Visegrad Group countries compared through world university rankings

Jan Vašenda
Anglo-American University, Prague, Czech Republic: *jan.vasenda@aauni.edu*

The Visegrad Group is an alliance of four Central European countries: Czech Republic, Hungary, Poland, and Slovakia, founded by the Visegrad Declaration in 1991. The historical, political, and cultural similarities, highlighted by their shared experiences with economic transformation, make the Visegrad Group countries well suited for comparison. The article analyses and compares the performance of Visegrad Four (V4) countries in the recent editions of the most established individual university rankings as well as in the recent rankings of national higher education systems. Czech Republic ranks highest, followed by Poland and Hungary at approximately the same level, while Slovakia falls behind other V4 countries. Relevant socioeconomic factors influencing the country's performance in university rankings are considered and discussed. The results confirm the leading position of the Czech Republic in the region, and they are in line with the recently conducted studies comparing the economic attributes, R&D expenditures and quality of life in the V4 countries. The results thus also prove and confirm the strong interconnection between the economic performance, R&D expenditures and the performance of the higher education sector.

Keywords: higher education, world university rankings, Visegrad group, comparison

INTRODUCTION AND BACKGROUND

The Visegrad Group, also called Visegrad Four (V4) is an alliance of four Central European countries: Czech Republic, Hungary, Poland and Slovakia, founded by The Visegrad Declaration in 1991. The initiative was inspired by an initial meeting of the Polish, Czech and Hungarian kings at the Visegrad castle in 1335. The nations share many historical similarities, which significantly affected the educational development. They all belonged to the Austro-Hungarian Empire.[1] The 1774 Educational reform of Maria Theresa introducing compulsory schooling in the monarchy is certainly the most remarkable milestone of that era with regard to education. All the nations obviously also share the heritage of the communist totalitarian regime, being members of the former Soviet Bloc in the second half of the twentieth century. Although private higher education institution legally started operating in all the countries in the 1990s, a vast majority of

---

[1] Poland only partly.

students still remain enrolled in public universities in all countries of the V4 (OECD, n.d.). In 2000, the V4 agreed to establish the International Visegrad Fund, which promotes regional cooperation within the V4 region as well as between the V4 region and other countries, especially in the area of culture, education, science, and research. The V4 countries also joined the EU in 2004 and have been collaborating closely within the EU since. The historical, political, and cultural similarities, highlighted by their shared experiences with economic transformation, make the V4 countries well suited for comparison. Therefore, a number of studies have been conducted which compare V4 countries in various aspects, such as economic performance and environment (e.g. Dorozynski & Marszalek, 2016; Ivanová & Masárová, 2018; Kiss, 2018; Kočenda & Valachy, 2006; Kowalska et al., 2018), R&D expenditures (Bočková, 2013), quality of life (Nováková & Šoltés, 2016), foreign policy (Gazdag, 1997; Marton, 2012), environmental issues (Gałaś et al., 2015; Urbaniec, 2014), and agricultural policy (Svatoš et al., 2013). However, a comparison of higher education is yet to be done. Given the importance of education for economic growth (Aghion & Howitt, 1998; Lucas, 1988; Mankiw, Romer, & Weil, 1992; Nelson & Phelps, 1966) and general quality of life (Ross & Willigen, 1997), there is a need for an up-to-date comparison between the V4 countries' higher education institutions and the whole higher education systems. Such a comparison would certainly be found relevant and interesting for a V4 audience, but also for a broader audience outside the region.

Previous comparative studies show that the Czech Republic surpasses others in the V4 region in terms of the relevant economic indicators (Dorozynski &Marszalek, 2016; Ivanová & Masárová, 2018; Kowalska et al., 2018; Kiss, 2018), R&D expenditure indicators (Bočková, 2013), as well as quality of life as reflected in material living conditions (Nováková & Šoltés, 2016). This study aims to provide a comparison in the area of higher education, and thus to determine whether or not the results will emulate the above-mentioned comparative studies with respect to the standing of the Czech Republic. World university rankings will be used as a tool for the comparison.

The article is structured as follows. It first deals with the scholarly discourse on the phenomena of university rankings, including cross-country comparative studies. Then it analyses and compares the performance of V4 countries in the recent editions of the most established individual university rankings as well as in the recent rankings of national higher education systems. Relevant socioeconomic factors influencing the country's performance in the rankings are analysed and discussed later. In all tables, the V4 countries are presented in the alphabetical order.

UNIVERSITY RANKINGS: SCHOLARLY DISCOURSE

The global university rankings have become very popular since the publication of the Academic Ranking of World Universities (also known as the ShanghaiRanking) in 2003. The Academic Ranking of World Universities (ARWU) was followed closely by Quacqarelli-Symmonds World University Rankings (QSWUR) and, later, by the Times Higher Education World University Rankings (THEWUR). Although quite a few new university rankings have recently emerged, those three world university rankings mentioned above can certainly be regarded as the most established and influential ones (Dobrota et al., 2016; Hou & Jackob 2017; Jajo & Harrison 2014; Millot, 2015; Soh,

2014, 2015). The methodology of ARWU, THEWUR, and QSWUR is outlined in the following section.[2]

University rankings have been critically studied by scholars. It has often been argued that university rankings tend to favour universities from English-speaking countries (Dobrota et al., 2016; Huang, 2012; Li, Shankar & Tang., 2011; Marginson, 2007). Soh (2013a, 2014) finds discrepancies between the nominal and attained indicator weights used by all three of the most established rankings as well as by the ranking of national higher education systems Universitas 21 Ranking. Hazelkorn (2013) summarizes that rankings do not properly measure teaching and learning, including value added, the impact of research on teaching, the humanities and social science research, knowledge transfer or impact of research, regional or civic engagement, and student experience.

The QS-THE university ranking methodology[3] has been heavily criticized for putting too much emphasis on reputation data based on survey among academics and employers (Bowman & Bastedo 2011; Federkeil, 2008; Huang, 2012; Jajo & Harrison, 2014; Marginson, 2007, 2014; Taylor & Braddock, 2007). Dobrota et al. (2016) criticize the QS ranking methodology for its subjective, possibly biased, component indicator weights. Though, Dobrota et al. (2016) appreciate that the QS ranking is not so affected by bibliometric preferences compared to other rankings because it is focused on broad areas of interest to prospective students, that is. teaching, research, employability, and internationalization. Soh (2015) praises the QS rankings for reflecting the conception of the modern university, which values synergic relationships with industry community and international cooperation.

The AWRU methodology has been criticized mainly for the emphasis placed on research and Nobel Prize winners, while neglecting the aspects of teaching and learning (Jajo & Harrison, 2014; Marginson, 2007, 2014; Rauhvarges, 2014; Saisana, d'Hombres, & Saltelli, 2011; Taylor & Braddock, 2007). Marginson (2014) points out that AWRU surprisingly states the Nobel alumni measure as an indicator of teaching quality. Bougnol and Dula (2015) add that the indicator of Nobel Prize winners on staff should be rather regarded as an input to generate the outcome measured, remarking that treating inputs as outputs can lead to rewarding inefficiency. Jajo and Harrison (2014) see the heavy weighting towards the natural sciences at the expense of the arts and humanities as a limitation of the ranking. Saisana et al. (2011) object that five out of six indicators are size-dependent with only one indicator (academic performance per capita) being normalized by size. The ARWU is, however, in spite of its limitations, recognized and preferred by experts due to the data quality and objectivity (Li et al., 2011; Marginson, 2014; Saisana et al., 2011).

Despite all the criticism and controversial nature, scholars frequently conclude their papers admitting that rankings are here to stay, so we need to make sure it is used and interpreted carefully in an informed way (Dobrota et al., 2016; Federkeil, 2008; Hazelkorn, 2007; Rauhvargers, 2014; Taylor & Braddock 2007).

---

[2] The QSWUR was originally published jointly by Quacquarelli Symonds and Times Higher Education magazine as THE-QS *World University Rankings* from 2004 to 2009. In 2010, both started publishing their own ranking separately. Times Higher Education adopted a new methodology, while Quacquarelli Symonds kept using the original one.

[3] Since 2010, QS and THE publish their own ranking separately. Both rankings use reputation surveys.

It has been shown that rakings have an impact on the micro (institutional) level, that is. on strategic planning and management of higher education institutions (Federkeil, 2008; Hazelkorn, 2007, 2008; Marconi & Ritzen, 2015; Soo, 2013; Rauhvargers, 2014; Wilkins & Huisman 2012). There is also an impact on the macro (national) level, that is, on public policy. Ranking may have an influence on immigration policy rules, eligibility of partner institutions, recognition of qualifications, university mergers, centres of excellence, or government study abroad scholarships (Li et al., 2011; Rauhvargers, 2014; Saisana et al., 2011).

Several cross-country comparative studies have also been conducted. The following results have been found. Taylor and Braddock (2007) compared rankings of Australian and Japanese universities in the ARWU and THE-QS, finding contradictory results depending on the respective ranking. Soh and Ho (2014) provide a detailed comparison of the two former British colonies of Hong Kong and Singapore with regard to their performance in the established university rankings, concluding that universities in the two cities are on a par.

No study analysing and comparing European countries through world university rankings has yet been conducted. This study narrows the gap in the comparative education literature, starting with a comparison of the V4 countries. The standing of V4 countries is analysed and compared in the following sections of the article.

PERFORMANCE IN UNIVERSITY RANKINGS

3.1 Academic rankings of world universities

Universities are ranked by six academic or research performance indicators, using weights assigned as follows (ShanghaiRanking Consultancy, 2017a): Alumni winning Nobel Prizes and Fields Medals (10%); Staff winning Nobel Prizes and Fields Medals (20%); Highly cited researchers (20%); Papers published in Nature and Science[4](20%); Papers indexed in the Science Citation Index-expanded and Social Science Citation Index (20%); Per capita academic performance of an institution (10%).

Since 2017, ARWU has published the top 800 universities, while in the previous years it was only the top 500. Those institutions ranked between 501 and 800 are regarded as ARWU World Top 500 Candidates (ShanghaiRanking Consultancy 2017a).

Exact ranks and overall scores are available only for the top hundred universities, which is not the case for any V4 university. Table 1 shows the rankings of V4 universities in the ARWU 2017.

Only three universities ranked in the top 500, two being from Poland and one from the Czech Republic. The Charles University in Prague performs the best from the V4 region, finishing among the top 300 universities. Poland has the highest number (6) of representatives in the published top 800.

---

[4] For institutions specialized in humanities and social sciences such as London School of Economics, N&S is not considered, and the weight of N&S is relocated to other indicators.

Table 1: V4 Universities in ARWU 2017

University	Rank
Czech Republic	
Charles University in Prague	201-300
Czech Technical University in Prague	601-700
Masaryk University	601-700
Palacký University	601-700
Hungary	
Eötvös Loránd University	501-600
University of Szeged	501-600
Budapest University of Technology and Economics	701-800
Poland	
University of Warsaw	301-400
Jagiellonian University	401-500
AGH University of Science and Technology	601-700
Adam Mickiewicz University	701-800
Medical University of Silesia	701-800
University of Wroclaw	701-800
Slovakia	
Comenius University in Bratislava	701-800

Source: ShanghaiRanking Consultancy (2017b)

The mean values of the individual indicators scores are presented in Table 2. The ARWU individual indicators are not normalized by size, with the only exception for *Per capita academic performance of an institution* (PCP),[5] which makes the indicator suitable for a comparison. With regard to PCP, on average, top Czech universities do the best, followed by Polish universities, with the Hungarian universities being on the same level as the one Slovakian university included in the ranking. Low standard deviations (SD-PCP) show that the mean values reflect the situation well (in a statistically reliable way), taking into account the very low number of universities

Table 2: Comparisons of V4 group universities on ARWU indicator scores (mean values)

	Alumni	Award	HiCi	N&S	PUB	PCP	SD (PCP)
Czech Republic (N=4)	4.0	0.0	3.9	5.9	30.6	17.8	2.69
Hungary (N=3)	7.9	4.4	0,0	4.9	22.6	12.5	0.92
Poland (N=6)	5.1	0.0	3.6	4.4	28.0	14.8	2.92
Slovakia (N=1)	0	0	0	3.6	25.0	12.5	0

Source: ShanghaiRanking Consultancy (2017b), mean values and standard deviations calculated by author

---

[5] The weighted scores of the five indicators divided by the number of full-time equivalent academic staff.

The THEWUR 2018

The indicators and respective weights used by THEWUR are following (Times Higher Education, 2017): Teaching - the learning environment (30%); Research - volume, income and reputation (30%); Citations - research influence (30%); International outlook - staff, students and research (7,5%); Industry income - knowledge transfer (2,5%).

There were 13 Czech, 6 Hungarian, 12 Polish, and 3 Slovak universities ranked among 1102 institutions published in THEWUR 2018 (Times Higher Education, 2018). The total of 34 V4 universities included in the ranking is the highest number from the three most established university rankings considered. However, only 13 were able to rank in the top 800, which is similar to 14 universities from the V4 group in the top 800 published by ARWU 2017 as well as 14 universities from V4 countries featuring among the best 800 in the QSWUR Rankings 2018.

Table 3 shows the average scores for the individual indicators gained by the respective V4 group universities included in the ranking.

Table 3: Comparisons of V4 group universities on THE indicator scores (mean values)

	Teaching	Research	Citations	Industry income	International outlook
Czech Republic (N=13)	20.1	14.3	24.0	36.5	42.8
Hungary (N=6)	19.6	10.1	36.3	38.6	49.9
Poland (N=12)	19.4	11.0	27.1	33.8	26.9
Slovakia (N=3)	21.9	12.5	20.1	36.1	31.7

Source: Times Higher Education (2018), mean values calculated by author

On average, the Hungarian and Czech Universities included in the ranking do significantly better than the Polish and Slovakian universities for the *International outlook* indicator. The Hungarian universities also perform comparatively well in terms of the research influence indicator measured by *Citations*. With regard to *Teaching, Research* and *Industry income*, there are no significant differences between the average scores gained by the top representatives of the respective countries.

QS world university rankings

Universities are evaluated according to the following six metrics (Quacquarelli Symonds, 2018d): academic reputation (40%); employer reputation (10%); faculty/student ratio (20%); citations per faculty (20%); international faculty ratio (5%); international student ratio (5%).

Table 4 shows rankings of V4 Universities in QS World University Rankings 2018. Five Czech, 6 Hungarian, and 9 Polish are ranked in the top 1000 published by the QSWUR 2018. Again, similar to the ARWU, Comenius University in Bratislava is the only Slovak university considered competitive worldwide. Two Czech and two Polish universities were able to make the top 500. Neither the Hungarian nor the Slovak institutions feature

in the top 500. Exact ranks are specified only for top four hundred universities, which is only the case of Charles University in Prague. As mentioned above, 9 Polish universities got to the top thousand included in the ranking, however 6 were ranked in the last range of 801-1000.

Table 4: V4 Universities in QS World University Rankings 2018

University	Rank
Czech Republic	
Charles University in Prague	314
Czech Technical University in Prague	491-500
Masaryk University	551-600
Brno University of Technology	601-650
Palacký University in Olomouc	701-750
Hungary	
University of Szeged	501-550
Eötvös Loránd University	651-700
University of Debrecen	651-700
Budapest University of Technology and Economics	751-800
University of Pécs	751-800
Corvinus University of Budapest	801-1000
Poland	
University of Warsaw	411-420
Jagiellonian University	461-470
Warsaw University of Technology	601-650
Adam Mickiewicz University	801-1000
AGH University of Science and Technology	801-1000
University of Lodz	801-1000
Nicolaus Copernicus University	801-1000
University of Wroclaw	801-1000
Wroclaw University of Technology	801-1000
Slovakia	
Comenius University in Bratislava	701-750

Source: Quacquarelli Symonds 2018e

There is, unfortunately, only very limited data available regarding exact scores, both overall and individual indicators, which makes more detailed comparison impossible.

Summary: Individual university rankings

Table 5 provides a summary of the appearance of the V4 countries in the most established rankings. Many universities feature in all three rankings, and are, therefore, counted more than once. Average rankings are shown in Table 6.

Table 5: No. of appearance - summary table

	ARWU	THE	QS	Total
Czech Republic	4	13	5	22
Hungary	3	6	6	15
Poland	6	12	9	27
Slovakia	1	3	1	5

Table 6: Average rankings - summary table

	ARWU	THE	QS
Czech Republic	550.0	803.8	546.8
Hungary	616.7	758.3	720.8
Poland	616.7	858.3	767.2
Slovakia	750.0	833.3	725.0

Note: Means of intervals were used for calculating the average ranking

Polish universities had the most appearances in total in the selected rankings, followed by the Czech Republic, Hungary, and Slovakia. On average, Czech universities ranked highest within the group for ARWU and QSWUR, while Hungarian universities reached the best average ranking in THEWUR.

Graduate employability rankings 2018

Graduate Employability Rankings is one of the QS rankings, and certainly worth considering and discussing because of its linkage to the labour market.

The ranking assesses universities according to the following subcategories (Quacquarelli Symonds, 2018b): Alumni outcomes, employer-student connection, employer reputation, graduate employment rate, and partnership with employers. Again, there is only very limited data available regarding individual indicators.

General ranking performance (intervals) of the V4 group universities is shown in Table 7. There are 3 Czech universities, 3 Polish universities, 2 Hungarian universities, and 1 Slovak university listed in the top 500 published by the Graduate Employability Rankings 2018. Charles University in Prague ranks the best, that is, 161-170, followed by the Brno University of Technology, falling within the range of 251-300, while all other universities from the V4 group listed in the ranking were assigned a rank within the range of 301–500.

Rankings of national higher education systems do not use individual universities but national higher education systems as a unit of analysis. There are currently two relevant rankings of higher education systems, that is, *Universitas 21 Ranking* and *QS Higher Education System Strength Rankings*.

Table 7: QS Graduate Employability Rankings 2018

University	Rank
Czech Republic	
Charles University in Prague	161-170
Brno University of Technology	251-300
Czech Technical University in Prague	301-500
Hungary	
Budapest University of Technology and Economics	301-500
Eötvös Lorànd University	301-500
Poland	
Jagiellonian University	301-500
University of Warsaw	301-500
Wroclaw University of Technology	301-500
Slovakia	
Comenius University in Bratislava	301-500

Source: Quacquarelli Symonds (2018a)

UNIVERSITAS 21 RANKING 2017

The Universitas 21 Ranking evaluates performance of the national systems in the following four areas using the respective weights (Melbourne Institute of Applied Economic and Social Research, 2017): Resources (20%), Environment (20%), Connectivity (20%) and Output (40%). The indicators are briefly outlined below. Variables used are standardised for population size.

Resources: expenditures on tertiary education, research and development, etc.

Environment: proportion of female students and staff, financial autonomy, regulatory environment, etc.

Connectivity: proportion of international students, proportion of articles co-authored with international collaborators, percentage of university research publications co-authored with industry researchers, etc.

Output: total articles produced by higher education institutions, average impact of articles, the excellence of a nation's best universities, enrolments in tertiary education as a percentage of the eligible population, unemployment rates comparison, etc.

Table 8: Performance in U21 Ranking 2017

	Rank	Overall	Resources	Environment	Connectivity	Output
Czech Republic	24	56.9	58.5 (26)	76.5 (33)	56.9 (21)	36.8 (30)
Hungary	31	50.8	44.2 (38)	72.6 (39)	57.6 (20)	31.2 (32)
Poland	32	50.0	52.6 (33)	82.5 (17)	28.4 (46)	34.9 (31)
Slovakia	38	45.9	45.3 (36)	71.4 (40)	38.8 (33)	29.2 (35)

Source: Melbourne Institute of Applied Economic and Social Research (2017), figures in parenthesis are ranks among 50 nations included

As shown in Table 8, Czech Republic ranks the highest within the group, followed by Hungary, Poland and Slovakia. The gap between Hungary and Poland is very narrow as Hungary ranks only a single position above Poland. When it comes to the individual areas of the ranking, we can see Poland doing very well in terms of *Environment* indicator, while doing poorly for *Connectivity*. Otherwise, the ranks gained in the individual areas are not too distant from the overall ranks of the respective countries.

QS Higher Education System Strength Rankings 2016

The QS Higher Education System Strength Rankings compares the performance of the national systems in four areas (Quacquarelli Symonds, 2018c): *system strength* (to give an overall indication of each country's standing in the global ranking tables), *access* (to give an indication of the chances of gaining a place at a world-class university for residents of the country in question), *flagship institution performance* (based on the premise that the performance of a country's leading institution is a credit to the overall system, often resulting from national investment in developing a flagship institution to lead the way), and *economic context* (to assess the impact of national investment in higher education, by comparing each nation's financial situation to its performance in the international rankings). These four indicators are combined with equal weighting to give the overall scores, with the top 50 countries published. The indicators are further outlined below.

System strength*:* Each country is awarded a score based on the number of its institutions which are ranked 700 or above in the QS World University Rankings, divided by the average position of those institutions.

Access: Scores in this category are calculated based on the number of places available at universities ranked within the global top 500, divided by an indicator of population size. The specific figures used in this calculation are the total number of full-time equivalent students at universities in the top 500 of the QS World University Rankings, divided by the square root of the population.

Flagship institution*:* This is a normalized score, based on the place each nation's top university occupies in the QS World University Rankings.

Economic context: An indexed score is awarded for each university featured in the rankings (7 points for a university in the top 100, 6 points for 101-200, 5 points for 201–300, 4 for 301–400, 3 for 401–500, 2 for 501–600 and 1 for 601–700), and this is then factored against the GDP per capita for the country in question.

Table 9: Performance in QS Higher Education System Strength Rankings 2016

	Rank	**Overall**	**System**	**Access**	**Flagship**	**Economic**
Czech Republic	38	31.8	16.5	46.8	46.4	17.5
Poland	43	20	11.2	25.2	29.8	13.9
Hungary	50+	N/A				
Slovakia	50+	N/A				

Source: Quacquarelli Symonds (2016)

As presented in Table 9, Czech Republic does the best out of the V4 countries, followed by Poland. Hungary and Slovakia do not feature among the top 50 countries included in the ranking. The leading position of the Czech Republic in the region is apparently caused especially by the performance of the *flagship institution*, and by the good score in the indicator of *access*.[6] With regard to the two remaining indicators (*system strength* and *economic context)*, the gap between Czech Republic and Poland is not so significant.

In both national higher education system rankings, Czech Republic does the best out of the V4 countries, followed by either Hungary or Poland depending on the ranking. The Slovakian higher education system lags in comparison with the other countries of the region.

RANKING PERFORMANCE DETERMINANTS

What are determinants of a country's success in the university rankings? Li et al. (2011) examined various socioeconomic factors[7] that potentially affect the accumulation of academic talent and found that a large proportion of cross-country difference can be explained by several variables, especially population size and GDP, with the addition of research and development expenditure and an English language dummy (all variables having positive influence).

Table 10 shows potentially relevant socioeconomic indicators for V4 countries.[8] Considering the crucial factors (variables) noted above, Czech Republic leads the group in terms of GDP per capita as well as R&D expenditure, while Poland has the highest population by far. In neither of the countries is English the official national language.

Table 10: Relevant socioeconomic indicators - V4 countries, 2008-2013 averages[9]

	Czech Republic	Hungary	Poland	Slovakia
Population (million)	10.5	10.0	38.1	5.4
GDP per capita (constant 2010 US$)	19 938	13 332	12 802	16 842
Research and development expenditure (% of GDP)	1.5	1.2	0.7	0.6
Government expenditure on education, total (% of GDP)	4.1	4.7	4.9	3.9
Expenditure on tertiary education (% of government expenditure on education)	23.4	21.4	22.5	22.0
Government expenditure per student, tertiary education (in PPP$)[10]	6715	5548	4480	4766

Source: WDI- World Bank, averages calculated by author

---

[6] In 2016, there were 2 Czech (Charles University in Prague and Czech Technical University) and 2 Polish institutions (University of Warsaw and Jagiellonian University) ranked in the top 500 relevant for the indicator calculation.

[7] The choice of the variables was largely based on human capital theory.

[8] Rankings of national higher education system standardize variables and indicators for country's population size and income to a certain extent (as outlined in the prior text). Hence, these factors should not be influencing the system rankings significantly, unlike the individual university rankings.

[9] The time periods of indicators are chosen to lag 2016-2017 (the release dates of the respective rankings analyzed)

[10] UNESCO Institute of Statistics: Browse by country, http://uis.unesco.org/en/home#tabs-0-uis_home_top_menus-3.

It should be noted that expenditure on education, research and development are obviously treated as an input factor affecting the final performance, while Universitas 21 Ranking considers expenditure as a performance (output) indicator, which is a shortcoming of the ranking, similar to the issue related to the ARWU indicator of Nobel Prize winners mentioned above.

With regard to the determinants on the level of institution, Marconi and Ritzen (2015) conclude that expenditure per student is positively related to a university's score. The Czech Government spent the most per tertiary student as shown also in Table 10.

DISCUSSION AND CONCLUSIONS

Based on the analysis and comparison of the available data in light of individual university rankings (number of universities ranked, actual rankings, individual indicator scores) and the national higher education system rankings, I conclude that the Czech Republic ranks highest, followed by Poland and Hungary at approximately the same level, while Slovakia falls behind other V4 countries.

The leading position of the Czech Republic may be explained by the country's economic power, as well as by the comparatively high amount of R&D expenditure and government expenditure on higher education. Poland seems to benefit from its high population, having the most appearances in the established individual university ranking (Table 5). However, only up to a point because the difference is not as substantial as one would expect considering the significant population gap between Poland and the other countries in the region. This could be attributed (or certainly not unrelated) to the comparatively low GDP per capita of Poland. Low population together with low R&D expenditure seem to be the factors limiting the performance of Slovakia in the rankings, having only one globally competitive university.

It should also be highlighted that the leading position of the Czech Republic was significantly supported by the performance of its flagship institution (Charles University in Prague), which does the best in the region considering all the relevant established rankings including the special ranking of graduate employability.

Despite all the criticism, we simply have to accept that university rankings are here to stay and still, arguably, possess the only way to comprehensively and understandably measure the quality of higher education, both on the institutional and national level. The results, however, must be interpreted with caution, bearing in mind all the shortcomings described. Therefore, I don't intend to claim that higher education in one country is unambiguously better than in another and vice versa, the conclusion being based solely on the ranking figures and scores. However, the conducted comparison does provide certain information about the higher education systems of the V4 countries.

The results confirm the leading position of the Czech Republic in the region, and they are in line with the recently conducted studies comparing the economic attributes, R&D expenditures and quality of life in the V4 countries. The results thus also prove and confirm the strong interconnection between the economic performance, R&D expenditures and the performance of the higher education sector.

REFERENCES

Aghion, P., & Howitt, P. (1998). *Endogenous Growth Theory*. Cambridge: MIT Press.

Bočková, N. (2013). Visegrad Four countries: Evaluation in R&D sectors of performance. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *61* (4), 873–880.

Bougnol, M., & Dula, J. (2015). Technical pitfalls in university rankings. *Higher Education*, 69, 859–866.

Bowman, A., & Bastedo, M. (2011). Anchoring effects in world university rankings: exploring biases in reputation scores. *Higher Education*, *61*, 431–444.

Dobrota, M., Bulajic, M., Bornmann, L., & Jeremic, V. (2016). A new approach to the QS university ranking using the Cmposite I-Distance Indicator: Uncertainty and sensitivity analyses. *Journal of the Association for Information Science and Technology, 67* (1), 200–211.

Dorożyński, T., & Marszałek, A. (2016). Investment attractiveness. The case of the Visegrad Group countries. *Comparative Economic Research*, *19* (1), 120–140.

Federkeil, G. (2008). Rankings and quality assurance in higher education. *Higher Education in Europe*, *33* (2/3), 219–231.

Gałaś, S., Gałaś, A., Zeleňáková, M., Zvijáková, L., Fialová, J., & Kubíčková, H. (2015). Environmental Impact Assessment in the Visegrad Group countries. *Environmental Impact Assessment Review*, *55*, 11–20.

Gazdag, F. (1997). *Comparative analysis of the Visegrád Countries and their endeavours to integrate into the North Atlantic Alliance.* (Final Report to the NATO Fellowship Program 1996-1997), Budapest, NATO publications.

Hazelkorn, E. (2007). The impact of league tables and ranking systems on higher education decision making. *Higher Education Management and Policy*, *19* (2), OECD.

Hazelkorn, E. (2008). Learning to live with league tables and ranking: The experience of institutional leaders. *Higher Education Policy*, *21*, 193–215.

Hazelkorn, E. (2013). World-class universities or world-class systems? Rankings and higher education policy choices. In P. T. M. Marope, P. J. Wells, & E. Hazelkorn (Eds.). *Rankings and accountability in higher education: Uses and misuses* (pp.71–94). Paris: UNECSO Publishing.

Hou, Y., & Jacob, J. (2017). What contributes more to the ranking of higher education institutions? A comparison of three world university rankings. *The International Education Journal: Comparative Perspectives*, *16* (4), 29–46.

Huang, M. (2012). Opening the black box of QS World University Rankings. *Research Evaluation*, *21*, 71–78.

Ivanová, E., & Masárová, J. (2018) Performance evaluation of the Visegrad Group countries. *Economic Research-Ekonomska Istraživanja*, *31* (1), 270–289.

Jajo, N., & Harrison, J. (2014). World university ranking systems: An alternative approach using partial least squares path modelling. *Journal of Higher Education Policy and Management*, *36* (5), 471–482.

Kočenda, E., & Valachy, J. (2006). Exchange rate volatility and regime change: A Visegrad comparison. *Journal of Comparative Economics*, *34*, 727–753.

Kowalska, A., Kovarnik, J., Hamplova, E., & Prazak, P. (2018). The selected topics for comparison in Visegrad Four countries. *Economies*, *6* (3), 1–15.

Kiss, L. (2018). The economic development of the Visegrad Four in the last 15 years in the European Union. *The Romanian Economic Journal*, *21* (67), 52–62.

Li, M., Shankar, S., & Tang, K. (2011). Why does the USA dominate university league tables? *Studies in Higher Education,* 36 (8), 923–937.

Lucas, R. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22* (1), 3-42.

Mankiw, N., Romer, N., & Weil, D. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, *107* (2) 407-437.

Marconi, G., & Ritzen, J. (2015). Determinants of international university rankings scores. *Applied Economics*, 47(57), 6211-6227.

Marginson, S. (2007). Global university rankings: Implications in general and for Australia. *Journal of Higher Education Policy and Management*, *29* (2), 131–142.

Marginson, S. (2014). University rankings and social science. *European Journal of Education*, *49* (1), 46–59.

Marton, P. (2012). The sources of Visegrad conduct: A comparative analysis of V4 foreign policy-making. *The Polish Quarterly of International Affairs*, *21* (4), 7–31.

Melbourne Institute of Applied Economic and Social Research. (2017). *U21 ranking of national higher education systems 2017*. Birmingham: University of Birmingham.

Millot, B. (2014). International rankings: Universities vs. higher education systems. *International Journal of Educational Development, 40*, 156–165.

Nováková, B., & Šoltés, V. (2016). Quality of life research: Material living conditions in the Visegrad Group countries, *Economics and Sociology*, *9* (1), 282–294.

Nelson, R., & Phelps, E. (1966). Investment in humans, technological diffusion, and economic growth. *The American Economic Review*, *56* (1/2), 69–75.

OECD. (n.d.). *OECD.Stat*. Retrieved from http://stats.oecd.org/.

Quacquarelli Symonds. (2016). *QS higher education system strength rankings 2016*. Retrieved from https://www.topuniversities.com/system-strength-rankings/2016

Quacquarelli Symonds. (2018a). *Graduate employability rankings 2018*. Retrieved from https://www.topuniversities.com/university-rankings/employability-rankings/2018

Quacquarelli Symonds. (2018b). *QS graduate employability rankings 2018: Methodology.* Retrieved from https://www.topuniversities.com/employability-rankings/methodology

Quacquarelli Symonds. (2018c). *QS higher education system strength rankings 201:8 Methodology.* Retrieved from https://www.topuniversities.com/system-strength-rankings/methodology

Quacquarelli Symonds. (2018d). *QS world university rankings: Methodology.* Retrieved from https://www.topuniversities.com/qs-world-university-rankings/methodology

Quacquarelli Symonds. (2018e). *QS world university rankings 2018.* Retrieved from https://www.topuniversities.com/university-rankings/world-university-rankings/2018

Rauhvargers, A. (2014). Where are the global rankings leading ss? An analysis of recent methodological changes and new developments. *European Journal of Education*, *49* (1), 29–44.

Ross, C., & Van Willigen, M. (1997). Education and the subjective quality of life. *Journal of Health and Social Behavior*, *38* (3), 275–297.

Saisana, M., d'Hombres, B., & Saltelli, A. (2011). Rickety numbers: Volatility of university rankings and policy implications. *Research Policy*, 40, 165–177.

ShanghaiRanking Consultancy. (2017a). *Methodology.* Retrieved from http://www.shanghairanking.com/ARWU-Methodology-2017.html

ShanghaiRanking Consultancy. (2017b). *Academic Ranking of world universities 2017.* Retrieved from http://www.shanghairanking.com/ARWU2017.html

Soh, K. (2013a). Misleading university rankings: Cause and cure for discrepancies between nominal and attained weights. *Journal of Higher Education Policy and Management*, *35* (2), 206–214.

Soh, K. (2013b). Rectifying an honest error in world university rankings: A solution to the problem of indicator weight discrepancies. *Journal of Higher Education Policy and Management*, *35* (6), 574–585.

Soh, K. (2014). Nominal versus attained weights in Universitas 21 Ranking. *Studies in Higher Education*, *39* (6), 944–951.

Soh, K., & Ho, K. (2014). A tale of two cities' university rankings: Comparing Hong Kong and Singapore. *Higher Education, 68*, 773–787.

Soh, K. (2015). What the overall doesn't tell about world university rankings: Examples from ARWU, QSWUR, and THEWUR in 2013. *Journal of Higher Education Policy and Management*, *37* (3), 295–307.

Soo, K. (2013). Does anyone use information from university rankings? *Education Economics*, *21* (2), 176–190.

Svatoš, M., Smutka, L., Elshibani, B., & Mousbah, S. (2013). Development of Visegrad Countries' agricultural trade in relation to agricultural production development. *Agris on-line Papers in Economics and Informatics*, *5* (1), 61–71.

Taylor, P., & Braddock, R. (2007). International university ranking systems and the idea of university excellence. *Journal of Higher Education Policy and Management, 29* (3), 245–260.

Times Higher Education (2017, August 29). *World university rankings 2018 methodology*. Retrieved from https://www.timeshighereducation.com/world-university-rankings/methodology-world-university-rankings-2018

Times Higher Education. (2018). *World university rankings 2018*. Retrieved from https://www.timeshighereducation.com/world-university-rankings/2018/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats

Urbaniec, M. (2014). Implementation of international standards for environmental management in Visegrad Countries: A comparative analysis. Entrepreneurial *Business and Economics Review*, *2* (2), 65–76.

Wilkins, S., & Huisman, J. (2012). UK business school rankings over the last 30 years (1980-2010): Trends and explanations. *Higher Education*, *63,* 367–382.

The World Bank. (2010, June 11). *World Development Indicators*. Retrieved from https://datacatalog.worldbank.org/dataset/world-development-indicator.