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Qualitative position of universities of V4 countries in World Rankings

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Abstract

Universities are a source of strength in the knowledge economy of the 21st century. They are increasingly seen as a key driver of innovation and a 'major driver of economic growth'. Universities are a key factor that plays a central role in the knowledge economy. Today, the role of the modern university goes beyond teaching and performing basic research. Universities cooperate with the business sector and/or the public sector with the main goal of exchanging knowledge to develop and use the results of science and research-based education in order to increase competitiveness and maintain the competitive advantage of the regions. For this reason, it is necessary to build and develop a high-quality, highly competitive university environment, which thus becomes the main driving force of innovation and is the main factor in the economic growth of states. It is therefore necessary for universities to achieve the required quality level and position within the competitiveness of world universities. The aim of this paper is to identify the qualitative and quantitative position of the universities of the V4 countries within the position of the world's universities in the five most important international rankings.

Keywords: V4 countries, universities, world rankings, quality education, higher education
Jel codes: B00

1. Introduction

Universities and scientific research centers are playing a new role in the system of creating wealth and prosperity in connection with increasing competitiveness. It is the universities that become the bearers of new innovative ideas, which can significantly support the economic and political development of countries.

Universities are becoming increasingly complex and diverse market players. The commercialization of the educational market changes their current position and forces them to redefine the orientation from traditional academic values towards business models. Their position in international rankings becomes a reflection of the quality, effectiveness of adopted strategies and actions determining the future decisions of its consumers - students.

The contribution has an empirical-theoretical nature and its goal is to identify the qualitative and quantitative position of the universities of the V4 countries within the framework of five selected rankings evaluating the international level and position of world universities. The paper thus specifically investigates the position of the best universities within a wider time period, which is defined by the placement of the respective universities in the thousandth place of the ranking of these selected world ranking agencies/organizations. In this way, we monitor both the hierarchical position of the universities in the ranking and, at the same time, the dynamics of qualitative changes within the monitored chronological development. Our research methodology was based on a critical content analysis of qualitative data and literature from various databases and information sources: EBSCO Information Services, Google Scholar, WoS, as well as the Scopus database.

2. Universities as a platform for creating knowledge

If we start from the premise that we live in a global knowledge economy and a society based on information processing - such as universities, then the quality, efficiency and relevance of the university system will be directly related to the ability of people, society and institutions to develop. In the context of the technological revolution and revolution in communication, the university becomes a central actor of scientific and technological changes, but at the same time, the importance of universities also lies in other aspects, such as the ability to train a workforce adequate to the new conditions of production and management. Universities also become a critical resource for leveling the odds and democratizing society by providing equal opportunities for people. It is not only a contribution to economic growth, but also a contribution to social equality, or at least to lower inequality. The university's ability to develop new cultures is another factor - to be a source of cultural renewal and cultural innovation associated with the new forms of life we are entering. After all, the university was dramatically affected by the technological changes themselves. Its own information and communication technologies, as an institution that processes information, deeply influence the functioning and culture of the university, sometimes without full knowledge of what is happening and without control of these processes. Despite all these challenges, possibilities and opportunities for the university system, universities in many cases remain rigid and bureaucratic, defending their own interests - especially when it comes to professors - and they are also extremely rigid in their functioning, when it comes to their management. (Castells, 2017, p. 57)

The university is an institution with more than 900 years of history, which supporters of the tradition refer to as a temple of knowledge or an "ivory tower" where knowledge represents an autotelic value (Barry, Chandler, Clark, 2001). For centuries, its goal was to determine the social order in accordance with the principles of reason and current values. (Sułkowski et al., 2020, p. 297) Even though it was considered a hermetic, traditional culture where everything was not comprehensible and clear, it still gave hope that it would eventually be so (Noga & Pauluk, 2014).

The very term "university" was coined by the University of Bologna, founded in 1088, the first medieval university. These were communities with administrative autonomy, study programs, publicly recognized degrees, and research tasks that differed significantly from the religious institutions that dominated here before (De Ridder -Symoens & Rüegg, 1992). Since then, universities have spread throughout the world in much the same form and are considered to have played a significant role in the commercial revolution through the development of legal institutions (Cantoni & Yuchtman, 2014) and in the industrial revolution in the construction and development of knowledge and its subsequent dissemination. (Mokyr, 2002). In 1900, only 1% of the world's young people were enrolled in university. Over the course of the century, this exploded to 20% as recognition of the value of such education spread. It turns out that the expansion of higher education since 1950 has not only been a product of rising wealth, but has also contributed to economic growth around the world. (Valero, Van Reenen, 2019, p. 53)

In the middle of the 20th century, higher education loses its elitist status. The emergence of the global economy, technical and technological expansion, the increase and economic importance of knowledge production have transformed higher education into a mass phenomenon directly responsible for the development of society.

The end of the 20th century witnessed changes in the socio-economic functions of the university. In addition to the traditional educational and scientific missions, rapidly developing areas of economic activity stood out. New areas of the university's activity include: development and transfer of technologies, commercialization of academic products and their entry into the market, establishment of new businesses, management of intellectual property for the purpose of making a profit.

In the early 2000s, universities in Europe played an important role in the creation of a knowledge-based society, as they were a milestone for research, education and innovation. The concept of EU Networks of Excellence is based on the idea of integrating the scientific environment at universities at the global level into network structures using the strengths of their participants. At the European meeting in Hampton Court (2005), together with research and development, universities were defined as the basis of European competitiveness. For example, Cambridge The University has transformed Cambridgeshire into an innovation cluster - giving birth to ten companies with billion-dollar revenue capitalisations. The UK government's 2011 White Paper on Higher Education states that the world's best universities are significantly deepening their relationships with business. They sought to take maximum advantage of innovation and provided training for students at a level beyond the general level of the labor market.

The latest policies for universities have recently been debated in the UK. While some argue that there are currently too many universities and graduates, the Universities and Research Act is being pushed through Parliament, which includes measures to encourage entry into the sector to encourage growth and social mobility. Brexit, meanwhile, poses a high risk to the university system. The potential impact on students, academics, research funding and cross-border collaboration in the EU - all of which are likely to be important to the success of Britain's world-class universities and their economic contribution - is huge. (Valero & Van Reenen, 2019, p. 53-67)

Universities must be understood as fulfilling different functions, which are emphasized in certain historical periods in some universities, and which are to some extent constantly combined and which depend on the emphasis on one or the other function. From a historical point of view, universities started mainly as creators of values and social acceptance. All the major universities in the world started as theological schools: Bologna - the oldest in Europe, then Cambridge, Oxford, Harvard, Salamanca, Sorbonne, etc. As theological schools, they were producers of values and social legitimacy. Other non-religious universities played a similar role in creating, for example, imperial values in the case of some major universities that justify Western dominance and superiority in the colonial world. A second function, historically as important as the creation of values, was the selection of the elite and the creation of stratification in society, ensuring that the elites passed through the selection functions of some of these universities. This function is very important both before and now. The so-called universities "Ivy League " [1]in the United States, or "grandes écoles" in France, or Cambridge and Oxford in England are slightly "better" than other universities, but not so much better that it corresponds to the fact that up to 90% of the elites who run business and politics come from these universities. The selection of elites is therefore extremely important, rather than other features. The third function, also in historical order, was workforce training. This led to the emergence of a professional university – medical, law and technical schools were particularly important. Technical schools were crucial for the development of industrialization. Examples include the School of Lausanne (one of the best engineering schools in Europe), Caltech as a purely engineering university in the US, and Imperial College the same in Great Britain.

There is another type of university that does not belong to the above, namely the scientific university. It is a university whose primary function and emphasis is the production of scientific knowledge. This is a later inventive approach that was established primarily at German universities in the second half of the 19th century. Humboldt was the first to assume that the role of scientific production would be the primary function of the university. This idea did not catch on in the United States until much later. The first university to copy the German model was Johns Hopkins university, and not, for example, Harvard or MIT. In the United States, universities that were public universities, so-called Land Grant18, they also developed as scientific universities, but with an overhang for society. For example, Berkeley began as an agricultural school and Michigan as a mining university.

The fourth function is science for the development of specific industries that were very important for the country. Fifth, they are "general universities", universities that came with the aim of increasing the educational level of the population in general and brought at least 20-25% of the wealthy classes to the universities. These were the universities that developed in France, Italy, Spain and Latin America after the Second World War and then in Africa after independence. "Everyone should be able to go to college" was the main idea, while it was

[1]Ivy League (Ivy League) is the name associations eight the most prestigious elite private universities in the northeastern USA. Brown University, Columbia University, Cornell University, Dartmouth College, Harvard University, the University of Pennsylvania, Princeton University, and Yale University.

important to keep the other functions in relatively separate institutions so that mass education would not overburden them. Each country developed systems in which the elite would be formed differently and science would be done differently. In the case of Europe, they separated research centers from universities to create national research centers, etc. Castells (2017, p. 60) calls this general type of university a university for mass education. Therefore, not to provide vocational training, but to provide degrees that enable access to the labor market and enable graduates to be trained in this work. The last function is what Castells (2017, p. 60) calls entrepreneurial universities. These universities focus on innovation and the connection between the world of business and the world of science and technology. A classic example of this type is Stanford university, which has deliberately institutionalized itself as a large scientific university, while it is constantly connected to practice and therefore to the business world. In this direction, MIT made the same decision as many other universities in the world. The concept of interaction, that is, a very close connection between excellent results in the field of science and technology and, at the same time, the ability to develop a business system.

All these functions are combined in different ways throughout the university system. One of the key issues is how to articulate these different functions without trivializing one or the other. For example, it is obvious that not every university can be a research university. At the same time, however, all universities must have access to the research centers that exist in the university system for specific purposes and can create small research centers that are connected to the needs of society and the economy on the one hand and are supplied by research networks that can build throughout the university system. Moreover, because we live in a global economy and a global research system, universities are becoming self-sufficient, which seems to lose the importance of the main research centers. However, it is crucial to be in the networks of global production of knowledge, research and innovation. Therefore, it is not necessary to be the best in any or even all areas. To enter the networks, you must have an invitation, that is; you have to provide something that is not necessarily the best in the world, but is sufficiently interesting and necessary for all other members of the global research network in a particular field. The Internet is of course crucial. You don't necessarily have to go to other research centers; you can disseminate your results, network and work in a global research network without having to spend every two years in a different country. In the current state of the global knowledge economy, knowledge production and technological innovation are becoming the most important productive forces. For this reason, no country can truly participate in the global knowledge economy without having at least some level of a national research system composed of universities, the private sector and public research centers. (Čajka, 2020, p. 77-81)

Universities are becoming increasingly complex and diverse market players. The commercialization of the educational market changes their current position and forces them to redefine the orientation from traditional academic values towards business models. Building a market advantage forces the need to take actions that focus on consumer-related values. It is the consumer who, on the one hand, becomes a key stakeholder in the activities of universities and, on the other, a partner. As a result, the university is transformed into an ecosystem of mutual multidimensional relationships between its staff and students. It is developed in search of subsequent success factors and unique values. Its position in the rankings becomes a reflection of the effectiveness of adopted strategies and actions determining the future decisions of its consumers - students. (Sułkowski et al., 2020, p. 296)

However, the university has ceased to fulfill its functions in the classical sense. It is now widely recognized that universities are an important tool for facilitating the contemporary knowledge economy. As much knowledge is developed within universities and government research facilities, they are considered important catalysts for regional economic and social development through the creation of new, innovative businesses that add value through knowledge creation (Guerrero-Cano, Kirby, Urbano, 2006). As a result, the university is evolving towards the concept of an entrepreneurial university and a socially responsible university, moving away from the concept of "universitas". The university is explicitly transformed from a scientific institution to an enterprise, and traditional university values are partially replaced by market rules (Czerepaniak-Walczak, 2013). This situation requires a new approach to the functions that the university fulfills in the educational process, and a greater orientation than before to the needs and expectations of various groups of interested parties, especially students - consumers. Consumer orientation becomes an indicator of the effectiveness of the implemented market strategy and a source of new challenges for university management determined by eclecticism, in which everyone is right depending on the surrounding conditions and the network of meanings. Entrepreneurial universities redefine the traditional roles of the university in the community as a creator of knowledge through basic and applied research, a subject of technology and knowledge transfer, an innovator and a supporter of economic development (Sultan, 2017).

Although the key function of the university still remains the education of students and the conduct of scientific studies, they are increasingly developing the character of entrepreneurial activity. A key role in this process is played by the strategy of building a competitive advantage based on understanding the changing needs of the market, flexibility, proactivity and adaptability to observed changes. The stimulator of such processes are

domestic and international rankings of universities, which, according to employers, indicate academic prestige, innovativeness or reputation. They influence the individual decisions of future students about the choice of university and major, as well as approaches and preferences to the current educational process. It advocates a reinterpretation of the behavior of universities from the point of view of changes in their social and economic orientation in the context of the implemented educational functions. (Sułkowski et al., 2020, p. 297)

3. International rankings of university quality assessment

International rankings originate from the United States of America, where a specific "rating culture" has developed in many areas of social and economic life. The advantage of the university ranking is the possibility of comparing not only universities themselves, but also countries, as well as monitoring long-term trends of changing relative positions in the ranking. The disadvantage is the arbitrary selection of methodology criteria, which determines the appreciation of one type of improvement and the undervaluation of others. For example, most recognized rankings highly value significant scientific achievements (e.g. Nobel Prizes) as well as the weight of publications and citations due to the development of scientometric methodology. It is much more difficult to assess the educational value, which can be described using hard-to-grasp and measurable variables such as the quality of education, employment and the added value of education. (Sułkowski et al., 2020, p. 299-300)

Evaluating entire systems of higher education is not an easy task. The multiple functions of such systems, the diversity of their mission, the absence of consensus on what constitutes system quality, as well as the lack of generally available, measurable indicators that would reflect these functions and mission, all lead to ambiguity. Due to this complexity, there are still few attempts to evaluate higher education systems. There are at least two dimensions critical to system evaluation that are mostly missing from university evaluations: (a) student evaluation and (b) system governance. Indeed, the lack of internationally comparable data on university student performance is a huge obstacle to measuring how well countries are doing in equipping their youth with skills and knowledge. (Millot, 2015, p. 157)

For an objective evaluation and comparison of the level and quality of universities in the V4 countries, we used five ranking lists. Within these rankings, we focused on evaluating the ranking and number of universities in each state up to the thousandth place. The selection of international university rankings was easy because three of these rankings are the most popular, the best established and provide comparable data for several years. They are: a) Shanghai Academic Ranking of World Universities (ARWU) developed by the Center for World Class Universities (2013); Times World University Rankings Higher Education (THE) and the Quacquarelli world ranking of universities Symonds (QS). They differ in terms of objectives, scope, methodology and data sources, as well as their institutional affiliation (THE and QS are commercial activities run by private firms, ARWU is run by a consultancy firm - Shanghai branch Jiao Tong University), the "big three" also share a number of common features. Therefore, they are a logical choice for comparison. A fourth ranking Round has been added to these three University Ranking, RUR World University Rankings. Round University Ranking (RUR) is an international world university ranking system that measures the performance of 1100 leading world universities from 82 countries using 20 unique indicators and 4 key areas of university activities: teaching, research, international diversity, financial sustainability. All raw data (such as the number of students, academic staff, etc.) is provided by Thomson Reuters through a special data survey called Global Institutional Profiles Project (GIPP). This survey is conducted every spring and includes 700-800 higher education institutions worldwide, with a prospective expansion of 1000+. RUR Rankings cover the period from 2010 to the present. RUR Rankings is designed as a rating system that aims to provide sufficient information about university performance to address the specific tasks of stakeholders: students, academics, university management, policy makers.

The last rating scale is Center for World University Rankings. It is a leading consultancy that provides policy advice, strategic insights and consultancy services to governments and universities to improve education and research outcomes. Since 2012, CWUR has published the only academic ranking of the world's universities, which evaluates the quality of education, employability, faculty quality and research without relying on surveys and university data. The ranking began as a project in Jeddah, Saudi Arabia, to rank the world's top 100 universities. It was quickly reported by the university and the media around the world, and many requests were received for its expansion. In 2019, the ranking expanded to include the best 2,000 out of nearly twenty thousand universities worldwide, making it the largest academic ranking of the world's universities. Since 2016, the Center for World University Rankings has been based in the United Arab Emirates.

Shanghai Ranking's Academic Ranking of World Universities (ARWU) is one of the most popular (Buela-Casal, 2007), which was created to measure the distance between world universities leaders and Chinese universities. However, it soon proved to be a useful tool for measuring the scientific achievements of universities around the world. Like any scientometric method, the Academic Ranking of World Universities has its limitations, which means the need to supplement the ranking with other types of university evaluation. The

methodology used by ARWU favors the appreciation of the cumulation of scientific outputs and spectacular scientific achievements, which leads to the strengthening of the tendency to create relatively large universities (Salmi, 2016). In recent decades, many governments have decided to stimulate consolidation in the higher education sector, not only to rationalize educational networks and improve the quality of science and management, but also to improve the visibility of the country and universities worldwide. Ranking progress is a recognizable and logical measure of success not only for university managers, but also for national public policy makers (Münch, Schäfer, 2014). That the instrumental criterion for measuring the quality of science and education, related to the visibility of the university and the country in the rankings, has become so important is characteristic of the Internet era. Cxritics of evaluation note that they have sometimes become more important than the organic development and growth of the university (Lynch, 2015). As a result, they can even lead to irrational, destructive mergers that can destroy the university's potential instead of enhancing it. (Sułkowski et al., 2020, p. 300)

	University	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SK (2)	Comenius University	-	-	-	-	-	#701 - 800	#701 - 800	#801 – 900	#601 – 700	#801 - 900	#701 - 800
	Slovak University of Technology in Bratislava	-	-	-	-	-	-	#801 - 900	-	-	-	-
CZ (9)	Charles University in Prague	#201 - 300	#201 – 300	#201 - 300	#201 – 300	#201 – 300	#201 - 300	#201 - 300	#201 – 300	#201 – 300	#201 - 300	#301 - 400
	Masaryk University	-	-	-	-	-	#601 - 700	#501 - 600	#601 – 700	#601 – 700	#601 - 700	#401 - 500
	Palacký University Olomouc	-	-	-	-	-	#601 - 700	#601 - 700	#501 - 600	#501 – 600	#701 - 800	#701 - 800
	Czech Technical University in Prague	-	-	-	-	-	#601 - 700	#601 - 700	#701 - 800	#701 - 800	#801 - 900	#801 - 900
	Czech University of Life Sciences Prague	-	-	-	-	-	-	#901 - 1000	#901 - 1000	#801 - 900	#801 - 900	#801 - 900
	Technical University of Ostrava	-	-	-	-	-	-	-	-	-	#901 - 1000	#901 - 1000
	Brno University of Technology	-	-	-	-	-	-	-	-	-	#701 - 800	#901 - 1000
	University of Chemistry and Technology Prague	-	-	-	-	-	-	#901 - 1000	#701 - 800	#901 - 1000	-	-
	University of South Bohemia	-	-	-	-	-	-	#901 - 1000	#901 - 1000	#901 - 1000	-	-
PL (12)	Jagiellonian University	#301 - 400	#301 - 400	#301 - 400	#301 – 400	#401 – 500	#401 - 500	#401 - 500	#301 - 400	#401 - 500	#401 - 500	#401 - 500
	University of Warsaw	#301 - 400	#301 - 400	#301 - 400	#301 – 400	#401 – 500	#301 - 400	#301 - 400	#401 - 500	#301 - 400	#401 - 500	#401 - 500
	AGH University of Science and Technology	-	-	-	-	-	#601 - 700	#601 - 700	#601 - 700	#701 - 800	#701 - 800	#601 - 700
	Adam Mickiewicz University	-	-	-	-	-	#701 - 800	#701 - 800	#701 - 800	#801 - 900	#901 - 1000	#901 - 1000
	Medical University of Warsaw	-	-	-	-	-	-	#701 - 800	#701 - 800	#901 - 1000	#701 - 800	#901 - 1000
	Warsaw University of Technology	-	-	-	-	-	-	#701 - 800	#801 - 900	#801 - 900	#901 - 1000	#901 - 1000
	Wroclaw University of	-	-	-	-	-	-	#901 -	#901 -	-	#901 -	#901 -

	Science and Technology							1000	1000		1000	1000
	Nicholas Copernicus University	-	-	-	-	-	-	#901 - 1000	#901 - 1000	-	-	#901 - 1000
	Gdańsk University of Technology	-	-	-	-	-	-	-	-	#801 - 900	#801 - 900	#801 - 900
	Wroclaw Medical University	-	-	-	-	-	-	-	-	-	#801 - 900	#801 - 900
	Warsaw University of Life Sciences	-	-	-	-	-	-	-	-	-	#801 - 900	#801 - 900
	University of Wroclaw	-	-	-	-	-	#701 - 800	#901 - 1000	-	-	-	-
HU (5)	University of Szeged	#401 - 500	#401 - 500	#401 - 500	#401 – 500	-	#501 - 600	#501 - 600	#601 - 700	#601 - 700	#601 - 700	#701 - 800
	Eötvös Lorand University	#301 - 400	#301 - 400	#301 - 400	#401 – 500	-	#501 - 600	#501 - 600	#501 - 600	#601 - 700	#601 - 700	#601 - 700
	Semmelweis University	-	-	-	-	-	-	#601 - 700	#901 - 1000	#901 - 1000	#701 - 800	#601 - 700
	Budapest University of Technology and Economics	-		-	-	-	#701 - 800	#701 - 800	#801 - 900	#801 - 900	#801 - 900	#901 - 1000
	University of Debrecen	-	-	-	-	-	-	#901 - 1000	#901 - 1000	#901 - 1000	-	-

Source: own processing according to Shanghai Ranking's Academic Ranking of World Universities 2020, www.shanghairanking.com/index.html

The Times Higher Education (THE) World University Rankings (https://www.timeshighereducation.com/), considers the key performance indicators to be: pedagogical process (educational environment); research (volume, income and reputation); citations (research impact); international outlook (staff, students and research);

	University	2014 - 2015	2015 - 2016	2016-2017	2018	2019	2020	2021	2022
SK (3)	Comenius University in Bratislava	-	#601-800	#601-800	#601-800	#801-1000	-	-	-
	Slovak University of Technology in Bratislava	-	#601-800	#801+	#801-1000	-	-	-	-
	Technical University of Košice	-	-	-	#801-1000	-	-	-	-
	over #1000	-	-	-	-	+ 2	+ 4	+ 6	+7
CZ (14)	Charles University	#301-350	#401-500	#401-500	#401-500	#401-500	#401-500	#401-500	#501-600
	Masaryk University	-	#501-600	#601-800	#501-600	#601-800	#601-800	#601-800	#801-1000
	Palacký University Olomouc	-	#501-600	#601-800	#601-800	#601-800	#601-800	#601-800	#801-1000
	University of South Bohemia in České Budějovice	-	-	-	-	-	#801-1000	#801-1000	#801-1000
	Czech Technical University in Prague	-	#501-600	#601-800	#601-800	#801-1000	#801-1000	-	-
	University of Chemistry and Technology , Prague	-	#601-800	#601-800	#601-800	#801-1000	-	-	-
	Brno University of Technology	-	#401-500	#601-800	#801-1000	#801-1000	-	-	-
	Czech University of Life Sciences Prague (CULS)	-	-	#801+	#801-1000	#801-1000	-	-	-
	University of Ostrava	-	-	-	#801-1000	#801-1000	-	-	-
	University of Pardubice	-	#601-800	#801+	#801-1000	-	-	-	-
	Tomas Bata University in Zlín	-	-	#801+	#801-1000	-	-	-	-
	VSB - Technical University of Ostrava	-	#301-350	#801+	#801-1000	-	-	-	-
	University of West Bohemia	-	#601-800	#801+	#801-1000	-	-	-	-
	Technical University of Liberec	-	-	#801+	-	-	-	-	-
	over #1000	-	-	-	+ 1	+ 6	+ 12	+ 14	+14

PL (11)	Jagiellonian University	-	#601-800	#601-800	#601-800	#601-800	#601-800	#501-600	#501-600
	University of Warsaw	#301-350	#501-600	#501-600	#501-600	#601-800	#601-800	#801-1000	#601-800
	Medical University of Warsaw	-	-	-	-	-	-	#801-1000	-
	Adam Mickiewicz University, Poznań	-	#601-800	#801+	#801-1000	#801-1000	#801-1000	-	-
	Gdańsk University of Technology	-	#601-800	#801+	#801-1000	-	#801-1000	-	-
	AGH University of Science and Technology	-	#601-800	#601-800	#601-800	#801-1000	-	-	-
	Warsaw University of Technology	-	#601-800	#501-600	#601-800	#801-1000	-	-	-
	University of Wroclaw	-	-	-	#801-1000	-	-	-	-
	University of Silesia in Katowice	-	#601-800	#801+	#801-1000	-	-	-	-
	Nicholas Copernicus University in Toruń	-	-	#801+	#801-1000	-	-	-	-
	University of Łódź	-	-	#801+	-	-	-	-	-
	over #1000	-	-	-	+ 3	+ 7	+ 10	+ 16	+21
HU (8)	Semmelweis University	-	#501-600	#501-600	#401-500	#401-500	#401-500	#401-500	#251-300
	Eötvös Lorand University	-	#601-800	#601-800	#601-800	#601-800	#601-800	#601-800	#601-800
	University of Pécs	-	#601-800	#601-800	#601-800	#601-800	#801-1000	#601-800	#801-1000
	University of Szeged	-	#601-800	#601-800	#601-800	#601-800	#801-1000	#801-1000	#801-1000
	University of Debrecen	-	#601-800	#801+	#801-1000	#801-1000	#801-1000	#801-1000	#801-1000
	Budapest University of Technology and Economics	-	#601-800	#601-800	#801-1000	#801-1000	-	-	-
	Corvinus University of Budapest	-	-	-	#801-1000	-	-	-	-
	Central European University	-	-	#301-350	-	-	-	-	-

	over #1000	-	-	-	-	+ 1	+ 3	+4	+6

Source: own processing according to THE World University Rankings, https://www.timeshighereducation.com/

QS World University Rankings (https://www.topuniversities.com/qs-world-university-rankings), which considers the following measurable indicators: academic reputation – 40%; faculty citations – 20%; faculty/student ratio – 20%; employer's reputation - 10%; international faculty rate – 5%; and the proportion of international students – 5%.

	University	**2012**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
SK (5)	Comenius University	-	-	-	#651 - 700	#651 - 700	#701 - 750	#751 - 800	#751 - 800	#701 - 750	#651 - 700	#651 - 700
	Slovak University of Technology	-	-	-	-	-	-	#751 - 800	#751 - 800	#801 - 1000	#801 - 1000	#801 - 1000
	Technical University of Kosice	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Pavol Jozef Šafárik University in Košice	-	-	-	-	-	-	-	-	#651 - 700	#601 - 650	#701 – 750
	University of Zilina	-	-	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000
CZ (10)	Charles University in Prague	#286	#233	#244	#279	#302	#314	#317	#291	#260	#266	#288
	Czech Technical University in Prague	#501 - 550	#451 - 460	#411 - 420	#451 - 460	#501 - 550	#491 - 500	#531 - 540	#498	#432	#403	#378
	Masaryk University	#551 - 600	#551 - 600	#551 - 600	#551 - 600	#601 - 650	#551 - 600	#571 - 580	#551 - 560	#531 - 540	#551 - 560	#551 - 560
	Brno University of Technology	#601 +	#651 - 700	#651 - 700	#601 - 650	#651 - 700	#601 - 650	#651 - 700	#651 - 700	#651 - 700	#701 - 750	#701 - 750
	Palacký University Olomouc	-	-	-	-	#651 - 700	#701 - 750	#651 - 700	#601 - 650	#591 - 600	#601 - 650	#651 - 700
	University of Chemistry and Technology in Prague	-	-	-	-	-	-	-	#355	#342	#373	#358
	Technical University of Liberec	-	-	-	-	-	-	-	#751 - 800	#751 - 800	#801 - 1000	#801 - 1000

	Czech University of Life Sciences in Prague	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Mendel University in Brno	-	-	-	-	-	-	-	-	#701 - 750	#801 - 1000	#801 - 1000
	University of Hradec Kralove	-	-	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000
PL (17)	University of Warsaw	#398	#338	#335	#344	#366	#411 - 420	#394	#349	#321	#308	#284
	Jagiellonian University in Krakow	#401 - 450	#376	#371	#411 - 420	#431 - 440	#461 - 470	#411	#338	#326	#309	#293
	Warsaw University of Technology	#601 +	#601 - 650	#651 - 700	#651 - 700	#601 - 650	#601 - 650	#601 – 650	#521 - 530	#511 - 520	#501 - 510	#521 - 530
	Nicholas Copernicus University	#701 +	#701 +	#701 +	#701 +	#701 +	#801 - 1000	#801 – 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	University of Lodz	#601 +	#701 +	#701 +	#701 +	#701 +	#801 - 1000	#801 – 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	University of Wroclaw	#701 +	#701 +	#701 +	#701 +	#701 +	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Adam Mickiewicz University in Poznań	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	AGH University of Science and Technology in Krakow	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Wroclaw University of Science and Technology	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	University of Gdańsk	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Cracow University of Technology	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Poznań University of Technology	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Łódź University of Technology	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000

	Gdańsk University of Technology	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Silesian University of Technology	-	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000	-
	University of Silesia in Katowice	-	-	-	-	-	-	#801 - 1000	#801 - 1000	-	-	-
	Warsaw University of Life Sciences	-	-	-	-	-	-	-	#801 - 1000	-	-	-
HU (8)	University of Szeged	#501 - 550	#501 - 550	#551 - 600	#501 - 550	#501 - 550	#501 - 550	#470	#501 - 510	#501 - 510	#551 - 600	#551 - 600
	University of Debrecen	#601 +	#601 - 650	#601 - 650	#601 - 650	#651 - 700	#651 - 700	#601 - 650	#601 - 650	#521 - 530	#591 - 600	#651 - 700
	Eötvös Lorand University	#551 - 600	#551 - 600	#601 - 650	#601 - 650	#601 - 650	#651 - 700	#701 - 750	#651 - 700	#601 - 650	#651 - 700	#701 - 750
	Corvinus University of Budapest	#551 - 600	#651 - 700	#701 +	#701 +	#701 +	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	-
	University of Pécs	-	-	-	-	#701 +	#751 - 800	#701 - 750	#651 - 700	#651 - 700	#651 - 700	#701 - 750
	Budapest University of Technology and Economics	-	-	-	-	#701 +	#751 - 800	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000	#801 - 1000
	Szent Istvan University	-	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000	#801 - 1000
	Széchenyi István University	-	-	-	-	-	-	-	-	-	#801 - 1000	#801 - 1000

Source: own processing according to QS World University Rankings, https://www.topuniversities.com/qs-world-university-rankings

Round University Ranking, RUR World University Rankings (https://roundranking.com/) considers the following key indicators: teaching indicators (academic staff per students, academic staff per bachelor's degree, doctoral degrees per academic staff, doctoral degrees per bachelor's degree, teacher reputation); research indicators (citations per academic and research staff, doctoral degrees per received PhD., normalized citation impact, articles per academic and research staff, research reputation); indicators of international diversity (international academic staff, foreign students, international co-authored works, international reputation, international level); and indicators of financial sustainability (institutional income per academic staff, institutional income per students, research income per million researches, research income per academic staff, research income per institutional income).

	University	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
SK (2)	Comenius University in Bratislava	#505	#500	#496	#416	#445	#433	#391	#417	#394	#404	#426
	University of Zilina	-	-	-	-	-	-	-	-	-	-	#658
CZ (7)	Charles University in Prague	#276	#301	#266	#247	#276	#259	#274	#273	#277	#250	#254
	Masaryk University	#522	#562	#538	#562	#482	#395	#526	#488	#477	#449	#443
	Brno University of Technology	#548	#587	#591	-	-	#629	#659	#632	#574	#531	#509
	University of West Bohemia	-	#655	#653	#712	#658	#696	#685	#713	#648	#664	#676
	Pancakes University of Olomouc	-	-	-	-	#530	#459	#482	#494	#442	#452	#430
	University of Pardubice	-	-	-	-	-	-	-	-	-	-	#844
	Prigo University	-	-	-	-	-	-	-	-	-	-	#882
PL (8)	University of Warsaw	#472	#439	#495	#525	#514	#473	#457	#411	#389	n.d	n.d
	Jagiellonian University	#399	#433	#445	#436	#425	#421	#411	#420	#392	#358	n.d
	Adam Mickiewicz University	#537	#602	#612	#609	#647	#678	#640	#601	-	n.d	-
	Warsaw University of Technology	#515	#580	#610	#621	-	-	#635	#591	#551	#540	-
	University of Lodz	#571	#624	#648	#667	-	-	-	#710	#674	n.d	-
	Gdańsk University of Technology	-	-	-	-	-	-	-	#659	#642	#634	-
	Łódź University of Technology	-	-	-	-	-	-	-	-	#665	#627	-
	AGH University of Science and Technology	-	-	-	-	#651	-	-	-	-	-	-
HU (8)	Semmelweis University	#361	#368	#396	#366	#430	#328	#336	#329	#282	#339	#259
	Central European University	#448	-	#234	#238	#245	#199	#251	#350	#179	#182	#396
	University of Szeged	-	#527	#412	#500	#512	-	-	#531	#482	#416	#474
	University of Debrecen	-	#590	#545	#569	-	-	#586	#539	#547	#377	#450

	Corvinus University of Budapest	#572	#639	#645	#679	#665	-	-	-	-	-	-
	Eötvös Lorand University	-	-	-	-	-	-	-	-	#516	#464	#498
	University of Pecs	-	-	-	-	-	-	-	-	-	-	#535
	University of Sopron	-	-	-	-	-	-	-	-	-	-	#812

Source: own processing by Round University Ranking, https://roundranking.com/

Center for World University Rankings (CWUR) (https://cwur.org/), which considers the following measurable evaluation indicators: research performance (research output, measured by the total number of research papers; high-quality publications, measured by the number of research papers appearing in top journals; impact, measured by the number of research papers appearing in highly influential journals; and citations, measured by the number of highly cited research papers, a total of 40% of the indicator's value); the quality of education (measured by the number of university graduates who received significant academic awards in proportion to the size of the university - 25% of the indicator value); employment of graduates (measured by the number of university graduates who held the highest executive positions in the world's largest companies in proportion to the size of the university - 25% of the indicator value); and faculty quality (measured by the number of faculty members who have received significant academic awards - 10% of the indicator value).

	University	**2014**	**2015**	**2016**	**2017**	**2018 - 2019**	**2019 - 2020**	**2020 - 2021**
SK (1)	Comenius University in Bratislava	#732	#685	#637	#658	#673	#651	#607
	+ 2 over #1000 (2020 – 2021)	-	-	-	-	-	#1959	-
CZ (6)	Charles University	#313	#270	#266	#255	#203	#237	#237
	Palacký University Olomouc	#804	#724	#658	#600	#610	#572	#573
	Masaryk University	#742	#702	#731	#686	#571	#546	#577
	Czech Technical University in Prague	#771	#716	#663	#661	#667	#652	#609
	University of South Bohemia in České Budějovice	-	-	-	-	#930	-	-
	University of Chemistry and Technology, Prague	#963	#980	-	-	-	-	-
	+ 8 over #1000 (2020 – 2021)							
PL (14)	Jagiellonian University	#479	#451	#429	#421	#381	#362	#375
	University of Warsaw	#419	#462	#449	#464	#260	#394	#396
	AGH University of Science and Technology	#653	#782	#819	#857	#633	#673	#624
	Warsaw University of Technology	#688	#646	#963	#666	#576	#729	#717
	University of Wroclaw	#914	#921	#890	#888	#776	#928	#833

	Adam Mickiewicz University, Poznań	#878	#890	#922	#954	#741	#831	#836
	Medical University of Warsaw	-	-	-	-	#834	#865	#911
	Wroclaw Medical University	-	-	-	-	-	#900	#940
	Medical University of Lodz	-	-	-	-	-	#901	#966
	Wrocław University of Science and Technology	#922	#944	#963	-	#844	#929	#976
	Medical University of Silesia	-	-	-	-	-	#933	-
	University of Silesia in Katowice	#954	#964	#969	-	#899	-	-
	Nicholas Copernicus University in Toruń	#918	#911	#888	#944	#954	#962	-
	Medical University of Gdańsk	-	-	-	-	-	#955	-
	+ 25 over #1000 (2020 – 2021)							
HU (6)	Eötvös Lorand University	#371	#458	#488	#515	#413	#598	#588
	Semmelweis University	#598	#617	#631	#611	#658	#643	#666
	University of Szeged	#712	#731	#708	#762	#758	#692	#667
	University of Debrecen	#673	#667	#661	#694	#696	#724	#684
	Budapest University of Technology and Economics	#811	#819	#850	#898	#823	#862	#898
	University of Pécs	#862	#892	#877	#885	#948	-	-
	+ 3 over #1000 (2020 – 2021)							

Source: own processing according to The Center for World University Rankings (CWUR), https://cwur.org/

Based on the above analyzes in the following table no. 1, we summarize the total number of universities for the entire monitored evaluation period of individual ranking agencies.

Table 1. Number of universities in the first 1000 selected agencies

State	ARWU	THE	QS	RUR	CWUR
Slovakia	2	3	5	2	1
Czech	9	14	10	7	6
Poland	12	11	17	8	14
Hungary	5	8	8	8	6

Source: own processing according to the above-mentioned ranking agencies

In table no. 2 shows the total number of universities in individual countries, as well as the type of universities in which, apart from the Slovak Republic, private universities dominate. A specific example is Poland, where the number of private universities exceeds the number of more than 300. Most of the universities that were placed in

all 5 rankings within the individual V4 states are public universities. From the point of view of the total number of public colleges/universities in table no. 2 and at the same time the total number of universities located within 1000 places in table no. 1 we see a significant disparity in the case of Slovakia as well as Poland.

Table 2. Number of universities in V4 states

State	Total	Public	Private	State	Religious	Foreign
Slovakia	**33**	20	10	3	-	6
Czech	**58**	26	30	2	-	17
Poland	**457**	131	326	-	-	-
Hungary	**64**	6	37	-	21	4

Source: own processing according to available national databases

4. Conclusion

A high-quality education sector is one of the important factors that contribute to the country's strength in international relations. Growing internationalization brings more direct links between education, international relations and foreign policy. The importance of education in the international prestige and status of the country has grown significantly in recent years, mainly as a result of the fundamental transformations of the global economy and the associated shift in values. Knowledge is not only growing exponentially, but also spreading rapidly globally. In order to catch up with the global knowledge race, education outside the labor market is needed, which reflects the shift to post-materialist values, and these effects can be a source of a country's attractiveness to the world economy.

Flexibility, adaptability, strong leadership and, above all, an encouraging environment supporting business processes will be essential for the future of universities. In many countries, the position in the global rankings increasingly influences the acquisition of research funds, the acquisition of better students, staff and researchers, together with scientific cooperation with domestic and international players. The level of awareness and the extent of the use of rankings when choosing a university in the context of a broadly understood international market should be much higher. However, it requires a wide range of changes both at the national level (e.g. legislation, research funding) and at the level of individual universities, especially in the process of building their market position based on the criteria of international rankings.

The performed analysis of the qualitative and quantitative level of universities in the V4 countries showed relatively significant differences in the number as well as in the ranking position between the V4 countries. In all cases, we can state that the quantitative number of universities represented in individual states is approximately the same, with slight differences in the number of universities. At the same time, this number naturally reflects the total number of universities in individual countries, as documented in Table 2, which also reflects the total size of these countries in terms of population. From a qualitative point of view, in terms of the higher-ranking position of individual universities, we can generally see a constantly decreasing position of universities in most states, which is also documented by the color highlighting in red. In some cases, there was even a situation where they dropped to position 1000+ in the university ranking, which is an even worse result. In addition to The Times Higher Education and Center for World University Rankings, in the case of all countries, we can see a gradual increase of new universities in the ranking. The Times Higher Education is characterized by the most significant decrease in the number of universities in the ranking itself, as well as a decrease in the position in this ranking, which can most likely be attributed to the methodology of the selected indicators. The highest qualitative position, highlighted in green in the tables, among all countries, is achieved by Hungarian universities within the Round University Ranking. In the case of the other four ranking organizations, we can see approximately the same position within all countries.

In conclusion, it can be concluded that the competitiveness of universities, and not only in the case of the V4 countries, will depend on how they react to changing environments - complex, unpredictable, such as the current one, where the scene is characterized by globalization and not isolationism, rather international than domestic trade and competitive markets instead of economic regulation.

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References

Barry, J., Chandler, J. & Clark, H. (2001). Between the ivory tower and the academic assembly line. *Journal of Management Studies*, 38(1), 88–101.

Buela-Casal, G., Gutiérrez-Martínez, O. & Paz Bermúdez-Sánchez, M. (2007). Comparative study of international academic rankings of universities. *Scientometrics*, 71.3., 349-365.

Cantoni, D. - Yuchtman, N. (2014). Medieval universities, legal institutions, and the Commercial Revolution. In *The Quarterly Journal of Economics*, 823–887. DOI:10.1093/ qje /qju007.

Castells, M. (2017). The role of universities in development, the economy and society. In *Castles in Africa: Universities and Development*. Cape Town: African Minds. Available online: http://doi.org/10.5281/zenodo.1067363.

Czerepaniak-Walczak, M. (eds.) (2013). *Factories diplomas czy University? About " nadwiślańskiej " version change in education akademickiej*. Office Wydawnicza Impulse. Kraków.

Čajka, P. (2020). *Regional development in the 21st century*. Belianum. Publishing house of Matej Bel University in Banská Bystrica. ISBN: 978-80-557-1696-1.

De Ridder-Symoens, H. - Rüegg, W. (1992). *A history of the university in Europe*. Cambridge University Press 16 Oct. 2003.

Guerrero-Cano, M., Kirby, D., Urbano, D. (2006). *And literature review on entrepreneurial universities: an institutional approach. Working paper presented at the 3rd Conference of Pre- Communications to Congress. Business Economic Department*. Autonomous University of Barcelona.

Lynch, K. (2015). Control by numbers: new managerialism and ranking in higher education. *Critical Studies in Education*, 56.2, 190-207. doi:10.1080/17508487.2014.949811.

Millot, B. (2015). International rankings: Universities vs. _ higher education systems. *International Journal of Educational Development*, Volume 40, January 2015, Pages 156–165.

Mokyr, J. (2002). *The Gifts of Athena: Historical Origins of the Knowledge Economics*, Princeton University Press.

Munch, R., & Schäfer, LO (2014). Rankings, Diversity and the Power of Renewal in Science. A Comparison between Germany, the UK and the US. *European Journal of Education*, 49.1., 60–76.

Noga, H., & Pauluk, D. (2014). The Traditional University in the Context of New Challenges and Expectations, *Edukacja constant dorosłych*, 4(87), 62–70.

Salmi, J. (2016). Excellence strategies and the creation of world-class universities. In: *Matching Visibility and Performance*. Sense Publishers, Center for International Higher Education.

Sułkowski, Ł., Gregor, B., & Kaczorowska – Spychalska, D. (2020). Rankings in Students ' decision-making process in Poland – implications for university management. *Journal of International Studies*, 13(3), 296-308. doi:10.14254/2071-8330.2020/13-3/19

Sultan, S. (2017). Moving from a Traditional into an Entrepreneurial University. *International Journal of Business and Social Science*, 8.2., 207–214.

Valero, A. - Van Reenen, J. (2019). The Economic Impact of Universities: Evidence from Across the Globe, In *Economics of Education Review* 68 (2019). with. 53–67. DOI: 10.1016/j.econedurev.2018.09.001.