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Competitiveness of higher education system: international dimension

Abstract
The globalization of the scientific-educational area determines the search for new competitive advantages of universities. One of the modern instruments of competition in the world educational services market is universities ranking. Nowadays the educational rankings are widespread; they are studied by researchers and experts of international organizations. In the same time the high dynamism of scientific-educational area requires the permanent monitoring of the competitive positions of the national higher education systems. The purpose of the article is to analyze the competitive positions of higher education systems of selected countries in the world rankings, as well as to identify the directions of increasing their competitiveness in the context of globalization and digitization of the scientific-educational area. The authors studied the methodology of a range of popular rankings of educational systems, and analyzed the ranks of selected countries (United States of America, Switzerland, United Kingdom, Sweden, Denmark, Canada, Finland, Norway, Ukraine, Germany, France, Austria, Poland, China, and Spain). The selection is based on the differentiation of the countries according to the geographic position and ranking position. The source of data: bases of international organizations OECD, World Bank, UNESCO, ILO; and rankings ARWU, SCImago, Webometrics, and Leiden Ranking. Based on the comparative analysis, the article concludes that the increasing of competitiveness of the national higher education system needs the use of integrated approach combining the set of educational, research, financial, internationalization, and managerial components. The authors emphasized the urgency of developing and implementing institutional strategies for internationalization of universities, synchronized with national ones.

Keywords
fhigher education system, university, competitiveness, ranking, globalization, internationalization, scientific-educational area

JEL: I21, I25, O50, I23

1 Statement of the problem

The structure and quality of the higher education system is initial for the economic, social and cultural development of the country. In modern conditions traditional concept and priorities of higher education is transformed. Globalization is an important aspect of rethinking the paradigm of higher education, which means the correlation of national and world determinants of higher education.

The purpose of the article is to analyze the competitive positions of higher education systems of selected countries in the world rankings, as well as to identify the directions of increasing their competitiveness in the context of globalization and digitization of the scientific-educational area.

To achieve the research objective, the following

methods were used: comparative analysis, convergence and generalizations. For the purpose of the research the data from Universitas 21 Ranking were analyzed. For the comparison we selected 15 countries: United States, Switzerland, United Kingdom, Sweden, Denmark, Canada, Finland, Norway, Ukraine, Germany, France, Austria, Poland, China, Spain. The selection is based on the differentiation of the countries according to the geographic position and ranking position.

2 Latest scientific progress and publications review

The problem of ensuring the competitiveness of higher education system is in focus of attention of scientists, educators and experts of the United Nations, UNESCO, OECD, World Bank, World Economic Forum. In the era of globalization of scientific-educational area the issue of improving theoretical, methodological and applied foundations of increasing the competitiveness of national higher education system in international dimension is becoming more actual (Altbach, Wit, 2015) [1].

Ederer P., Schuller F., Willms S. (2008) propose to consider the competitiveness of higher education through the analysis of its main function – social [3]. We support the position of Stoneken M., Matkevichen R., Weiginen E. (2016), who argue that research of the competitiveness of the national higher education system requires the use of integrated and interdisciplinary approaches.

Methods and instruments for identifying and analyzing the competitive position of institutions in the global educational services market are studied by Williams R. et al. (2017) [14], Martin M., Sauvageot C. (2011) [7], Stonkienė M. et al. (2016) [10], Antonyuk L. et al. (2017) [2], Kalenyuk I. et al. (2018) [5]. The paper is based on the works of Williams [1-3] on the lessons learned from Universitas 21 ranking, Kováts on the discussion of the advantages and disadvantages of higher education rankings [6], and the ideas of Millot B. [8] and Hazelkorn E. [4] regarding the world-class higher education systems.

Various university rankings are widely spread in the modern scientific-educational area. The positions of universities and national higher education systems in such rankings determine the level of their competitiveness among students and other stakeholders (local authorities, employers, enterprises, other partners, etc.). At the same time, taking into consideration the fact of dynamic and changeable nature of the global educational services market, we insist that the monitoring and analysis of positions of different universities and national higher education systems in rankings should be the subject of permanent research.

3 Results of the research

International university rankings primarily take into account indicators reflecting the results of scientific achievements and teaching. At the same time activities aimed at developing the local community are usually ignored. These rankings have a great influence on the development of universities, especially in Europe, Asia, Australia, as a result of which many universities lose their unique features and become similar to others.

We agree with the researchers who criticize the projects and reports where the results of institutional rankings extrapolate on the national higher education systems. It does not mean that if a country has world class universities its higher education system is also world class. National Higher Education Systems Ranking (U21) is a first ranking of national higher education systems. It is a global survey with a ranking measuring of the achievements of world countries in higher education. The survey has been conducted annually since 2012 as a part of a global project by the Universitas 21 (U21) international network of universities from 17 countries (Australia, Belgium, US, United Kingdom, India, Ireland, Canada, China with Hong Kong, Mexico, Netherlands, New Zealand, Singapore, Chile, Sweden, South Africa, Switzerland and Japan). The authors of the study believe that the economic development and competitiveness of modern countries depends to a large extent on the availability of educated and competent specialists and technologies that increase their productivity. The higher education sector contributes significantly to meeting these needs. Moreover, high-quality higher education systems that have broad connections at the international level promotes the global development through the exchange of students, researchers, projects and ideas across the national borders. Based on these prerequisites, the main objective of the U21 project is to find out which countries provide the best higher education. Unlike higher education rankings (for example, Times Higher Education and Quacquarelli Symonds rankings of the best universities in the world), U21 ranks higher education systems among a relatively large number of economically and socially diverse countries [6].

The ranking U21 is calculated using the methodology of the Institute of Applied Economic and Social Research, University of Melbourne, Australia, and rates national higher education systems by 25 key indicators, grouped into four groups: Resources (private and public sector investments) - 25%; Results (scientific research, scientific publications, correspondence of higher education to the needs of the national labor market, including employment rate of graduates) - 40%; Communications (level of international

cooperation, which shows the degree of openness or closedness of the higher education system) - 10%; Environment (state policy and regulation, educational opportunities) - 25%. The first cluster includes such variables as the amount of private and public funds allocated to higher education in relation to the country's GDP and the amount of expenditure in terms of one student. The second is the degree of financial and academic independence of educational institutions, their diversity, a system for monitoring quality standards, and the views of representatives of the business community. To the third - interaction with the industrial sector, the number of publications prepared jointly with representatives of companies and international partners, interaction with industry, representation in online resources, and the attention paid to foreign students. And to the fourth - scientific productivity, the proportion of continuing education, the reputation of the three best universities in the country. The final calculations take into account the population adjustments of the studied countries. These measurements of the effectiveness of higher education systems are summarized in the final index, which determines the position of each country in the world ranking according to the results of international comparison. The source of data for the majority of indicators is the database of one of the major international organizations (e.g. OECD, World Bank, UNESCO, ILO etc.). Results of other rankings, such as ARWU, SCImago, Webometrics and Leiden Ranking are also incorporated. The indicator of "policy and regulatory environment" is calculated in a qualitative way by using expert opinions [11].

The overall ranking of countries is the result of weighting of indicators. Therefore, U21 faces some methodological challenges like other rankings which based on qualitative and quotative indicators. According to Soh (2012) most notable of them are: the correlation of indicators: in the overall ranking output is counted twice, directly and indirectly; the selection of indicators depends on their availability (for example quality of teaching and learning are care not included because there is no reliable international survey dealing with them); there are only 50 countries included in the U21 ranking because of the lack of data for the rest of the countries; the methodology of U21 changed in every year [9].

Table 1 shows the change of rank position in U21 ranking of fifteen selected countries from 2012 to 2019. Some countries do not change their positions significantly during seven years (US, Switzerland, Germany, France, Austria, Norway, Spain), but for others we can see increased (China, UK) or decreased dynamic (Ukraine, Finland, Poland). One of the reasons for such different positions for some countries could be a changing in the indicators within the ranking. As for Ukraine, we can highlight that the decreasing in the position during 2014-2016 is reasonable as it is provoked by complicated geopolitical situation resulted by the

TABLE 1 The change of rank position of selected countries in U21 ranking

Country	Rank position								Change between 2012/2019	Change between 2016/2019
	2012	2013	2014	2015	2016	2017	2018	2019		
United States	1	1	1	1	1	1	1	1	No change	No change
Switzerland	5	3	6	2	2	2	2	2	3	No change
United Kingdom	10	10	8	8	4	3	3	3	7	1
Sweden	2	2	2	5	5	5	4	4	-2	1
Denmark	6	5	3	3	3	4	5	5	1	-2
Canada	3	4	4	6	9	7	8	6	-3	3
Finland	4	6	5	4	6	9	6	9	-5	-3
Norway	9	12	11	12	12	13	12	11	-2	-1
Ukraine	24	36	43	42	42	35	38	38	-14	4
Germany	17	15	18	14	16	16	15	16	1	No change
France	15	17	19	17	17	18	16	17	-2	No change
Austria	12	11	12	13	13	11	11	12	No change	1
Poland	26	30	31	32	32	32	31	31	-5	1
China	38	42	35	34	30	30	30	27	11	3
Spain	23	20	23	24	24	23	25	24	1	No change

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com)

antiterrorist operation in the East of the country.

As mentioned by Kováts, composite overall scores in the ranking hide the differences between systems. Countries with different profiles are ranked similarly. For example, they can be stronger by the separate indicators or have some advantages [6].

It is interesting to analyze the correlation between U21 ranking and the other one (Table 2). As we mentioned previously most of the rankings focus on institutions but not the higher education systems and it is not an analogue for U21. Only QS Higher Education System Strength Ranking highlights the nations with the world's strongest higher education systems. Comparing national performance in four areas, the ranking is based on system strength, access, flagship institution performance, and economic context. Seventy five countries were included in 2018 ranking. In both rankings United States ranked in first place. Other

TABLE 2 The correlation in rank position of selected countries in U21 ranking and QS Higher Education System Strength Ranking

Country	U21 ranking	QS Higher Education System Strength Ranking
	2018	2018
United States	1	1
Switzerland	2	13
United Kingdom	3	2
Sweden	4	14
Denmark	5	22
Canada	8	5
Finland	6	20
Norway	12	30
Ukraine	38	44
Germany	15	4
France	16	6
Austria	11	27
Poland	31	46
China	30	8
Spain	25	12

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com), QS Higher Education System Strength Ranking (https://www.topuniversities.com/)

selected countries differ by their positions as the rankings cover different indicators.

There is also an additional ranking U21, where countries are ranked according to the level of GDP per capita, and China, Ukraine occupy significantly more prominent positions in it. The United States is measured as performing above expected values but falls to 17th position (see Table 3).

A high-quality national system of higher education is formed in the presence of a favorable national support and appropriate resources. Looking at the correlation of scores for the first two clusters that evaluate the invested resources, and for the other two that measure the results, we can define some points. The proportion of those who graduate from higher education significantly correlates with the amount of funds poured into the educational system, regardless of whether it is mainly public funds (as in the countries of Scandinavia). On the other hand, scientific productivity correlates with how much universities spend on research, and this is mainly budgetary funds. The combined effectiveness of the educational system evaluates the total return on resources invested by the country. UK and China are two examples among the selected countries with high scientific productivity, but relatively low starting resources. The governments of both countries support only selected universities, which suggests that this is an effective way to increase scientific productivity. The performance of the third cluster is also highly correlated with the level of resource provision [12].

U21 chose a seven year period and four indicators (research expenditure, publications, international research links and the educational qualifications of the workforce) to analyze the

TABLE 3 Additional ranking U21 – selected countries analysis

Country	U21 ranking (general)	U21 ranking (controlling for level of economic development)
	2019	2019
United States	1	17
Switzerland	2	9
United Kingdom	3	1
Sweden	4	7
Denmark	5	5
Canada	6	6
Finland	9	2
Norway	11	22
Ukraine	38	16
Germany	16	29
France	17	21
Austria	12	15
Poland	31	24
China	27	18
Spain	24	31

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com)

changes and define the trends in higher education modernization worldwide.

The percentage change in Research Expenditure during 2009-16 is presented on the Figure 1. We can

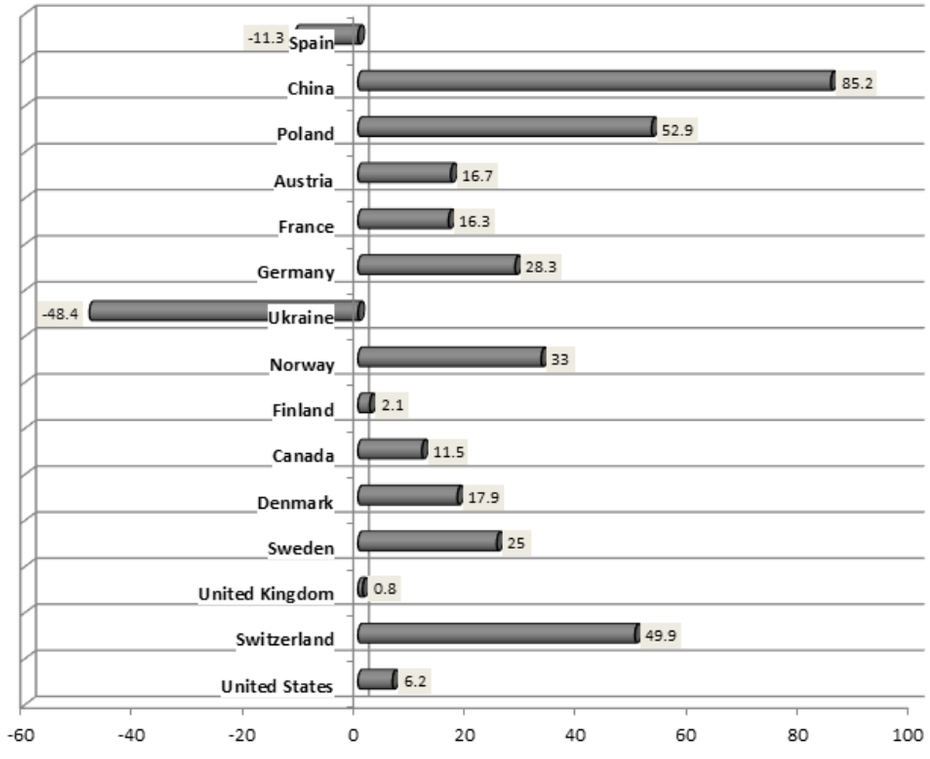

Figure 1 Research Expenditure, 2009-16, % change total

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com)

see the largest increase for China, Switzerland and Norway and the decrease For Ukraine and Spain.

The percentage changes of Publications during 2010-2017 are given in the Figure 2. China has

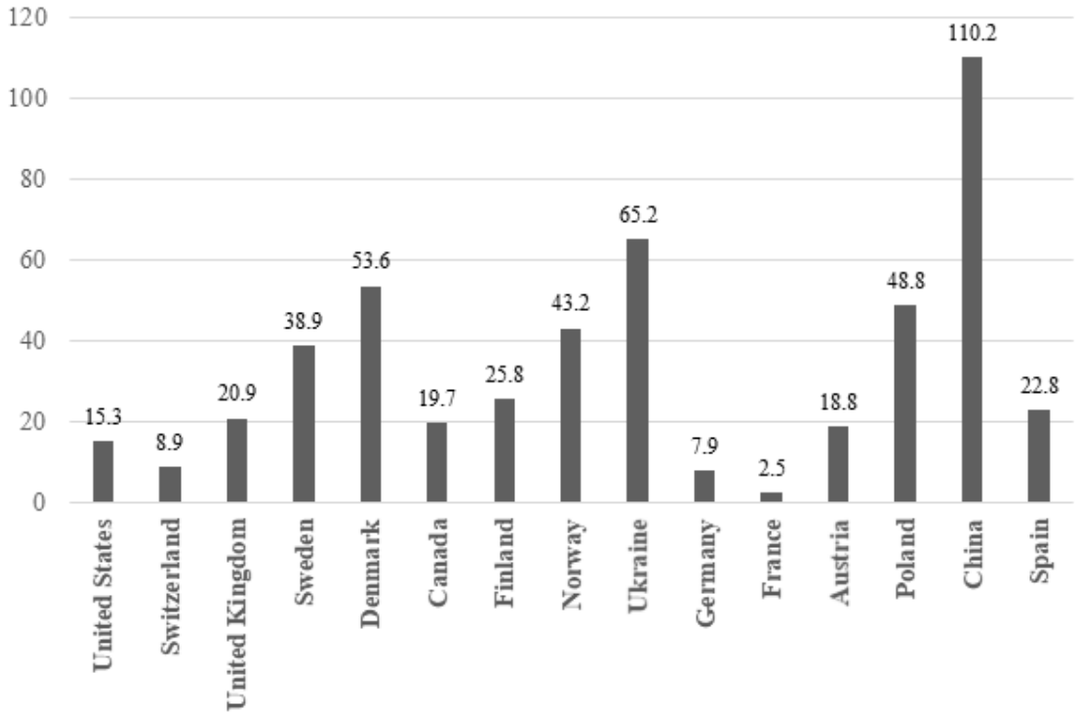

Figure 2 Research Publications, 2010-17, % change total

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com)

more than doubled their publications over the seven-year period.

According to the U21 Report, the largest increases in research publications tend to be from countries coming off a low base; so there is convergence. Countries with well-developed research activity in 2010, as measured by publications, show the smallest increases: Switzerland, Germany and France are among the lowest ranked six countries; the United States is ranked 42nd [11].

In the context of internationalisation the important indicator is joint publications with international co-authors. Over the period 2010 to 2017 the median increase in the share of publications that are jointly authored with international researchers rose in 4.4 percentage points [11]. Finland and the United Kingdom have increased the international share by over ten percentage points. Joint publications fell in Ukraine (Figure 3).

In the context of previous research and

Figure 3 Share of publications with international co-author, 2010-2017

Source: completed by the data from U21 Data Comparison Tool (https://universitas21.com)

developed Quadruple Helix model of the competitive higher education [15] it is interesting to analyze education-business cooperation as a lever of innovative potential development. The cooperation of universities with business sector contributes to economic growth due to the introduction of new technologies obtained as a result of research and preparation of a qualified specialists to meets the needs of the business. It is important to note, that this tendency is observed worldwide. Authorities and business are increasingly demanding more active interaction from higher education institutions. This process is closely related to internationalization: international relations facilitate the exchange of new technologies, international studying and training enriches the individual experiences of students and teachers, and they can participate in strengthening the international relationships.

The degree of engagement in interaction is one of the four modules of the Universitas 21 project. U21 used five indicators of engagement in interaction: the proportion of international students; the proportion of scientific publications written in collaboration with foreign scientists; the proportion of scientific publications prepared as a result of cooperation with the industrial sector; the opinion of business representatives on the process of sharing knowledge; webometric assessment of the external views of online materials. Among the selected countries in the top of the ranking according to the degree of involvement in the interaction are Switzerland, Austria and the UK. The value of each indicator, in fact, also does not reflect a holistic picture of the country. For example, at the national level the proportion of international students is not homogeneous and depends on the level of educational programs. So, in the bachelor's degree of Austrian and British universities, the proportion of international students varies from 14% to 18%. In the US, foreigners make up only 4% of undergraduate students, but among doctorate students their share exceeds 40% [13].

The ranking and expert questionnaires proved that it is easier for relatively small countries to establish relations within the Quadruple Helix: universities, authorities, local community and the private sector. In large by area and population countries such relationships at the national level are usually more complex and formal. Universities in this case develop institutional research links at the local or regional level. In our opinion, state policy plays initial role. Authorities can promote cooperation between universities and industry by introducing financial grant for universities and tax incentives for business; improve the migration law to help the development academic exchange programs and international students' requirement.

4 Conclusions

It is difficult to point the best higher education system or define one ideal model. Different systems have their strong sides, advantages and disadvantages. For example, the Scandinavian higher education system is characterized by the close interaction with the state and business and large investments in science, the same applies to Switzerland, where universities are active in international activities and involved in the life of the local community. The higher education system in the United States, that is in the ranking top, differs significantly from the other systems, as it is less dependent on government support. It is possible to conclude that the higher education system largely controlled by the state, but at the same time little invested has no so much chances to be competitive.

In the process of adapting higher education best policies national governments should focus on countries with a similar size and level of income. The characteristics of a "good" system of higher education partly depend on the size of the average per capita income in the country. First of all, it is necessary to invest in teaching and learning, and then involve all stakeholders to contribute to the ideas` development their implementation.

Increasing the level of global competitiveness of the national higher education system requires the use of integrated approach to universities management. This approach should combine differentiated aspects of the development of higher education institutions. These are the main aspects:

- educational aspects - orientation of universities' educational processes on development of intercultural competences of students, and deepening of research component in teaching;
- research aspects - strengthening the applied component of universities' R&D, and scaling up the presentation of R&D results in publications in foreign scientific journals;
- financial aspects - diversification of universities funding sources, and activation of R&D results commercialization;
- internationalization aspects - increasing export of educational services, and development of institutional strategies for internationalization of universities;
- managerial aspects - widening the spectrum of long-term stakeholder partnerships within the Quadruple Helix Model (government, enterprises, civil society).

The high competitive positions of educational systems require the qualified management with specification of key parameters (KPIs) of assessment of level of objectives achievement at microeconomic and macroeconomic levels. It should also be completed by the implementation of effective system of monitoring the achieved results.

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