



COUNTRIES DISPOSITION IN THE GLOBAL SCIENTIFIC AND EDUCATIONAL AREA: MANAGEMENT AND CLUSTERING

Nataliia Kholiavko

Department of Finance, Banking and Insurance,
Chernihiv National University of Technology, Chernihiv, Ukraine

Artur Zhavoronok

Department of Public, Corporate Finances and Financial Mediation,
Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine

Maksym Marych

Department of Public, Corporate Finances and Financial Mediation,
Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine

Anastasia Viknianska

Department of Public, Corporate Finances and Financial Mediation,
Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine

Serhii Kozlovskiy

Department of Entrepreneurship, Corporate and Spatial Economics,
Vasyl' Stus Donetsk National University, Vinnytsia, Ukraine

Kostiantyn Herasymiuk

National Agency of Ukraine for Civil Service in Vinnytsia, Zhytomyr and
Khmelnitsky regions, Vinnytsia, Ukraine

ABSTRACT

The paper is aimed at developing of suggestions on the directions of internationalization of higher education systems of the world countries on the basis of their clustering by parameters of export and import of educational services.

The study involved the use of the cluster analysis method, which was implemented using the software tool for statistical processing of IBM data SPSS Statistics Base (Statistical Package for the Social Sciences).

The results of the research showed three important findings. Firstly, globalization leads to a gradual change in the forms and methods of work of higher education

institutions; it is accompanied by a change in the structure of foreign students. Secondly, in the world market for educational services, India and China hold the lead in terms of imports of educational services; the USA, Great Britain, Australia, Germany, France, China, Russian Federation – by the export of educational services. Thirdly, enhancing competitiveness of universities in the global educational services market requires a transformation of management approaches at both national and institutional levels, namely: towards the development and implementation of holistic strategies for the internationalization of higher education systems and higher education institutions. The authors emphasize the integrative nature of such strategies, which means combining aspects of marketing and branding of universities abroad, modernization of the educational process, internationalization of research, improvement of the infrastructure and organization of leisure for international students.

JEL Classification: I21, I25, O50, I23.

Key words: management, higher education system; university; clustering; educational services; internationalization; globalization; strategy

Cite this Article: Nataliia Kholiavko, Artur Zhavoronok, Maksym Marych, Anastasia Viknianska, Serhii Kozlovskiy and Kostiantyn Herasymiuk, Countries Disposition in the Global Scientific and Educational Area: Management and Clustering. *International Journal of Management*, 11 (5), 2020, pp. 400-415.
<http://www.iaeme.com/IJM/issues.asp?JType=IJM&VType=11&IType=5>

1. INTRODUCTION

The intensification of competition in the global market for educational services causes the need for searching new tools to evaluate the competitive positions of universities. For this reason, a significant number of world rankings of the best universities of the world and national higher education systems have emerged. However, they are not without certain disadvantages, such as:

- subjectivity (through the involvement of experts in evaluating the performance of universities);
- prioritization (giving more weight to a particular type of university activity - for example, the potential to score more in terms of academic performance than in terms of the quality of the educational process);
- limitations of the parameters selected for accounting (as a consequence, it is impossible to take into account all the parameters and ensure the completeness of the information base);
- uniformity (not taking into account the peculiarities of individual countries, the specifics of local stakeholder requests, the needs of national labour markets, the intensity of scientific and technological and innovative development, etc.).

Notwithstanding the above, world university rankings are still one of the most common competition tools in the educational services market. This is caused primarily by the simplicity of their interpretation, the clarity for the entrants and the transparency of their construction (due to the open access to the method of calculating all rating indicators). However, in order to conduct an in-depth scientific study of the development of the global market for educational services, it is advisable to cluster the countries of the world according to the dynamics of their higher education systems.

2. LITERATURE REVIEW

Clustering of countries by the parameters of export and import of educational services allows to outline their positions in the modern scientific and educational space, the defining characteristic of which development is the active globalization and internationalization. The universally recognized notion of internationalization in higher education was formulated by J. Knight (2011-2012). The scientific community pays considerable attention to research on the processes of internationalization of higher education (Scott, 1998-2000; Coelen, 2015; Kehm & Teichler, 2017; Tamtik, 2017; Frolich, Veiga & Dezembro, 2005; Debych, Horbunova, Zinchenko, Stepanko & Skypko, 2016). Historical aspects of the course of internationalization processes reveal P.G. Altbach and H. De Wit (2015). Separately in this context, it is important to note the scientific work of J.K. Hudzik (2011), in particular, suggested approaches to integrated and institutionalized internationalization of higher education. Conceptual principles for the development and implementation of strategies for internationalization of higher education system and universities are developed by A.V. Verbytska (2018).

A significant contribution to the study of internationalization of higher education was made by L.E. Rumbley and P.G. Altbach (2016). These scientists in their publications highlighted practical and strategic directions of internationalization. In the first direction, institutional frameworks for the internationalization of universities were developed; in the second direction – a complex of issues of state regulation of internationalization processes (Rumbley & Altbach, 2016). L.E. Rumbley (2015) considered internationalization as the imperative of the 21st century. The team of authors (Helms, et al., 2015) analysed the processes of internationalization of higher education at the national level, in particular through the prism of national policies and programs. The economic aspects of higher education internationalization were revealed in the work of P. Bennell and T. Pierce (2003).

R. Choudaha, H. Wit (2014) and D. Killick (2015) considered the impact of internationalization processes on student mobility parameters in the world. Particular attention was paid to the challenges that internationalization cause in shaping a student's personality (Killick, 2015).

The general principles of global competitiveness of educational systems were disclosed in M. West (2012) work. Trends of competition in higher education sphere at the national and global levels were highlighted by S. Marginson, while demonstrating one's own attitude to numerous university rankings (2000-2007). An in-depth analysis of international competitive disposition of national higher education systems was conducted by a team of Ukrainian researchers – L. Antonyuk, D. Ilnytsky and M. Sandul (2017). I. Kalenyuk & O. Kuklin (2009) in a joint scientific work specified the current tendencies of transformation of education in the global environment. A theoretical model for assessing the competitiveness of the national higher education system was proposed in the publication of M. Stonkiene, R. Matkeviciene & E. Vaiginiene (2016). Moreover, in 2003, M. Kwiek (2003) identified a set of challenges that a new century will bring to the higher education system and approaches to its regulation.

While appreciating the existing scientific achievements in the field of internationalization and globalization of the scientific and educational space, it should be noted the following. The dynamism of national higher education systems and the rapid pace of university development require constant monitoring of both the system as a whole and its individual elements. Trends in academic mobility, geographical and profile structure of foreign students require regular monitoring. Formation and effective implementation of programs, strategies, policies of internationalization are possible only on the basis of in-depth analysis and assessment of the current state of the global market for educational services. Based on this, the need to analyse

the countries by export and import of educational services through the use of modern cluster analysis tools is actualized.

3. AIMS OF THE STUDY

The aim of the article is formulation of suggestions on the directions of internationalization of higher education systems of the world countries on the basis of their clustering by parameters of export and import of educational services.

4. RESEARCH METHODS

In the course of the research, the method of cluster analysis has been used, which made it possible to group countries according to the set of parameters of development of national higher education systems. Therefore, it made possible to analyse not each country individually, but to study the dynamics of the development of their groups formed by the criterion of similarity. Thus, it allowed to optimize the research process itself and to avoid cumbersome calculations. Clustering allows, on the one hand, to identify common trends in development of a particular group of countries; on the other hand, to identify leaders and outsiders of the market both generally by sampling and by individual clusters.

Modern ICTs can significantly simplify and accelerate the process of objects clustering. Within this study, was used the IBM SPSS Statistics Base (Statistical Package for the Social Sciences) program, which is characterized by its versatility and is widely used in economics for applied research. The clustering criterion in this program is the distance between the points of the scatterplot, which is most commonly defined as the Euclidean distance.

SPSS uses several clustering methods: Between-groups linkage; Within-groups linkage; Nearestneighbor; Furthest neighbor; Centroid clustering; Median clustering; Ward's Method. The last of these methods has been involved in the course of our study. Ward's Method primarily involves calculating the averages of variables in clusters. The Euclidean squared distance between the mean values of the variables in the clusters and the individual observations is then determined; the distances calculated in this way are added. According to these summaries, the clusters with the smallest increment of distance are merged.

IBM SPSS Statistics Base gives the opportunity not only to perform comprehensive statistical analysis of data, but also to graphically visualize the results of the analysis. In the process of clustering the countries, a modern system of methods and procedures for statistical data processing is used.

The database of the conducted research was taken from Eurostat and UNESCO official statistics; the retrospective analysis has been made possible by the use of Education at a Glance and Global Education Digest statistical collections from different years of release.

In the methodology of the current study were identified two blocks: clustering of countries by export of educational services (inbound mobility ratio, defined as the proportion of students from abroad in the total number of students in a country; the proportion of foreign students in a certain country in the total number of foreign students in the world) and by import of educational services (outbound mobility ratio, which is defined as the proportion of nationals studying abroad in the total number of students in that country; the proportion of foreign students-citizens of a particular country in the total number of foreign students in the world). The statistical sample was comprised only of those countries where the official statistical databases provide complete information on the studied indicators.

5. RESULTS

5.1. Methodology of Clustering Countries by the Parameters of Educational Services Export and Import

1. Defining the purpose of clustering. Choosing a clustering method.
2. Formation of an array of statistics on indicators selected for clustering.
3. Description of the selected variables by determining the form of their distribution, which shows the frequency of the variables entering the intervals of grouping. This allows to define clear intervals in which the indicator fluctuates. Technically, this looks like SPSS program building a spreadsheet with the results of calculations of the frequency of the indicator values entering the intervals, as well as indicating the corresponding valid and accumulated percentages.
4. Construction of the diagram of frequency distribution of variable values. Determination of sample size; specification of the interval at which the overwhelming proportion of inbound sample objects falls. If a certain portion of the input sample falls outside the identified interval, then such values are removed from further calculations. This prevents the results of clustering being distorted.
5. Construction of a summary report table on observations.
6. Determination of agglomeration order (in the current study - by Ward's Method). The SPSS program builds a table describing the steps of agglomeration and calculating the coefficients used to determine the optimal number of clusters. These coefficients show the distance between the two clusters. In the current research, the Euclidean square, defined by standardized values, has been used as such distance.
7. Formation of country clusters by the parameters of export and import of educational services, in particular by identifying the initial cluster centers and the step-by-step integration of observation groups. This integration takes place until the distance between the clusters changes abruptly. SPSS program creates clusters whose objects are characterized by similar manifestations of variables; clusters that are relatively close to each other. Construction of an iteration chronology table indicating the change of cluster centers at each stage.
8. Specifying the affiliation of countries to a particular cluster (SPSS program generates the clusters observation table). Construction of tables with fixation of the final centers of clusters, distances between the final centers of clusters, number of observations in each of the formed clusters.
9. Construction of a dendrogram showing the process of merging clusters (based on the data of the agglomeration order table). The dendrogram clearly demonstrates the merged clusters as well as the values of coefficients within the interval [0; 25]. The clusters formed during the merger are marked on the dendrogram by horizontal dashed lines.
10. Analysis of the formed clusters of countries, in particular by specifying for each of them the intervals of fluctuations of parameters. Economic interpretation of clustering results.

5.2. Clustering of Countries by Import Parameters of Educational Services

In the course of the analysis was identified the feasibility of forming five clusters of countries by import parameters of educational services. This is confirmed by the data in Table 1, which contains a description of the history of object clustering operations performed.

Table 1 Timeline of iterations

Iteration	Change of cluster centers				
	1	2	3	4	5
1	1301,729	698,647	2965,269	0,000	2695,600
2	705,439	106,700	96,134	0,000	0,000
3	0,000	0,000	0,000	0,000	0,000

Source: Compiled by the authors

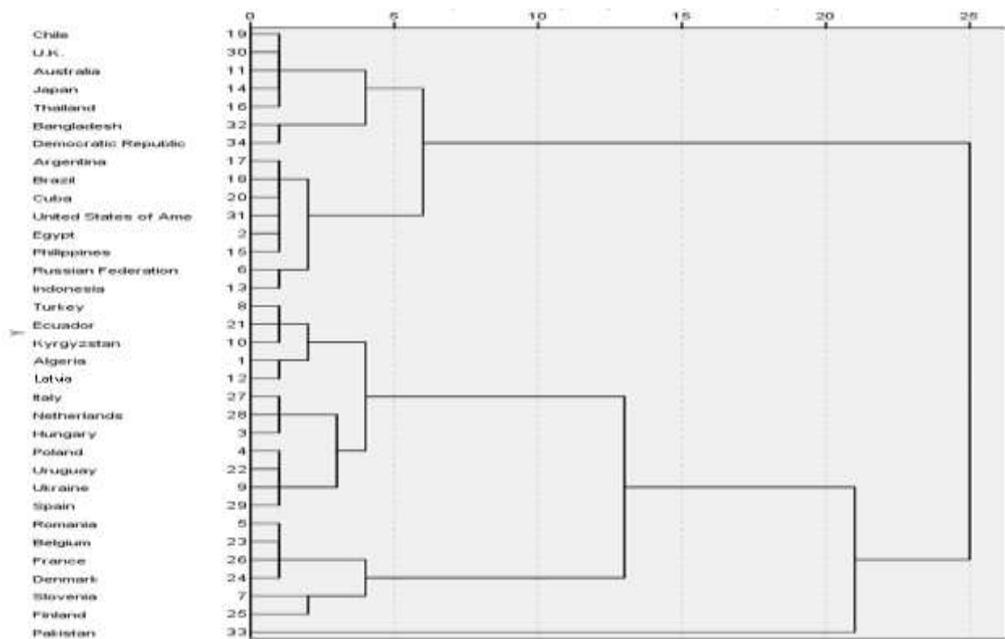
To prevent the clustering results from being distorted, India and China were removed from the original sample. The calculated information on the initial and final centers of the formed clusters is presented in Table 2.

Table 2 Estimated data on cluster centers

Parameter	Cluster				
	1	2	3	4	5
<i>Initial cluster centers</i>					
Number of students	35066,00	16135,00	31,00	562889,00	54407,00
Out bound mobility ratio	1,30	6,40	60,90	1,80	2,40
Gross outboun denrolment ratio	1,10	1,00	4,80	0,50	1,30
<i>Final cluster centers</i>					
Number of students	33058,83	15329,66	3092,31	562889,00	51711,40
Out bound mobility ratio	3,24	5,04	36,46	1,80	2,06
Gross out bound enrolment ratio	1,79	1,93	5,68	0,50	0,96
<i>Distances between cluster endpoints</i>					
Cluster	1	2	3	4	5
1	-	17729,178	29966,547	529830,167	18652,567
2	17729,178	-	12237,391	547559,345	36381,745
3	29966,547	12237,391	-	559796,696	48619,107
4	529830,167	547559,345	559796,696	-	511177,600
5	18652,567	36381,745	48619,107	511177,600	-

Source: Compiled by the authors

The dendrogram showing the connections between some sample objects is shown in Figure 1.



Source: Compiled by the authors

Figure 1 Dendrogram using Ward's method for clustering countries by parameters of educational services import

Analysing the clustering results it should be reminded that India and China were removed from the sample and assigned to the group of leading countries by the parameters of educational services import. This position of these countries is explained, first of all, by demographic and migration factors. India and China have one of the largest population in the world; in an age of globalization and internationalization of the scientific and educational space, the citizens of these countries are actively going abroad for study. Statistics show that in total, a great number of international students in the world is occupied by immigrants from China and India. This is caused by the following major reasons:

- 1) socio-economic (higher standard of living in the EU and the USA);
- 2) political (government stimulating the population to study abroad with the condition of compulsory return and introduction of the acquired knowledge in the economy of the motherland);
- 3) market (highly competitive position of European and American universities in the market due to the higher quality of their services);
- 4) social and personal (people's desire to improve their social status through education abroad for further employment in a high-paid workplace with career prospects).

The first cluster includes Algeria, Saudi Arabia, Belarus, Poland, Romania, Ukraine, Kazakhstan, Indonesia, Japan, Thailand, Brazil, Colombia, Mexico, Greece, Italy, Spain, United Kingdom, Bangladesh, Iran, Nepal and Pakistan. These countries are characterized by a relatively low level of outbound student mobility (0-8%) and an average level of values (0.6-1.3%) of the indicator “the proportion of the population of the country studying abroad in the total volume of international students in the world”.

The first cluster includes Algeria, Saudi Arabia, Belarus, Poland, Romania, Ukraine, Kazakhstan, Indonesia, Japan, Thailand, Brazil, Colombia, Mexico, Greece, Italy, Spain, United Kingdom, Bangladesh, Iran, Nepal and Pakistan. These countries are characterized by a relatively low level of outbound student mobility (0-8%) and an average level of values (0.6-1.3%) of the indicator “the proportion of the population of the country studying abroad in the total volume of international students in the world”.

The first cluster includes Ukraine, whose national higher education system is undergoing reforms. Among their priorities are the activation of the processes of European integration and improvement of the quality of educational services of domestic universities. It should be noted that the statistics show an annual increase in the number of Ukrainian citizens receiving tertiary education abroad. In most cases, Ukrainian students choose higher education institutions in Poland, Czech Republic, Germany, Italy, and Latvia. This choice is motivated not so much by the quality aspects of higher education as by the potential employment opportunities and prospects of living in the EU countries.

The second cluster brings together countries that fall within the averages of the analytics. This cluster includes countries with different geographies, namely: Bahrain, Morocco, United Arab Emirates, Bosnia and Herzegovina, Bulgaria, Moldova, Slovakia, Macedonia, Georgia, Uzbekistan, Singapore, Barbados, Grenada, Jamaica, Ireland, Malta, Angola, Cameroon, Kenya, Senegal and Togo. Systematizing the data it should be noted the economic validity of such grouping of countries, given the lack of powerful higher education institutions in these countries, also those listed in world-recognized university rankings. Accordingly, in pursuit of high quality higher education, students from these countries choose prestigious foreign universities.

The third cluster turned out to be the largest, accounting for 51% of the sample objects. The countries of this cluster are characterized by a low level of outgoing mobility of students (0-8%), as well as a relatively small share of their students studying abroad in the total

number of foreign students in the world (0-0,6%). Geographically, these are countries in Europe, Asia and Africa. There are two main reasons why countries may fall into the cluster with low parameters of educational services import:

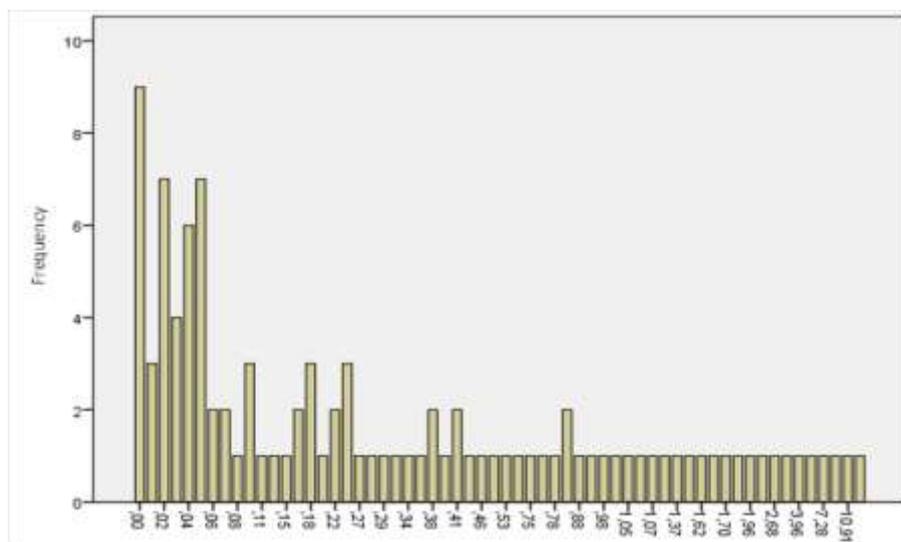
- 1) demographic – due to the low population size in these countries, the number of their citizens-foreign students is too small globally;
- 2) economic – the low income and living standards of some countries in this cluster limit their ability to study abroad (since in addition to tuition fees, they have costs associated with the purchase of teaching and methodological materials, payment for Internet services, and accommodation and food).

The fourth cluster comprises 6.4% of the statistical sample objects, including Montenegro, Aruba, Iceland, Chad, Gambia, Malawi and Niger. According to the parameter “outbound mobility ratio” countries in this cluster fall into the range (14-20%). The above mentioned countries are characterized by a small proportion (0-0.1%) of their citizens in the total number of international students in the world. 4.6% of the sample countries – Turkey, Russian Federation, Malaysia, France, USA – are in the fifth cluster. The share of immigrants from these countries in the total number of international students is relatively large (1.3-2%), and the outbound mobility ratio is at a low level of 0-8%.

The results of clustering the world countries by the parameters of educational services import obtained through the use of the SPSS program are analysed above. To conduct a comprehensive study of the trends of internationalization and globalization of the scientific and educational space, it is necessary to conduct a cluster analysis by the parameters of educational services export.

5.3. Clustering of Countries by the Parameters of Educational Services Export

In accordance with the methodology described above, the next step of the research is clustering of the world countries by major indicators characterizing the export of educational services.



Source: Compiled by the authors

Figure 2 Diagram of distribution of the values frequency of educational services export

The diagram of distribution of values frequency of selected indicators is shown in Figure 2. The United States of America, the United Kingdom, Australia, Russian Federation, China, Japan and France are excluded from the initial sample for quality clustering. These countries are leaders in scientific and educational space in terms of export of educational services.

Excluding them from the sample allowed a thorough clustering of the rest of the world countries by dividing them into four groups (rather than combining them into one cluster). Accordingly, this step made it possible to analyse more deeply several groups of countries, identify trends in the development of their higher education systems.

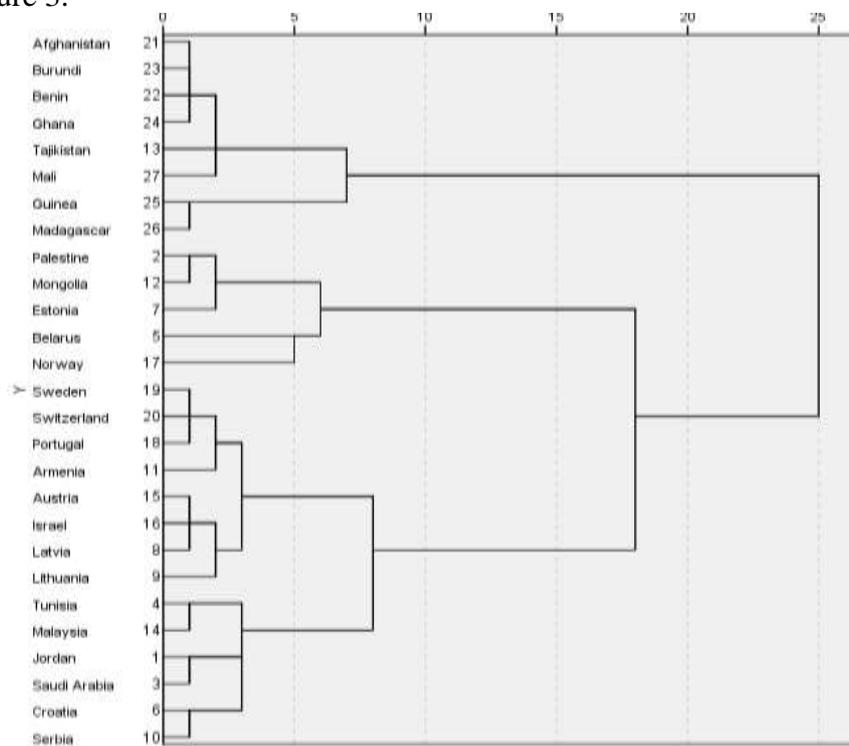
Summary report on observations is presented in Table 3, generated by SPSS program. Similar to the previous stage of the research, in clustering countries by parameters of educational services export, were separated 5 clusters of countries.

Table 3 Summary Report on Observations

Observations					
Valid		Missed		Total	
N	Percentage	N	Percentage	N	Percentage
80	100,0%	0	0,0%	80	100,0%

Source: Compiled by the authors

The dendrogram of relationships between individual objects of the statistical sample is shown in Figure 3.



Source: Compiled by the authors

Figure 3 Dendrogram with the use of Ward's method for clustering countries by the parameters of educational services export

Below are briefly analysed the results of clustering of the world countries by parameters of educational services export. It should be noted that the leading countries in the selected parameters were excluded from the initial sample of clustering objects: the USA, the UK, China, Australia, Japan and France. Taking a cumulative share of the global market for educational services, they are able to significantly distort the results of clustering, thus complicating market segment analysis.

The SPSS program has formed clusters, the most numerous of which is the first. It includes 50 countries from the statistical sample, which is 62.5% of all analysed objects. In general, these are the countries that exhibit low performance of educational services export.

Geographically, this cluster is quite diverse, as it contains countries from different continents. The analysis of the structure of this cluster revealed the following main reasons for the countries' entering it:

- the relatively small size of the countries and, accordingly, their limited ability to accommodate a large number of international students;
- lack of universities with highly competitive positions in the world market of educational services;
- low level of socio-economic development of the country, its national higher education system, which complicates the notification of diplomas of local universities abroad or reduces the competitiveness of their graduates in the labour markets.

The first cluster included Latvia, with, as of 2018, had more than 8,800 foreign students enrolled (about 10-11% of the total number of students in the country). The Latvian Government initiated a policy of active internationalization of higher education, which envisaged expanding the capacity of universities to implement study programs, conduct exams and defend dissertations in EU languages. As a result, measures in internationalization of higher education have increased the number of foreign students fourfold (Government of Latvia, 2018). According to the Central Statistical Bureau of the Republic of Latvia, most foreign students study at Riga Technical University, University of Latvia, Transport and Telecommunication Institute, Baltic Russian Institute, Medical Academy of Latvia. The largest number of foreigners are from Israel, Lithuania, Russia, Estonia and Sri Lanka. The share of Ukrainians among foreign students in Latvia is less than 0.2%.

The second cluster brings together countries with a high proportion of their citizens in the total number of international students in the world (1.5-2%) and low inbound mobility ratio (0-6%). In particular, the SPSS program included in this cluster Egypt, Malaysia, the Republic of Korea, Italy and Spain.

Countries with a low level of representation of their citizens among foreign students of the world (0-0,9%) and average level of inbound mobility ratio (6-14%) are classified in the third cluster. This is Jordan, Czech Republic, Kyrgyzstan, Antigua, Barbados, Bermuda, Ireland, Norway, Sweden, Angola and Namibia.

Austria, Switzerland and New Zealand are included in the fourth country cluster. They are characterized by the average level of the parameter of the number of the country representatives in the total volume of foreign students of the world (1-2%), as well as the high level of the parameter of inbound mobility ratio (14-20%).

The fifth cluster includes a set of countries with low inbound mobility ratio (0-6%) and the average proportion of their population among a cohort of international students in the world (0.3-1.5%). Poland, Romania, Saudi Arabia, Turkey, Ukraine, Thailand, Brazil, Cuba, Netherlands and Belgium are included in this cluster.

Ukraine is in the fifth cluster. According to the state-owned enterprise “Ukrainian State Center for International Education” of the Ministry of Education and Science of Ukraine, in 2018, more than 75,600 foreign students from 154 countries studied in the country. Most foreign students come from India (19.8%), Morocco (9.8%), Azerbaijan (8.2%), Turkmenistan (6.7%) and Nigeria (4.7%). Measures on the internationalization of higher education in Ukraine bring their results, as there is a steady upward trend in the number of foreign students (with the exception of 2013-2014, when the indicator declined due to the deployment of hostilities in eastern Ukraine). The following specialties are most popular among foreign students: “Medicine”, “Medical care”, “Dentistry”, “Management”, “Pharmacy, industrial pharmacy”. This is also reflected in the structure of Ukrainian institutions of higher education, in which the majority of foreigners study: Kharkiv National

Medical University, V.N. Karazin Kharkiv National University, Odessa National Medical University, Bogomolets National Medical University, Zaporizhzhya State Medical University, Dniprovsky Medical Academy, Vinnytsia National Medical University named after M.I. Pirogov, Interregional Academy of Personnel Management, I. Horbachevsky Ternopil National Medical University, Bukovyna State Medical University. As of 2018, only 23 Latvians studied at Ukrainian universities, which is 0.03% of foreign students in Ukraine. The percentage of foreign students from other countries of the Eurozone is similarly low among foreign students in Ukraine.

6. DISCUSSION

Presented in this paper result of the analysis of countries disposition in the global scientific and educational area is correlate with the conclusions of P. Ederer, P. Schuller and S. Willms (2008). Based on the study of the educational systems of 17 countries of the Organization for Economic Co-operation and Development, the mentioned above researchers concluded that competitive higher education systems are aimed at: permanent improvement of learning process; expanding of opportunities for student and other stakeholders; fast respond to changing labor market needs and global challenges; attracting talents (including international students, foreign professors, lecturers). In contrast to the study of P. Ederer, P. Schuller and S. Willms (2008), the analysis presented in this article is structured in two separate blocks - export and import of educational services of universities. Such approach to the study allowed: 1) conducting of in-depth analysis of the countries in both blocks and 2) synthesizing the results to identify current trends in the global scientific and educational area.

The conducted research revealed that the leading positions in the world educational services market are occupied by countries characterized with high parameters of investment of financial resources in the spheres of higher education and science. Besides, the investments are attracted not only from the government sector, but also from the business enterprise sector and private non-profit sector (for example, endowment funds). The same position regarding the direct correlation between amount of investing and level of competitiveness of the higher education system is inherent for J. Kabok, T. Kis, M. Csullog, I. Lendak (2013) and I. Degtyarova, O. Hryhorash, V. Chentsov (2018). At the same time, as V. Satsyk (2014) pointed out, not only the investment aspects affect the level of competitiveness of higher education institution. Achieving high competitive positions in the world educational services market requires the advanced infrastructure and management model, as well as the consolidation of interests of universities, business, government and civil society (Satsyk, 2014). In our opinion, such a comprehensive approach to ensuring the competitiveness of the higher education system is the optimal and the most relevant to the current challenges of the dynamic scientific and educational area.

Analyzing the rank of Ukraine in the world scientific and educational area, the necessity of developing a comprehensive strategy for the internationalization of the higher education system of Ukraine was noted. During the research the scientists L. Antonyuk, D. Ilnytskyy, D. Barabas and M. Sandul (2017) come to the similar conclusion, in particular, they emphasize the necessity of development and effective implementation of strategy for enhancing the competitiveness of the national higher education system. Y. Petrunia, V. Chentsov, N. Zyczynski, V. Petrunia (2019) substantiated that increasing of competitiveness of higher education institutions actualize the transformation of the university's management structure, in particular, they proposed to strengthen the role of the marketing unit in management. Stable competitive positions of higher education institutions in the global scientific and educational area require the development of the universities' marketing management systems (Petrunia et al., 2019). R. Tarrach, E. Ergon-Polack, P. de Maret, J.-M. Rapp and J. Salmi (2011)

emphasize that effective implementation of such strategies is possible on the basis of the modernization of management systems in higher education, in particular towards decentralization and autonomization of universities.

S. Marginson (2006, 2012) stated that there is no optimal, universal strategy for the development of competitive universities at the global level. It is explained by the significant difference of countries in terms of pace and features of their economic, social and cultural development. Therefore It is important to analyze world experience, identify the best practices and adapt them to the particularities of the national economy (Kudła, Stachowiak-Kudła, Polszakiewicz, & Boehlke, 2014).

7. CONCLUSIONS

The use of the IBM SPSS Statistics Base toolkit revealed the leading positions of India and China in terms of importing educational services. These countries, according to the data from UNESCO Institute for Statistics, account for about 17% (China) and 3.8% (India) of the total number of international students in the world. The results of clustering of the countries of the world confirmed the hypothesis of increasing globalization and internationalization of scientific and educational space.

Clustering by parameters of educational services export confirmed the leadership of the USA, the UK, Russian Federation, China, Japan, Australia and France in the global market for educational services. What is more, among these countries, according to the UNESCO Annual Surveys for Statistics, according to the number of inbound internationally mobile students, the United States (more than 18.5% of the total number of international students in the world), the United Kingdom (more than 8%) and Australia (more than 7%) are ranked first.

The conducted research allows making the conclusion that the competitiveness of a higher education institution in the global market for educational services (and, accordingly, the number of foreign students in it) is positively influenced by the existence of a coherent strategy for the internationalization of the higher education system of the country and of universities in particular. At the same time, institutional strategies should be harmonized with the national internationalization strategy. In our view, strategies for the internationalization of higher education should integrate several key aspects:

- 1) marketing (promotion of the brand of Ukrainian universities among foreign applicants);
- 2) educational process (focus on the development of students' intercultural competences; expansion of English courses and programs; coordination of educational programs with stakeholders; introduction of innovative teaching and ICT methods);
- 3) research (intensification of international research activities of universities; strengthening of the research component in training programs of future specialists; commercialization of scientific research results in the real sector of the economy);
- 4) leisure and infrastructure (improving the quality of adaptation and support programs for foreign students, including the organization of their meaningful leisure; organization of courses in the language of the country of study; development of modern infrastructure, including the information one).

Latvia and Ukraine have shown a steady upward trend in the number of international students over the last ten years. This is the result of the gradual introduction of measures to internationalize the higher education systems of these countries. The actions taken in this direction by the governments of both countries are intensified by the activities of higher education institutions. With the demographic situation worsening in most regions of Ukraine and Latvia, universities are trying to actively enter the global market for educational services

by attracting more foreign students each year. Among the main priorities for the development of Ukrainian and Latvian universities are the improvement of the quality of their educational services, entering the top-50 world rankings and improving the reputation in the global scientific and educational space. This will not only attract more foreign students in the long run, but also significantly expand their geography (in particular, will increase the number of students from the European Union, the United States of America, Australia).

ACKNOWLEDGMENTS

This research is carried out with in the frame work of the scientific project “Integrated Model of Competitive Higher Education in Ukraine under the Quadruple Helix Concept” with the support of the Ministry of Education and Science of Ukraine.

REFERENCES

- [1] Altbach, P.G., & De Wit, H. (2015). Internationalization and global tension: Lessons from history. *Journal of studies in international education*, 19 (1), 4-10. <https://doi.org/10.6017/ihe.2015.81.8726>
- [2] Antonyuk, A., Ilnytsky, D., Barabas, D., & Sandul, M. (2017). International Competitive Disposition of National Higher Education Systems. *International Economic Policy*, 2, 7-38. Retrieved from http://iejournal.com/journals_eng/27/2018_1_Antoniuk_Ilnytsky_Barabas_Sandul.pdf
- [3] Bennell, P., & Pierce, T. (2003). The Internationalisation of Tertiary Education: Exporting Education to developing and Transitional Economies. *International Journal of Educational development*, 23, 215–232. [https://doi.org/10.1016/S0738-0593\(02\)00024-X](https://doi.org/10.1016/S0738-0593(02)00024-X)
- [4] Choudaha, R., & Wit, H. (2014). Challenges and Opportunities for Global Student Mobility in the Future: a comparative and critical analysis. *Internationalisation of Higher Education and Global Mobility*. Oxford: Symposium Books. <https://doi.org/10.15730/books.87>
- [5] Coelen, R. (2015) Why Internationalize Education? *International Higher Education*, 83, 4-5. <https://doi.org/10.6017/ihe.2015.83.9074>
- [6] Cosmulese, C.G., Grosu, V., Hlaciuc, E., & Zhavoronok, A. (2019). The Influences of the Digital Revolution on the Educational System of the EU Countries. *Marketing and Management of Innovations*, 3, 242-254. <http://doi.org/10.21272/mmi.2019.3-18>
- [7] De Wit, H., Hunter, F., Howard, L. & Egron-Polak, E. (2015). *Internationalisation of Higher Education*. Retrieved from www.europarl.europa.eu/RegData/etudes/.../2015/.../IPOL_STU540370_EN.pdf
- [8] Debych, M.A. (2017). *Internatsionalizatsiia vyschoi osvity: svitovyjdosvid [Internationalization of higher education: international experience]* Sumy. Retrieved from https://ihed.org.ua/wp-content/uploads/2019/11/Debych_M_2-12-2019_monogr_disert.pdf
- [9] Degtyarova, I., Hryhorash, O., & Chentsov V. (2018). The mechanism of higher education funding in Ukraine: nationwide and local perspective. *Investment Management and Financial Innovations*, 15(3), 223-236. [http://doi:10.21511/imfi.15\(3\).2018.19](http://doi:10.21511/imfi.15(3).2018.19)
- [10] Ederer, P., Schuller, P., & Willms, S. (2008) *University Systems Ranking: Citizens and Society in the Age of the Knowledge*. Lisbon Council, Brussels. URL: <https://vo.hse.ru/data/2010/12/31/1208182358/Evrop.pdf>
- [11] Frølich, N., Veiga, A., & Dezembro, R.P. (2005). Competition, cooperation, consequences and choices. Internationalisation in higher education. *EAIE/EAIR Joint Seminar*, 22, 23. Retrieved from

https://www.researchgate.net/publication/225083900_Competition_cooperation_consequences_and_choices_Internationalisation_in_higher_education

- [12] Helms, R.M., Rumbley, L.E., Brajkovic, L., & Mihut, G. (2015). *Internationalizing higher education worldwide: National policies and programs*, Washington, DC: American Council on Education. Retrieved from <https://www.acenet.edu/news-room/Documents/National-Policies-and-Programs-Part-1-Global.pdf>
- [13] Holyavko, N., Mostova, M., & Shestakovska, T. (2014). Ukraine's higher education system development tendencies. *Economic Annals-XXI*, 3-4 (2), 23-26. Retrieved from http://soskin.info/userfiles/file/2014/3-4_2014/2/Kholyavko_Mostova_Shestakovska.pdf
- [14] Horbunova, L., Debych, M., Zinchenko, V., Stepanko, I., & Shypko, O. (2016). *Analiz providnoho vitchyznianoho ta zarubizhnoho dosvidu internatsionalizatsii vyschoi osvity na osnovi kul'turno-humanitarnykh stratehij [Analysis of the leading national and international experience of higher education internationalization on the bases of cultural-humanitarian strategies] (part II): preprint*. Kiyv, IVO NAPN Ukraine.
- [15] Hudzik, J.K. (2011). *Comprehensive Internationalization: From Concept to Action*. NAFSA. Retrieved from http://ecahe.eu/w/images/1/1f/Comprehensive_Internationalization_-_NAFSA.pdf
- [16] Kabók, J., Kis, T., Csüllög, M., & Lendák, I. (2013) Data Envelopment Analysis of Higher Education Competitiveness Indices in Europe. *Acta Polytechnica Hungarica*. Vol. 10. No. 3. 2013. P. 185-201. URL: https://www.uni-obuda.hu/journal/Kabok_Kis_Csullog_Lendak_41.pdf
- [17] Kalenyuk, I., & Kuklin, O. (2009). Suchasni tendentsii transformatsii osvity u hlobalnomu seredovyshchi [Current trends in the transformation of education in the global environment]. *Sotsioekonomika [Socioeconomics]*, 86-99. Retrieved from <http://dspace.nbuv.gov.ua/handle/123456789/39804>
- [18] Kalenyuk, I., Tsymbal, L., Djakon, A., & Panchenko, E. (2018). Assessment of intellectual leadership under global competition. *Problems and Perspectives in Management*, 16(4), 212-223. [https://doi.org/10.21511/ppm.16\(4\).2018.18](https://doi.org/10.21511/ppm.16(4).2018.18)
- [19] Kozlovskiy, S., Mazur, H., Vdovenko, N., Shepel, T., Kozlovskiy, V. (2018). Modeling and forecasting the level of state stimulation of agricultural production in Ukraine based on the theory of fuzzy logic. *Montenegrin Journal of Economics*, Vol. 14(3), pp. 37-53. <https://doi.org/10.14254/1800-5845/2018.14-3.3>
- [20] Kozlovskiy, S., Khadzhynov, I., Vlasenko, I., Marynychak, L. (2017). Managing the sustainability of economic system as the basis of investment development in Ukraine. *Investment Management and Financial Innovations*, Vol. 14(4), pp. 50-59. [https://doi.org/10.21511/imfi.14\(4\).2017.06](https://doi.org/10.21511/imfi.14(4).2017.06)
- [21] Kozlovskiy, S., Grynyuk, R., Baltremus, O., Ivashchenko, A. (2017). The methods of state regulation of sustainable development of agrarian sector in Ukraine. *Problems and Perspectives in Management*, Vol. 15(2-2), pp. 332-343. [https://doi.org/10.21511/ppm.15\(2-2\).2017.03](https://doi.org/10.21511/ppm.15(2-2).2017.03)
- [22] Kehm, B.M., & Teichler, U. (2007). Research on internationalisation in higher education. *Journal of Studies in International Education*, 11(3-4), 260-273. <https://doi.org/10.1177/1028315307303534>
- [23] Killick, D. (2015). Developing the Global Student: Higher education in an era of globalization. *Internationalization in Higher Education Series*. New York: Routledge. 1st Edition. <https://doi:10.5281/zenodo.1035983>
- [24] Knight, J. (2003). Updated Internationalisation Definition. *International Higher Education*, 33, 2-3. <https://doi.org/10.6017/ihe.2003.33.7391>

- [25] Knight, J. (2011). Five myths about internationalization. *International higher education*, 62, 14-15. Retrieved from <https://ejournals.bc.edu/index.php/ihe/article/view/8532/7666>
- [26] Knight, J. (2012). *Internationalization: Three Generations of Crossborder Higher Education*. New Delhi: India International Centre. Retrieved from http://www.iicdelhi.nic.in/ContentAttachments/Publications/DiaryFiles/53511July92012_IC%20Occasional%20Publication%2038.pdf
- [27] Kudła, J., Stachowiak-Kudła, M., Polzakiewicz, B., Boehlke, J. (2014). The higher education competition in Poland and the quality of teaching and research: the case of economic and law studies. *Ekonomia i Prawo. [Economics and Law]*, 13(4), 471-482. <http://dx.doi.org/10.12775/EiP.2014.033>
- [28] Marginson, S. (2000). Living with the Other: Higher education in the global era. *International Higher Education. Monash Centre for Research in International Education, Australian Universities' Review*, 5-8. Retrieved from <https://files.eric.ed.gov/fulltext/EJ618275.pdf>
- [29] Marginson, S. (2006) Dynamics of National and Global Competition in Higher Education // *Higher Education*. Vol. 52. No. 1. P. 1–39. <http://dx.doi.org/10.1007/s10734-004-7649-x>
- [30] Marginson, S. (2006). Dynamics of national and global competition in higher education. *Higher Education*, 1-39. <https://doi.org/10.1007/s10734-004-7649-x>
- [31] Marginson, S. (2012). Emerging Countries Need World-Class Universities. *University World News*, issue 214. URL: <https://www.universityworldnews.com/post.php?story=20120320114704953>
- [32] Marginson, S., & Van Der Wende, M. (2007). To rank or to be ranked: The impact of global rankings in higher education. *Journal of studies in international education*, 11 (3-4), 306-329. <https://doi.org/10.1177/1028315307303544>
- [33] Petrunia, Y., Chentsov, V., Życzyński N. & Petrunia V. (2019). Marketing environment and marketing management of universities in Ukraine: national and regional dominants. *Innovative Marketing*, 15(1), 1-12. [http://doi:10.21511/im.15\(1\).2019.01](http://doi:10.21511/im.15(1).2019.01)
- [34] Rumbley, L.E. (2015). “Intelligent Internationalization”: A 21st Century Imperative. *International Higher Education*, 80, 16-17. <https://doi.org/10.6017/ihe.2015.80.6146>
- [35] Rumbley, L.E., & Altbach P.G. (2016). The local and the global in higher education internationalization. *Global and local internationalization*, Sense Publishers, Rotterdam, 7-13. https://doi.org/10.1007/978-94-6300-301-8_2
- [36] Satsyk, V. (2014). Детерминанты глобальной конкурентоспособности университетов: в поисках эффективной стратегии развития высшего образования на Украине [Determinanty globalnoy konkurentosposobnosti universitetov: v poiskakh effektivnoy strategii razvitiya vysshego obrazovaniya na Ukraine]. *Voprosy obrazovaniya*. 1, 134-161. URL: https://www.researchgate.net/publication/261544181_Determinanty_globalnoj_konkurentosposobnosti_universitetov_v_poiske_effektivnoj_strategii_razvitiya_vysshego_obrazovaniya_na_Ukraine_zurnal_Voprosy_obrazovaniya_Vyssaa_skola_ekonomiki_Moskva_2014
- [37] Scott, P. (1998). Massification, Internationalisation and Globalisation. The Globalisation of Higher Education. *Society for Research into Higher Education*. Open university press. Pp. 108–129.
- [38] Scott, P. (2000). Globalisation in Higher Education: challenges for the 21st century. *Journal of Studies in International Education*, 4 (1), 3-10. <https://doi.org/10.1177/102831530000400102>

- [39] Shkarlet, S., Kholiavko, N., & Dubyna, M. (2015). Territorial reform in the system of strategic management of energy-economic and information spheres of the state. *Economic Annals-XXI*, 5-6, 103-107. Retrieved from http://soskin.info/userfiles/file/2015/5-6%202015/Shkarlet_Kholiavko_Dubyna.pdf
- [40] Stonkienė, M., Matkevičienė, R., & E. Vaiginienė (2016). Evaluation of the national higher education system's competitiveness: Theoretical Model. *Competitiveness Review: An International Business Journal*, 26, 116-31. <https://doi.org/10.1108/CR-06-2015-0055>
- [41] Tamtik, M. (2017). Who governs the internationalization of higher education? A comparative analysis of macro-regional policies in Canada and the European Union. *Comparative and International Education*, 46. Retrieved from <http://ir.lib.uwo.ca/cie-eci/vol46/iss1/2>
- [42] Tarrach, R., Egron-Polack, E., de Maret, P., Rapp, J.-M., Salmi, J. (2011) Daring to Reach High: Strong Universities for Tomorrow's Spain. *Report of the Committee of International Experts*. EU2015. Madrid.
- [43] *The State, the Market, and Higher Education: Challenges for the New Century* / Marek Kwiek (ed.) The University, Globalization, Central Europe. Frankfurt-on-Main. New York: Peter Lang, 2003. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.189.4358&rep=rep1&type=pdf>
- [44] Verbytska, A. (2018). Proekt natsionalno istrategii internatsionalizatsii vyshchoi osvity Ukrainy: intehrovana model [The project of national internationalization strategy of Ukraine: the integrated model] *Derzhavne upravlinnia: udoskonalennia ta rozvytok [Public Administration: Improvement and Development]*, 11. <https://doi.org/10.32702/2307-2156-2018.10.24>
- [45] West, M. (2012). Education and Global Competitiveness. *Issues in Science & Technology*, 28, 37-44. Retrieved from <http://nrs.harvard.edu/urn-3:HUL.InstRepos:9544459>
- [46] Ibrahim Waheed, Prof. Dr. Andy Seddon, (2018), Utilisation and Challenges of the Learning Management Systems in the Higher Education Institutions in Maldives: The Lecturers' and Students' Perspectives, *International Journal of Information Technology & Management Information System*, 10(1), pp. 01–10.
- [47] Senthil Kumar J, Venkataraman V, Meganathan S and Meena V, (2017), A Data Mining approach to classify Higher Education Sector data using Bayesian Classifier, *International Journal of Mechanical Engineering and Technology*, 8(9), pp. 95–103
- [48] Hamad Balhareth, (2018), Cloud Computing Strategy and Adoption in Higher Education: The Case of Saudi Arabia. *International Journal of Information Technology & Management Information System*, 9(1), pp. 30–38.
- [49] Natalie V. Kamenez, Elena A. Aleshugina, Olgai. Vaganova, Zhannav. Smirnova and Anna V. Chanchina, (2018), Competency-Oriented Improvement of an Additional Language Educational Program in Technical Higher Education, *International Journal of Mechanical Engineering and Technology*, 9(11), pp. 1137–1145.