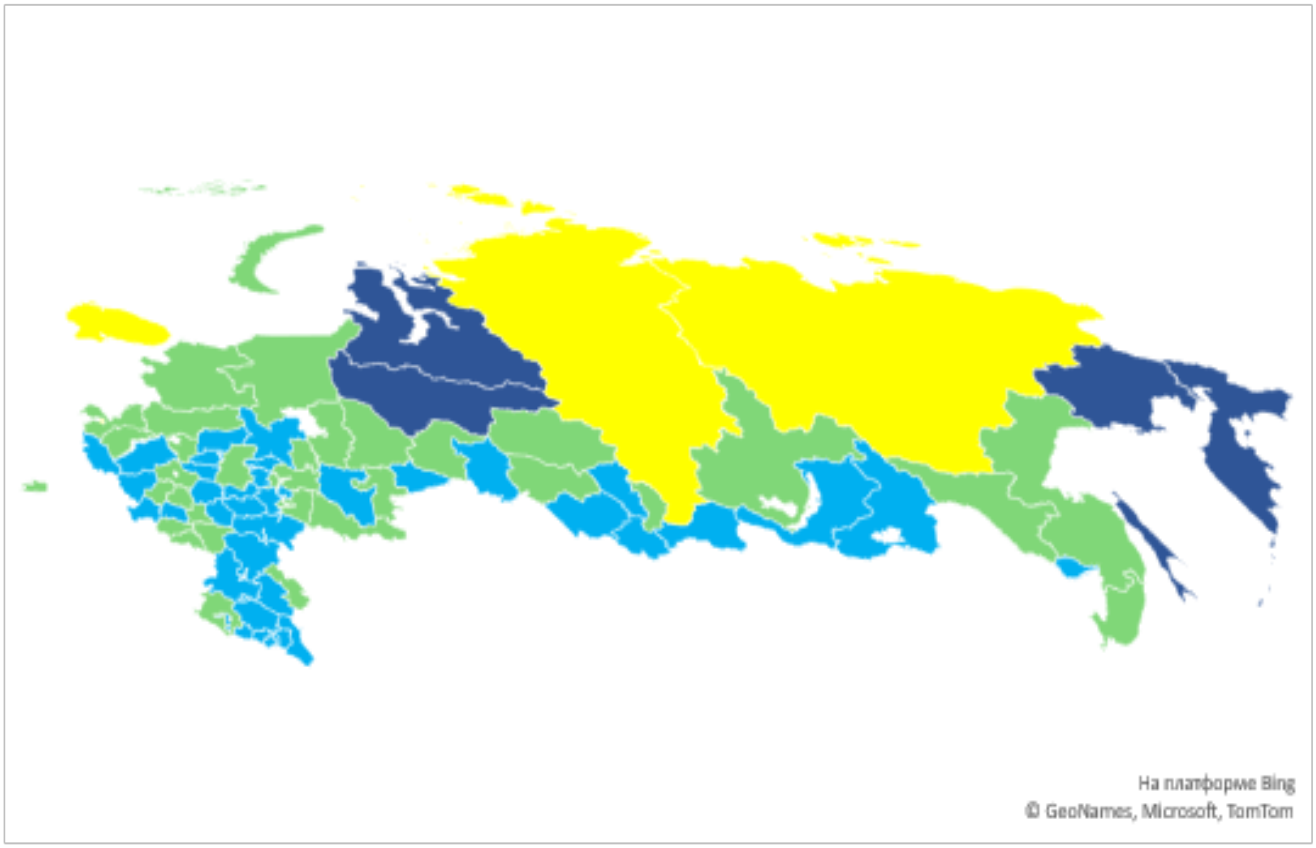

Figure 7. *Groups of Russian Federation regions according to socio-economic characteristics*
Source: compiled by the authors

Further analysis is based on the values of university performance indicators; the average values in subgroups are determined, the correlation between indicators is calculated, and a data reliability test is carried out.

Results

First, 4 groups of regions were identified based on their socio-economic characteristics. Further analysis is carried out within these groups, with universities divided into subgroups: (1) all universities within the group, (2) universities located in regions with positive migration (PM), (3) universities located in regions with negative migration (NM), (4) universities located in regions with negative migration and a share of gratuitous receipts of more than 40% (NM GR >40). The analysis for (2), (3), (4) is presented in the context of universities with a "special" status (hereinafter "_s"), i.e. those that are program participants (5/100, priority-2030) and/or those that have been assigned a status (National Research University - NRU, Federal University - FU, etc.) and universities without a status and/or not participating in programs (hereinafter "_w"). In addition, data are presented separately for all universities, without dividing them into groups of regions. Universities in group 1 are represented by heterogeneous characteristics: thus, along with more attractive regions and universities in Moscow and St. Petersburg, the group includes universities in the Murmansk region, the Republic of Sakha, and the Kamchatka Territory.

The calculation of average values showed (Table 4) that as the region's socio-economic indicators deteriorate, the share of income from the federal budget increases, mainly due to students studying in state-funded places, and so does the share of such students, while the average USE score of students in state-funded places lowers (Figure 8a). The situation with the indicators of research activity is different: they increase as the region's socio-economic indicators improve, and universities with and without special status show the same trend, but universities that participate in state programs and/or those with a special status have higher indicator values (Figure 8b).

Despite these two divergent trends, it should be noted that the university's total income per academic staff member increases as the socio-economic characteristics become worse, and participating universities and/or universities with status have higher values (Figure 8b).

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Table 4

Average values for the indicators of universities by groups of regions

Group	1		2			3				4	All universities			
Sub-groups	All universities in the group	1_s 1_w	All universities in the group	2_s PM 2_w PM	2_s NM 2_w NM	All universities in the group	3_s PM 3_w PM	3_s NM 3_w NM	3_s NM GR>40	All universities in the group	PM	NM	all_s/ _w PM	all_s/ _w NM
Number of regions	6	4 6	33	18 20	7 9	40	12 20	11 18	5 11	4	50	33	35 6	18 46
Number of universities	153	46 107	211	38 129	9 35	154	18 59	12 65	5 33	6	398	126	103 114	21 295
Average number of universities in the region, university/one region	25	12 17,8	6	2 6,5	1 3,9	4	2 3	1 3,6	1 3	2	8	4	3 19	1 6,4
Share of students studying in state-funded places, %	60	64 56	53	48 50	57 59	57	54 60	52 58	55 60	61	55	58	52 50	54 55
Average USE score for students studying in state-funded places, units	64	71 62	65	71 63	69 64	62	66 59	66 62	57 56	40	62	63	69 51	67 60
Average USE score for students paying for their tuition themselves	55	60 54	57	62 56	60 56	56	59 55	56 57	57 56	35	55	56	61 47	59 54
Share of income from the federal budget, %	67	67 64	60	58 56	62 67	65	61 62	61 67	69 69	54	59	69	59 46	63 58
Share of income from educational activities, %	72	78 69	67	63 63	69 74	70	63 68	69 73	68 76	74	66	74	66 61	69 65
Income for academic staff, rubles/person	4650	5150 4487	3309	3457 2980	3911 3494	2676	2724 2507	2822 2825	2876 2859	5495	3158	3206	3411 4917	3246 3036
Income from R&D for academic staff, rubles/person	309	681 235	238	452 167	343 130	164	241 144	240 150	200 134	212	236	158	398 257	280 171

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Group	1		2			3				4	All universities			
Sub-groups	All universities in the group	1_s 1_w	All universities in the group	2_s PM 2_w PM	2_s NM 2_w NM	All universities in the group	3_s PM 3_w PM	3_s NM 3_w NM	3_s NM GR>40	All universities in the group	PM	NM	all_s/ _w PM	all_s/ _w NM
Number of citations in WoS per 100 academic staff members, unit/person	192	458 133	155	345 163	175 87	86	143 90	125 70	146 56	36	141	86	280 179	144 124
Number of citations in Scopus per 100 academic staff members, unit/person	253	622 168	202	433 192	277 116	127	220 119	200 111	213 96	74	183	133	372 216	230 153
Number of full-time students for academic staff, student/one staff member	10	11 10	11	12 11	12 11	11	12 10	13 10	13 10	11	11	11	12 11	13 10
Number of students for academic staff, student/one staff member	16	14 17	19	19 20	18 19	19	17 18	22 19	24 20	24	18	20	17 20	21 19
Share of full-time students, %	67	78 59	62	66 56	68 61	59	70 56	59 57	58 57	48	62	58	69 53	62 56
Share of students in bachelor's degree programs, %	68	63 69	66	62 69	68 65	69	59 72	66 65	67 67	83	69	67	61 75	67 71

Note: "1_s" (2_s; 3_s) - calculation for universities with a special status, i.e. participating in the programs (NU/FU, Leading Engineering Schools - LES, 5/100, Priority 2030) and "1_w" (2_w; 3_w; 4_w) – universities without a special status. NM and PM - calculation for universities located in regions with negative and positive values of migration flows, NM GR>40 - calculation for universities located in regions with negative values of migration flows and with a share of gratuitous receipts of more than 40% (calculation according to paragraph 4, article 130 of the RF Budget Code). 1, 2, 3, 4 - universities located in regions of groups 1, 2, 3, 4.

Source: compiled by the authors based on the «Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/»

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Table 5

Coefficient of variation by groups, %

Group	1		2			3				All universities				
Sub-groups	All universities in the group	1_s	All universities in the group	2_s PM	2_s NM	All universities in the group	3_s PM	3_s NM	3_s NM GR >40	PM	NM	all_s PM	all_s NM	all_w GR >40
Share of students studying in state-funded places	9	7	11	13	9	10	11	14	14	11	8	13	12	15
Average USE score for students studying in state-funded places	5	10	5	5	3	5	4	4	5	11	4	5	4	5
Average USE score for students paying for their tuition themselves	8	7	7	4	4	7	3	3	2	11	6	4	4	2
Share of income from the federal budget	13	11	11	7	8	11	11	13	12	13	8	10	11	17
Share of income from educational activities	11	7	19	13	16	10	10	12	9	20	17	19	22	33
Income for academic staff	10	16	14	16	26	11	10	11	13	20	17	19	22	13
Income from R&D for academic staff	49	46	44	40	26	32	41	32	37	43	31	47	32	37
Number of citations in WoS per 100 academic staff members	42	35	65	78	38	64	46	72	91	67	51	79	56	91
Number of citations in Scopus per 100 academic staff members	40	37	59	71	38	46	47	64	91	59	42	70	52	91
Number of full-time students per academic staff member	6	8	7	8	7	9	11	11	13	8	8	9	10	13
Number of students per academic staff member	14	6	10	14	11	13	12	11	12	11	11	13	13	12
Share of full-time students	7	3	7	14	11	8	10	10	14	8	8	11	11	14
Share of bachelor's degree students	8	8	7	14	11	9	23	10	11	8	10	17	10	11

Source: compiled by the authors based on the «Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/»

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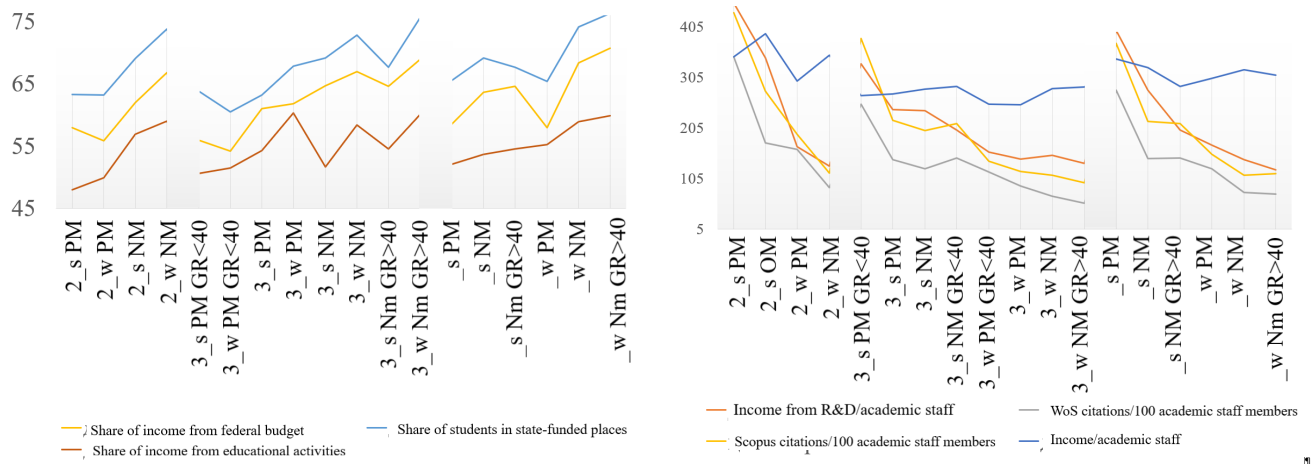

8a) 8b)

Figure 8. *Comparison of average values in university sub-groups*
Source: compiled by the authors based on the «Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/»

Table 5 shows the coefficient of variation for groups and sub-groups, the deviation of the data from the average value in the sample is within 10. However, if the average USE score in groups 2 and 3 is within 5, then the variation of specific indicators ("Income from R&D per academic staff member" and citation rates) exceed the allowable values (more than 30%), which indicates the heterogeneity of the sample according to these indicators.

In order to clarify the mechanisms for distributing funding, we conducted a correlation analysis of research-related indicators (Table 6): a positive correlation between the indicators will allow us to conclude that funding is distributed based on competition, while the absence of such correlation means distributions based on equalization.

Table 6

Indicators of correlation coefficients by indicators of universities

Coefficients	2_s PM	2_s NM	3_s, PM, GR < 40	_s PM	_s, PM, GR < 40	_s NM
University income from R&D and the number of citations in WOS**	0,4	0,3	**0,6**	0,5	0,4	0,3
University income from R&D and the number of citations in Scopus**	0,4	0,4	**0,7**	0,5	0,5	0,4
University income from R&D and the number of publications in WOS***	**0,6**	**0,5**	**0,7**	**0,6**	**0,6**	0,4
University income from R&D and the number of publications in Scopus***	0,6	0,7	0,6	0,6	0,5	0,5
Data validity (calculated in SPSS, 95% confidence interval)	100%	100%	100%	100%	100%	100%
Cronbach's alpha reliability coefficient based on standardized items	α>0,7	α>0,8	α>0,75	α>0,7	α>0,7	α>0,6
Cronbach's alpha reliability coefficient based on standardized items	α>0,6	α>0,5	-	α>0,6	α>0,6	α>0,5

*Note: *The number of students admitted for full-time studies in bachelor's and specialist's degree programs in state-funded places based on the results of the Unified State Examination; **The number of citations of papers published over the past 5 years, indexed in the information and analytical system Web of Science Core Collection (or Scopus), per 100 faculty members; ***The number of publications indexed in the Web of Science Core Collection (or Scopus) per 100 faculty members.*

Source: compiled by the authors based on the «Data on Russia taken from Form № VPO-2 (2021). URL: https://minobrnauki.gov.ru/action/stat/highed/»

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There is a correlation between the following indicators: (*) income from R&D and (*) the number of publications (Table 6), with the value of the correlation coefficient decreasing as the region's socio-economic characteristics deteriorate. It should be noted that the correlation coefficient between similar indicators for universities without a status is below 0.4.

The presented data allow us to make a conclusion about a possible difference in the mechanism for distributing funding among different groups of regions. Thus, regions with less favorable socio-economic conditions receive budget funding with a lesser focus on university performance indicators. Another pattern was identified: as the socio-economic characteristics of the region improve (in our case, universities in group 3), funding is directed to the development of research activity based on the principles of equalization.

The correlation between the indicators of the universities' educational activities allows us to draw a conclusion regarding the mechanism for distributing funding: less correlation between indicators related to research activities is observed among universities in group 3, as well as among universities without a special status in group 2.

Our study comes to a slightly different conclusion than that presented in the work of Abankina I.V., which states that "foreign countries try to increase financial support for higher education and the system's flexibility, and not pursue a policy of focusing efforts solely on supporting leaders, like in Russia" (Abankina, 2019).

Conclusion

The study is aimed at determining the principles for the distribution of funding among Russian universities. The significance of the study is justified by the fact that the importance of financing higher education as a means of investing in the public good has been proved more than once. Thus, the study analyzed foreign funding mechanisms and compared them with Russian practice, which has similar foundations: competition-based funding (mainly grants from research foundations), development programs, funding by formula (government assignments), etc. The analyzed funding mechanisms are classified according to the principle of distribution.

Based on the accumulated experience, the study puts forward a hypothesis about the possible existence of two principles for financing Russian higher education. The hypothesis was partially confirmed. However, the additional findings obtained, expand the understanding of higher education funding.

First, as the region's socio-economic characteristics deteriorate, there is an increase in the value of some indicators (for example, an increase in the share of income from the federal budget; the share of students studying in state-funded places, the number of students per 1 teaching staff member) and a significant decrease in other indicators (for example, the average USE score, the share of full-time students). These data do not allow us to make an unambiguous conclusion that the hypothesis was confirmed, since the change in indicators may be due to lower competition among university applicants (as a result, there is a decrease in the average USE score, and an outflow of applicants with higher scores to other regions); the increase in the share of federal funding and the share of students studying in state-funded places may be due to lower demand for non-state-funded ("commercial") places. However, an important addition to these conclusions is the increase in the indicator of income per academic staff member as the socio-economic characteristics of the region where the universities (within the group) are located, deteriorate.

Secondly, one more conclusion related to scientific activity was made during the study. As the region's socio-economic characteristics improve, the values of indicators related to research activity also improve.

The analysis carried out allows us to make the following conclusions: the distribution of funding among Russian universities is based on the principles of quasi-competition (analysis of data on universities with a special status) and equalization (as the region's socio-economic characteristics deteriorate). Universities located in regions with low indicators of socio-economic development are financed mainly based on the principle of equalization, for the most part, with respect to educational activities, and, as the socio-economic situation in the region improves, funding based on equalization affects the universities' research activities. Universities in group 4 stand out from the general trend (the so-called "wealthy northern regions").

Another more obvious conclusion is that research activities of universities that participate in state programs are funded on competitive basis,

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while other universities have less correlation between the indicators, as a result of which we can assume that research activities of other universities are funded based on the principles of equalization. And a less obvious conclusion is that the correlation between the indicators of educational activities in universities-participants of state programs is low and in some cases negative (with high USE scores, the share of students in state-funded places is different).

The results of the study expand the understanding of the principles of funding distribution in the Russian higher education system: in contrast to most studies on the concentration of resources in a limited number of universities, the study concludes that resources are also distributed based on equalization, supporting less competitive units of the system, and also that funding is sent to regions with unstable socio-economic characteristics.

The study can be expanded by detailing the indicators for ranking regions, as well as adding an analysis of the areas of training in the regions to identify the principle of financing based on investment.

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