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**THE ANALYTICAL INSTRUMENTS OF RESEARCHING INTO  
THE GEOGRAPHY OF EUROPEAN UNIVERSITY NETWORKS**

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***Abstract***

The scientific interest in the spatial organization of the university network and efficient instruments of its assessment is resulting from reduced impact of traditional production on territorial economy, increased role of universities in regional development. The qualitative analysis and quantitative measurement of the geography of a university network are prosecuted as a result of inadequate analytical instruments essential for sound management decisions and strategies. The European best practices of researching into the geography of a university network with the help of the instruments based on statistical methods and databases seem to be useful in addressing those problems. The information base of quantitative data is provided by World Higher Education Database (WHED), annual global education reports Global Education Digest and annual OECD education reports, the World Bank thematic reports, the Eurostat databases. Based upon possible solutions of the problems provided by the European analytical sources and databases, the authors have grounded, developed and recommended the analytical instruments of researching into the geographic organization of a university network consisting of the indicators of a university network geography, indices to assess the geographic conditions and rankings of regions in the global space of higher education. The paper provides recommendations regarding the use of the proposed tools to back up management decisions and strategies of the geographic distribution of a university network, the policy aimed at achieving equitable levels of territorial socio-economic development.

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**Keywords:** University network, European experience, analytical instruments.



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## 1. Introduction

The current EU regional policy is aimed at achieving equitable levels of socio-economic development in European countries. In addressing this, a university network plays an important role: universities are given social responsibilities for their regions, participating in developing businesses and interacting with regional and local authorities. A university provides training based on the EU needs and national economies of the EU countries, yet at the regional level provides the system of cooperation between the educational services market and the labour market, the market of R&D and innovations. In carrying out its educational and research tasks, a university network builds the combined intellectual capacity of a region and saturates the economy with innovative technologies and products. That is why in the EU countries federate entities take an active part in governing universities. High quality management in German federated states, Belgian communities and French regions is provided by adequate analytical instruments enabling to assess the geographic distribution fostering the impact of a university network on the regional development, use efficiently the resulting estimates in working out regional policies, higher education policies, university strategies.

## 2. Problem Statement

The scientific interest in understanding the impact of a university network on regional development results from reduced impact of traditional production on the economies of the EU member states emerging from the regional innovative development of European countries striving to build a knowledge-based economy and the digital economy, the economic space saturation with technology-intensive manufacturing activities and service organizations. The preparation of specialists with current and relevant expertise and their retention in a region provides the economic growth and competitiveness of regional economies, high quality of life for the population. Based on the relevance of the evaluation of university impact on regional development, two main approaches to explain the importance of an efficient geographic organization of a university network may be distinguished. The first approach treats a university as a basic scientific knowledge supplier for production needs (Bauman, 2002; Bolgova & Kurnikova, 2019; Lebedinskaya, Timofeev, & Kurnikova, 2019; Timofeev, Lebedinskaya, Yarnykh, & Kurnikova, 2019). Under that approach the role of knowledge in the productional system is peripheral and therefore external (Guston, 2000). The knowledge dissemination is described by a science push model where discoveries in basic science lead eventually to technological developments which result in a flow of new products and processes to the market place (Harrison & Turok, 2017). Under that approach the role of universities carrying out their R&D and educative functions is in providing the development of regional economies (Smith, Keeble, Lawson, Moore, & Wilkinson, 2001). Universities play 8 functions in this relationship (Kohoutek, Pinheiro, Čábelková, & Šmídová, 2017): knowledge creation, human capital creation, know-how transfer, creation of technological innovations, capital investment, regional leadership, impact on regional environment and knowledge infrastructure production. Recent foreign academic publications present empirical research and evidence that regional universities stimulate the development of less developed localities in Wales (Pugh, 2017), peripheral regions of South Italy (Harrison & Turok, 2017), Israeli rural areas (Frenkel & Leck, 2017). Goldstein and Drucker in “The Economic Development Impacts of Universities on Regions: Do

Size and Distance Matter?” pointed out the realignment of traditional university functions – the educational and R&D ones. According to these authors, “the entrepreneurial activities of universities are more important for economic development than the traditional functions such as human-capital creation and regional leadership” (Goldstein & Drucker, 2006, p.23).

Appreciating the contribution of modern scholars to the explanation of the impact of a university network on the socio-economic development of territories, we should point out the weak presence of research into analytical instruments enabling to measure the geography of a university network in academic publications.

### **3. Research Questions**

The relevance of developing analytical instruments to measure the geography of a university network determines the research questions of the paper. The assessment of analytical sources, European and global databases enables to establish an information database for developing analytical instruments. Based on the European experiences, the working out of indicators, indices and rankings to be used in measuring the state, conditions and peculiar features of the geographic organization of university networks provides an opportunity to design a set of analytical tools to research into the geography of a university network. The approbation of the designed analytical tools for measuring the geographic organization of a university network of a European country justifies the recommendations on their use in Russia (Bolgova, Grodskaya, & Kurnikova, 2020).

### **4. Purpose of the Study**

The study is aimed at designing the theoretical and methodical foundations and the toolbox for researching into the geographic organization of a university network based upon analytical sources and statistical databases having qualitative and quantitative characteristics of university geography in European countries. The authors believe that the EU efficient policy aimed at achieving equitable levels of socio-economic development in European countries and geographic organization of a university network enables to use the European experience in achieving the purpose of the study. The proposed analytical tools are needed for the scientifically based sound management decisions and strategies for higher education development and Russian universities aimed at strengthening the role of universities in the socio-economic development of Russian subjects and the scenario of the innovative development of regional economies.

### **5. Research Methods**

The research has used the methods of summarization to establish the quantifiable elements of a university network. The dialectic approach has been used in qualitative measuring of a university network in conjunction with its geographic organization. The methods of analysis and synthesis have been used to choose indicators, indices and rankings to measure the geographic organization of a university network. The methods of statistical grouping, indicators, indices and rankings were used to design analytical instruments and develop the methodology of their use in management practices.

## 6. Findings

The development of analytical instruments to research into the geography of a university network is based upon the opportunities of the educational statistics – the indicators of the territorial organization of universities presented in the European and global databases, as well as quality characteristics found in reports by EU relevant organizations. The measuring methodology has methods for collecting, grouping, analysis of actual values of spatial characteristics of a university network. Widely acknowledged databases and analytical sources are: a) WHED (World Higher Education Database) created by the IAU (International Association of Universities), having information concerning the university networks of 180 countries with well-formed education systems. As WHED information is mainly quantitative, it may be used while analysing the general principles of the spatial distribution of a university network; b) annual global reports on education by the UNESCO Institute for Statistics (Global Education Digest); c) annual educational reports by the Organization for Economic Cooperation and Development on OECD countries and their partners: Education at a Glance - OECD Indicators; d) thematic reports on education by the World Bank; e) databases of European statistics (Eurostat); f) UNESCO International Standard Classification of Education (ISCED) - the key statistical framework for translating national data into internationally comparable categories.

These sources and databases consist of three groups of analytical instruments to research into the spatial distribution of a university network in the EU countries or their certain regions: (1) indicators of a university network spatial distribution; (2) indices to assess the geographic conditions; and (3) rankings of the EU regions in the global space of higher education.

### 6.1. Indicators of a university network spatial distribution in the EU countries and their regions

Being estimation parameters, indicators may reflect spatial, organizational, technological, material, financial conditions under which a university network can develop sustainably. Unlike parameters providing with a quantitative statement of fact, indicators are vectors by nature as they have thresholds signaling of a critical state of a focus of control, the need to change the development strategy. The main role of indicators of a university network spatial distribution is to provide reliable information on the nature and performance of higher education sector as a whole; influence policy developments; and contribute to the public accountability of higher education, and their actual values are presented in “Education and Learning” of the Eurostat database (see Table 01).

**Table 01.** The indicators of assessing a university network in the Eurostat database

Aspect	Indicators
Participation in education and training	Pupils and students – enrolments; pupils and students – entrants; adult learning; continuing vocational training in enterprises
Learning mobility	Mobile students from abroad; degree mobile graduates from abroad; credit mobile graduates
Education personnel	Teachers and academic staff; distribution of teachers and academic staff
Education finance	Expenditure on education; expenditure of/on public and private educational institutions; financial aid to students; funding of education; funding of vocational education

Education and training outcomes	Graduates; educational attainment level; transition from education to work; young people by educational and labour status (incl. neither in employment nor in education and training - NEET); early leavers from education and training; labour status of young people by years since completion of highest level of education (incl. employment rates of recent graduates); underachieving 15-year-old students (PISA survey)
Languages	Language learning; self-reported language skills

Source: authors based on Eurostat database (2019)

The research value of indicators presented by the Eurostat database as an analytical tool is connected with the opportunity to measure comprehensively the process, result and resources of getting higher education in the EU countries, their regions, Länder, communities. The three levels of the NUTS system allows to establish the measurements of the spatial distribution of a university network across macroregions (NUTS 1), regions (NUTS 2), local areas (NUTS 3) (see Figure 01).

The example of using the indicators of French university network spatial distribution demonstrates the popularity of Île de France where 25.8 per cent of all French tertiary students are studying (see Figure 01). This indicator value is the same for several decades and has led to the change in French education policy towards measures aimed at achieving equitable levels of territorial conditions of the university network attractiveness.

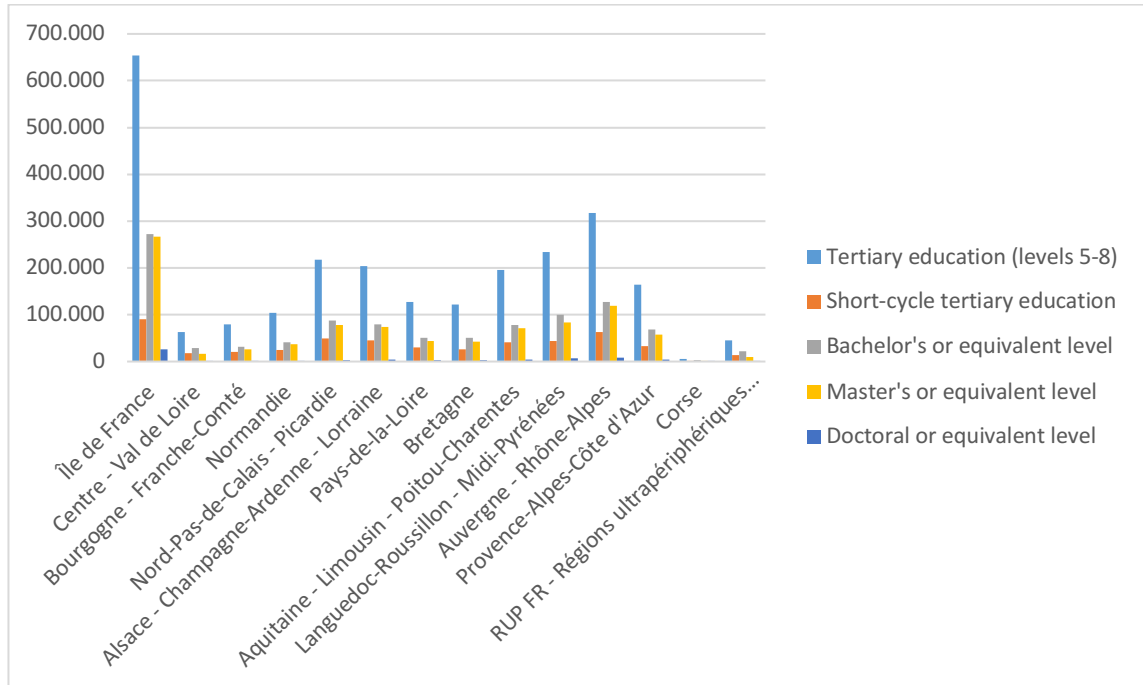
## 6.2. Indices to assess the spatial conditions of a university network in European countries

In analytical instruments aimed at researching into the spatial distribution of a university network, indices are used as aggregate assessments of the factors of the spatial distribution of universities in the EU countries (regions) (Chirkunova, Khmeleva, Koroleva, & Kurnikova, 2020). The value of a cumulative index includes subindices that are indicators reflecting a certain direction or result of the university network development (research, international cooperation, job placement, etc.) in an EU country or region. The methodology based upon the indicators in the form of indices was developed in 2012 within the global project of a network of research-intensive universities Universitas 21 (U21) to assess national systems of higher education. The study uses four groups of subindices measuring the framework of the spatial distribution of a university network in a European country: (1) resources (private and state investments), (2) environment (state policy and regulation), (3) connectivity (international cooperation), and (4) output (research, scientific publications, the compliance of higher education with the needs of the labour market including job placement).

The choice of subindices results from research objectives and the authors' point of view that the economic development and competitiveness of European countries is mainly dependent on well-educated and competent staff and technologies increasing their productivity and labour productivity.

Another approach to choosing subindices was developed by the Lisbon Council while assessing the contribution of universities into the socio-economic development of a country and/or region and has the following subindices: (1) inclusiveness: the percentage of graduates within the population theoretically available for advanced study; (2) access: minimum PISA math scores of tertiary ISCED Va graduates (threshold of skill aptitude required for tertiary graduation); (3) effectiveness: the wage premia that a university education commands on the local labour market; (4) attractiveness: the share of foreign students

and the diversity of source countries of foreign students; (5) age-range: the share of 30-39 year olds enrolled in tertiary education institutions; (6) responsiveness: progress in implementing Bologna targets measured in scorecard grades (one is the best score; five is the worst).



**Figure 01.** Students enrolled in tertiary education by education level in France (NUTS 1), 2017  
 Source: authors based on Eurostat database (2019)

### 6.3. Rankings of the EU regions in the global space of higher education

Rankings are instruments of assessing European regions in the global space of higher education for which the statistical data of UNESCO or OECD and the methodology of ranking universities by QS or ARWU is used. The QS ranking assesses universities according to 6 groups of indicators: Academic Reputation, Employer Reputation, Faculty/Student Ratio, Citations per faculty, International Faculty Ratio, International Student Ratio. The ranking is based on the expert opinion of 75,000 scholars and 40,000 employers, the analysis of 12.3 mln academic papers and 75.1 mln citations. For example, QS ranking for France reveals near 60 per cent of Parisian universities among Top 500 best world universities of which 40 per cent are higher education institutions outside the metropolitan area (see Table 02).

**Table 02.** French regions among Top 500 of the best world universities in 2018

University	Region	ARWU ranking	QS ranking
Université Pierre et Marie Curie – Paris 6	Paris	40	131
Université Paris-Sud- Paris 11	Paris	41	242
Ecole normale supérieure	Paris	69	43
Aix-Marseille University	Marseille	101-150	411-420
Université de Strasbourg	Strasbourg	101-150	303

University Paris Diderot - Paris 7	Strasbourg	101-150	305
University of Bordeaux	Bordeaux	151-200	-
University of Paris Descartes - Paris 5	Strasbourg	151-200	441-450
Claude Bernard University Lyon 1	Lyon	201-300	-
Ecole Normale Supérieure - Lyon	Lyon	201-300	157
Paul Sabatier University (Toulouse 3)	Toulouse	201-300	-
University of Lorraine	Metz	201-300	-
University of Montpellier	Montpellier	201-300	381
ESPCI ParisTech	Paris	301-400	-
Université Paris-Dauphine - Paris 9	Paris	301-400	-
Ecole Polytechnique	Paris	401-500	59
MINES ParisTech	Paris	401-500	-
University of Nice Sophia Antipolis	Nice	401-500	-
Université Toulouse 1 Capitole	Toulouse	301-400	-
Université Paris 1 Panthéon-Sorbonne	Paris	-	269
Ecole des Ponts ParisTech	Paris	-	270
Université Paris-Sorbonne – Paris 4	Paris	-	293
Ecole Normale Supérieure de Cachan	Cachan	-	330
Université Paris Dauphine	Paris	-	355
Institut National des Sciences Appliquées de Lyon	Lyon	-	451-460

Source: authors based on QS World University Rankings by Region 2020 (QS Top Universities, 2019)

Such a peculiarity of the QS ranking results from the policy of the country aimed at the spatial distribution of a university network and equitable distribution of universities across France in order to provide the population with equal access to high quality higher education and business with equal access to R&D results. The homogeneous distribution of universities across the country is proved by the ARWU ranking whose methodology differs from the one used by the QS ranking and is focused on science and research. French regions are presented in this ranking, however, given that their distribution is different from the one in the QS ranking.

## 7. Conclusion

The increased role of a university network in the socio-economic development require effective instruments to measure the state, state, conditions and peculiar features of its spatial organization. The study substantiates the prospects for the use of analytical instruments of measuring the spatial distribution of a university network based on information sources and statistical databases used in European countries. The instruments designed by the authors as indicators, indices, rankings enable to (1) obtain thresholds of the spatial distribution of a university network; (2) research into the conditions of the distribution; (3) assess the position of a territory in the global space of higher education. The proposed analytical instrument are recommended to be used for grounding managerial decisions and strategies for the spatial distribution of a

university network, the policy aimed at achieving equitable levels of territorial socio-economic development.

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