

WHAT DETERMINES SUCCESS IN WORLD UNIVERSITY RANKINGS? ANALYSIS OF INTERNAL GOVERNANCE AND STATE CHARACTERISTICS OF TOP 800 UNIVERSITIES IN EUROPE

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ABSTRACT

Higher education governance reforms are the subject of discussion in many countries, including Latvia, due to globalization, implementation of new public management (NPM) practices, and increasing demand for quality from a broad spectrum of stakeholders. One of the critical changes in university internal governance is introducing executive boards, which support decision-making effectiveness and transparency. Competition between institutions has also driven a rise in the importance of World University Rankings (WUR), which, although criticized, provide a basis for comparison. This research aims to explore top European universities' internal governance and residence countries' characteristics to determine factors that contribute to success in WUR. This paper reveals the importance of introducing executive boards in the governance model through an in-depth analysis of internal governance and country-specific indicators of 97 universities from 17 European countries. The paper also argues that universities from countries with smaller GDP may engage more external stakeholders. The analysis shows that internal governance, residence country-specific indicators, and university characteristics as a whole have a long-term impact on universities' success.

Keywords: *university governance, university rankings, higher education reforms.*

Introduction

Increasing demands from a wide range of stakeholders have driven education reforms in many European countries, internal governance being (one of) the fundamental instrument for rising performance and attracting scholars and students. This research aims to understand the impact of internal governance on the international standing of universities.

Many previous studies recognize different country-specific and internal factors that can influence the university's competitiveness – Gross Domestic

Product (GDP), GDP per capita, political stability, population, expenditure per student, size of the institution, etc. (Pietrucha, 2017, Marconi & Ritzen, 2015, Clifford, 2014). The relationship between country-specific indicators and university success is not clear (Clifford, 2014). However, it is recognized that good university internal governance can significantly impact the quality of education and the ability to get recognition from a wide range of stakeholders (van Vught & de Boer, 2015). This new approach recognizes that academic personnel is primarily liable for knowledge creation; however, governance is driven by implementing autonomous internal governance structures, competition for stakeholders' resources, and stakeholders' voting rights (Leisyte & Kizniene, 2006). One of the practical consequences of this trend has been the shift from democratic councils to executive boards in university governance, which has provided ground for making more informed and efficient decisions partly thanks to external representatives' engagement (de Boer, Maassen, & Gornitzka, 2017).

While economies of scale achieved by universities, which are located in larger countries, might provide ground for success, it can be noticed that universities from small economies achieve high results. Although there are many elements, both country-specific and related to internal practices, affect success; university governance inarguably is one of the building blocks. This research will compare internal university governance practices in European universities with country-specific indicators and scores in world university rankings as governance. The authors have been mainly motivated to run this research due to the ongoing Higher Education reform in their country, Latvia, which focuses on internal governance.

The paper aims to answer the research question – **“What are the country and internal governance characteristics of European universities listed as top 800 in the world university rankings?”**. Paper argues that executive boards are a fundamental part of successful higher education governance, and top universities from countries with smaller GDP are expected to include more external members in the boards. Authors also have found a correlation between internal governance bodies' composition, country-specific factors, and university characteristics, suggesting that these factors as a whole have an impact on universities' success in the long term.

Paper first discusses previous findings on university governance and world university rankings, which provides a specific benchmark for measuring a university's success. Then the paper discusses the results of in-depth research of 97 European universities from 17 countries' internal governance structures and their residence countries' characteristics. Finally, the recommendations for the composition of internal governance structures for universities located in economies of different sizes are provided.

Factors that influence universities position in World university rankings

The economy based on knowledge and skills has created a world where higher education institutions are expected to build a country's competitiveness. In this sense, world university rankings are perceived as a measure to analyze an institution's deficiencies and qualities. They reflect the institutions' capacity to recognize academics, potential students, industry, public (Marope et al., 2013). Hazelkorn (2015) shows that position in the ranking influences a wide range of stakeholders (both from governmental and private sectors) towards the corresponding higher education institution. A survey between university heads (Hazelkorn, 2015) also reveals that they perceive rankings' influence on attracting partners for research and funding, recruiting personnel, students' employability, and relationship with the government. Also, they suggest that high positions in rankings can lead to the attraction of excellent students. Consequently, world university rankings set higher education institutions' benchmarks and allow stakeholders to compare them globally (Hou & Jacob, 2017).

Previous research suggests various factors that might affect the results of a university in the World University Rankings. Pietrucha (2017) study reveals that the size of the economy (total GDP) is more important than the relative wealth of the population (GDP per capita). However, the same study argues that universities' position in the rankings cannot be predetermined solely by GDP and GDP per capita metrics as other factors have significant predictive value. For example, the countries' growth (whether countries economy is based on knowledge and innovation), stability of political situation allows a smooth accumulation of human and social capital (Pietrucha, 2017), etc. A study by Clifford (2014) shows a significant positive relationship between the number of universities in the country that are recognized in WUR and GDP per capita, although the causation of the correlation is not clear (Clifford, 2014). Regarding internal specifications of universities, Marconi and Ritzen (2015) indicate that economies of scale and high expenditure per student predict success in the WUR. (Marconi & Ritzen, 2015).

This research project aims to understand the factors that impact the position of the universities in WUR. Both authors are affiliated with one of the leading universities in Latvia, where the government decided in 2020 to undertake a major reform to enhance the position of the universities in WUR. Given the abovementioned research, the authors have chosen to analyze universities' success in rankings based on country indicators as GDP, GDP per capita, and population. We have also analyzed key factors pertaining to the universities' internal composition as internal governance structures and overall university metrics (proportion of external, academic,

and research staff, student, technical, and administrative staff members on the board and the Senate, international students, students per staff).

The authors have concentrated the research in three rankings: QS World University Ranking, THE World University Ranking, and Academic Ranking of World Universities. These three are recognized as the most influential by a range of stakeholders (Adina-Petruta, 2015). The methodologies of Times Higher Education (THE), Quacquarelli Symonds (QS), and Academic ranking of world universities (ARWU) define the position of each university by deducting rankings from the sum of weighted indicators of crucial importance (Moed, 2017). It is important to note that although all three rankings which are used in this research measure indicators that can be categorized in 5 fields (teaching, research, mission, reputation, and internationalization), the weights are given to each differ, for example, ARWU system focuses more on research performance. Simultaneously, QS results are dependent more on reputation scores (Hou & Jacob, 2017). The methodology has split research, teaching, and citation outputs uniformly by assigning 30% weight to each (Adina-Petruta, 2015). Rankings have been criticized for using a narrow list of metrics to measure quality. EUA (European University Association) analysis indicates that a major proportion of rankings base the scores largely on research quality (including the ones who claim students – for whom research quality might not be a primary concern – as a primary target group) and reputation surveys (results of which are criticized for validity) (Loukkola et al., 2020). Recognizing the concerns described above but admitting that there is not a better option of a standardized benchmark, this research will use WUR as a point of reference for universities' overall success.

What is the role of university governance?

Trends in university internal governance

Competition between institutions becoming international, the emergence of new public management (NPM) practices, and neo-liberalism has led universities to become tools for economic development, being governed as privately owned entities, focusing on performance (Hazelkorn, 2015). The higher education ecosystem is one of the key pillars for tackling emerging economic and social challenges as the increasing globalization of education and job market, an extension of retirement age, and fast development of technology (OECD, Benchmarking Higher Education System Performance, 2019). Good governance is perceived as a crucial key element for higher education systems to become more effective, able to compete, achieve goals and attract students and scholars (van Vught & de Boer, 2015). Higher education institutions should have both long-term (related to governance) and short-term (processes for daily management) systems in place.

Otherwise, universities will lack strategic governance, which adjusts to new opportunities and helps to operate efficiently (Bratianu & Pinzaru, 2015).

Latvia, one of the last countries in Europe to undergo a substantial reform in universities' governance, has defined internal governance's main challenges. They are as follows: creating executive boards to ensure implementation of good governance principles, clear definition of governance bodies functions (including allowing external representatives to guarantee independence), and promotion of collaboration between academic and research staff with governance bodies to ensure relevance and quality of scientific and academic work.

Although universities in Europe have been mainly led by academics, which state governments have protected from external parties' involvement until the late 20th century, nowadays, reforms are reshaping governance by enhancing institutional autonomy and introducing corporate management strategies (Veiga, Magalnaes, & Amaral, 2015). The transformation of universities becoming corporate-like organizations (corporate universities), which are led by internal and external stakeholders, has given empowerment to boards, which are responsible for the design and implementation of the internal strategy (Veiga, Magalnaes, & Amaral, 2015). This change provides a shift from democratic councils to executive boards – reducing the time needed to make decisions and allowing to make more informed and efficient decisions (de Boer, Maassen, & Gornitzka, 2017).

University internal governance structures and stakeholder's involvement

As the complexity of higher education institution governance increases, the term “networked governance” is introduced, which explains the model where universities combine both – state supervision and active involvement of internal and external stakeholders. As a result, there is a compromise in the level of institutional autonomy (Jongbloed et al., 2018). The most important stakeholders in this context are students, academic and research staff of the university, and external stakeholders' representatives; however, their involvement in processes varies in different systems (Henard & Mitterle, 2018).

Researchers identify two governance models of European universities – unitary and dual governance models, with the latter being divided into two subcategories (traditional and asymmetric) (Pruvot & Estermann, 2018). The division between unitary and binary models can also be defined (Shattock, 2014). Pruvot & Estermann (2018) states that unitary model is observed in structures with only one governing body: either senate type (mainly responsible for academic decisions, a large number of members and with primarily academic personnel representation) or board type (being involved

in strategic and financial decision making, fewer members than senate type bodies). The dual governance model instead is characterized by division of responsibilities between governing bodies (senate body – academic affairs, board – strategy and finance); however, the dual asymmetric model tends to be controlled by the board-type body while also decision-making power is given for the senate-type body (Pruvot & Estermann, 2018).

Shattock (2014) states that, depending on the region, there are different understandings of the notion of terms “external stakeholder” and “collegiality.” In Southern European countries, a shared governance approach is viewed negatively as an unwillingness to include external members in the governance. Their involvement is perceived as mere “emulation of business practices.” However, in the United States and the United Kingdom, external parties are fundamental governance elements, while collegiality is understood as a collaboration between academic and external stakeholders. In continental Europe, countries prefer governance by dual structure – focusing on the collaboration of academic and non-academic parts involved in governance (Shattock, 2014)

Methodology and study framework (design)

Research method and design

This paper aims to answer the research question – “**What are the country and internal governance characteristics of European universities listed as top 800 in the world university rankings?**”. The authors have run a quantitative study based on the application of descriptive research methods. In order to gather needed information, secondary data was collected from publicly available resources during the period February to April 2020. Results of THE World University Rankings 2020, QS World University Rankings 2020, and ARWU 2019 were used to identify a list of European countries with top 800 universities and the number of universities per country. For each country, data on total population, GDP per capita (current international dollars), and GDP (adjusted to purchasing power parity, international dollars) were collected from the World Bank Open Data database for the latest available year – 2018.

Research by the OECD (2013) provides evidence that macro-economic indicators impact climate in higher education, suggesting that although higher education is becoming increasingly global, the country’s size might provide economies of scale and scope (OECD, 2017). To classify countries, United Nations (2019) report World Economic Situation Prospects uses the gross domestic product (GDP) adjusted for purchasing power parity (PPP) (United Nations, 2019). Pietrucha (2017) and Clifford (2014), in their university governance studies, also use GDP and GDP per capita

indicators (Pietrucha, 2017; Clifford, 2014). By combining methods applied in previously named studies, as the country-specific determinants, measures of gross domestic product (GDP) per capita or GDP adjusted for PPP and location of the country are used to provide the basis for selection of the countries to be analyzed in multiple sections of the research. To select criteria that define university internal governance and other general characteristics of the institution, two types of resources were adapted – previous studies on university governance and methodologies of world university rankings:

- a) In the report, *University Autonomy in Europe III*, Pruvot and Estermann (2017) are using compositions of senate-type and board or council type bodies to analyze further the governance (Pruvot & Estermann, 2018). Pruvot and Esterman's research framework includes identifying governance bodies, their composition, and several different types of stakeholders (academic and research staff, students, external experts, and technical and administrative staff) with voting rights in each institution.
- b) The methodologies of *Times Higher Education Rankings 2020*, *QS World University Rankings 2020*, and *Academic Rankings of World Universities 2019* were reviewed, identifying three measures that are quantifiable and available for all universities – number of full-time students, percentage of international students, and students per faculty ratio.

Position in the world university rankings in our research framework is used as a dependent variable, which is perceived as a consequence of university internal governance structure and macro-economic environment (GDP). For further research, the authors suggest a wider range of independent variables that characterize higher education institutions and residence countries, such as political situation, funding, country-wide legislation, and university internal policies.

In order to define the overall position in the rankings, we have consolidated the position of each university in the three rankings – THE, QS and ARWU – by implementing a *university ranking indicator*. As Pietrucha (2017) suggested, to evaluate each universities' performance in the rankings, an indicator is to be created that assigns an overall value for each university, which is a sum of performance in all three rankings (Pietrucha, 2017). For example, universities, which were ranked from 1 to 100 in the rankings were assigned the value of 800, while universities being ranked from 501 to 600 were assigned a value of 300¹. The values assigned by each ranking

¹ As Times Higher Education WUR for universities being in the range from 600 to 800 in the ranking does not provide data with a precision of 100 places, the universities ranked in any of the rankings from 600th to 800th place were assigned with value 200.

to university were summed to make a university ranking indicator. A higher score means that the university is listed higher in the rankings.

When Pearson's correlation was performed, a portion of the variables was recognized as statistically significant; however, most showed relatively weak correlation (lower than $r = +/-0.5$). Other studies suggest that although correlations are weak, they can be analyzed due to the effects of time – in the long term, the effect of one variable on another can become more influential (Pietrucha, 2017).

Data sampling criteria

In order to define the sample of the research, we have followed two steps:

- a) We have selected universities with residence in European countries with GDP or GDP per capita in the range of being two times higher or lower when compared with Latvia. We chose Latvia as a reference point as it is the country of residence of the authors' university and one of the last in European countries to undertake significant governance reforms. There were 138 universities listed in the WUR as top 800, which complied with this sampling criteria.
- b) As data were collected from publicly available websites and documents, some universities were excluded from the final sample due to the unavailable data. Therefore, the final sample consisted of 97 universities. Ninety-seven universities from 17 countries were in the sample for in-depth analysis of university governance structure. The list included Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovenia, Spain, and Turkey.

Data analysis and clustering principles

In the first part of the research, we determined the university *ranking indicator*, which is described in the research methodology section. Further, this indicator was measured against country indicators (GDP and GDP per capita). Then correlation analysis was performed to test correlations between university performance in WUR (measured by *ranking indicator*), country-specific indicators (GDP, GDP per capita, and population), and internal governance structures (composition of the senate and board type bodies).

The second part of the research analyses the composition of the internal university governance structure in detail. In total, there were 97 universities from 17 countries selected by the criteria described in the sampling section. We have used K-means clustering to classify data in four groups by a total number of members in the board-type body (Cleophas & Zwinderman, 2015).

It has been proposed by Cleophas and Zwinderman (2015), and this method is valid if groups are expected to be in similar sizes. Four clusters were arranged (#1 – number of board members from 5 to 10; #2 – from 11 to 21, #3 – from 23 to 42, #4 – from 44 to 66). The same approach was used for clustering data regarding Senate type body composition.

To test the dispersion of data within each cluster, the variation (CV) coefficient or standard deviation divided by mean was calculated for each group. Also, measures of central tendency were compared in order to evaluate data distribution (see Appendix 1).

Results

Countries’ success in the World University rankings vis-a-vis GDP indicators

The ranking indicator of each country was compared with residence countries’ GDP and GDP per capita. As indicated above, the ranking indicator measures the residence countries’ universities’ success in the WUR by assigning higher scores to universities with higher positions in the WUR and *vice-versa*.

The comparison of GDP per capita (\$) and GDP (\$) to ranking indicator per universities located in the country is showed in Figure 1. It indicates that countries with higher GDP or GDP per capita do not necessarily have better rankings.

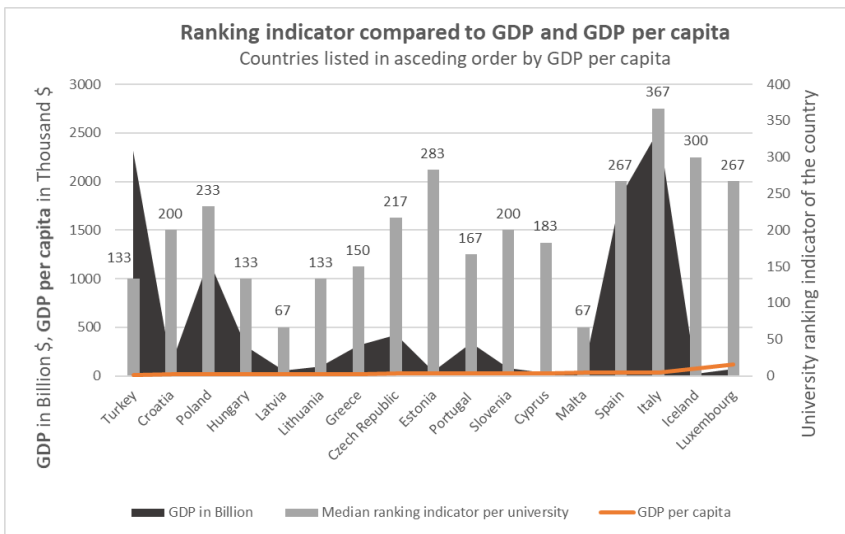


Figure 1. Median university ranking indicator per country compared to GDP (adjusted to PPP, \$) and GDP per capita (\$).

Neither GDP nor GDP per capita level predicts positions of countries' universities in the rankings. For example, Estonia, which is positioned in the middle of the list by GDP per capita, is ranked better than all eight countries having smaller GDP per capita; however, Estonia has a better average ranking per university than six countries with higher GDP per capita. Similar results were discovered when comparing ranking indicators with countries' GDP. For example, Iceland, which has the lowest GDP of all countries in the list (\$20 billion), shows the ranking indicator of 300². However, with a considerably higher GDP (\$2310 billion), Turkey has a university indicator of 133 as most of its universities are positioned between 500 and 800, and universities are not included in more than two rankings. Latvia and Malta have the lowest ranking indicators as each country has only one university ranked in one ranking, plus their position is lower than 600. For further research, the authors suggest exploring a larger sample as in this research, only data from 17 countries were compared.

How university internal governance structures and success in rankings are correlated with residence country GDP indicators and population?

To test the linear relationship between country indicators (GDP, GDP per capita, population) and university internal governance structures and performance, Pearson's correlation test was performed. Results indicate that there is a moderate **positive relationship between GDP per capita and university ranking indicator of the country ($r = 0.440, p < 0.1$)**; therefore, it can be predicted that countries with higher GDP per capita might take higher positions and be ranked in more WUR. No significant correlation is found between GDP and ranking indicators.

Total GDP is negatively correlated with proportion of external members in the board ($r = -0.794, p < 0.01$) and has positive relationship with academic and research staff proportion on the board ($r = 0.617, p < 0.05$) and technical and administrative staff proportion in the senate ($r = 0.538, p < 0.05$). **Therefore, universities located in countries with higher GDP might include a fewer proportion of external members in the Senate and a higher proportion of academic and research staff in the boards and technical and administrative staff in the senates. Also, countries with larger populations have less proportion of external members in the board ($r = -0.669, p < 0.01$).** However, it should be noted that

² However, only the University of Iceland is included in the sample, and the total score is high as the institution is ranked top 500 in THE and ARWU rankings without any other local university.

the sample of universities included 27 universities from Spain, which has large GDP and a small proportion of external members on the board when compared to other countries in the sample. Full results of correlation analysis are compiled in *Table 1*.

Table 1. Pearson's correlation coefficient between country GDP indicators, population, and university indicators. Symbols “*” indicate statistical significance levels: *** (0.10), ** (0.05) and * (0.01).

	Median ranking indicator per university in country	GDP adjusted to PPP in dollars	GDP per capita (\$)	Population
GDP per capita	0.440***	–	–	–
External members on board%	–0.287	–0.704*	0.334	–0.669*
Academic & Research staff on board%	0.245	0.617**	–0.501***	0.604**
Technical & Administrative staff on Senate%	0.583**	0.538**	0.496***	0.543**
Academic & Research staff on Senate%	–0.439***	0.041	–0.374	0.01

Characteristics of University Internal Governance Structures

Data about board-type body composition in 97 European universities reveal the number of total members ranging from 5 to 66. For senate-type bodies, the number of total members was in the range from 9 to 303. To analyze the data, universities were divided into clusters as described in detail in Appendix 1.

Results indicate that only ten universities of the sample do not have boards, and they are located in Latvia, Turkey, and Greece. 53% of the universities which have boards do not have more than 21 total members. Board-type bodies with 5 to 10 members have the biggest external members representation (41%) and are located in Slovenia, Hungary, Poland, and Italy. The proportion of external members in the board declines as the body's size increases. Full information is provided in Table 2. However, the proportion of academic and research staff representatives in the board increases as the body size becomes larger. Students are represented at a minimum of 9% and a maximum of 16% of the total board members. Technical and administrative staff in all clusters are the least represented members.

External members hold the majority of the mandates on boards of 11 universities, which are located in the following countries: Hungary, Poland,

Italy, Estonia, Luxembourg, Malta. For example, both Estonian universities (University of Tartu and Tallinn University of Technology) analyzed in this research had six external members of a total of 11. Twelve universities have included external members in the governance body in proportion from 40% to 50%. The majority of universities in the sample tend to include less than 40% of seats in the board for external members; however, a major part of the dataset is composed of universities in Spain, which have only 6% of external representatives on average board-type bodies.

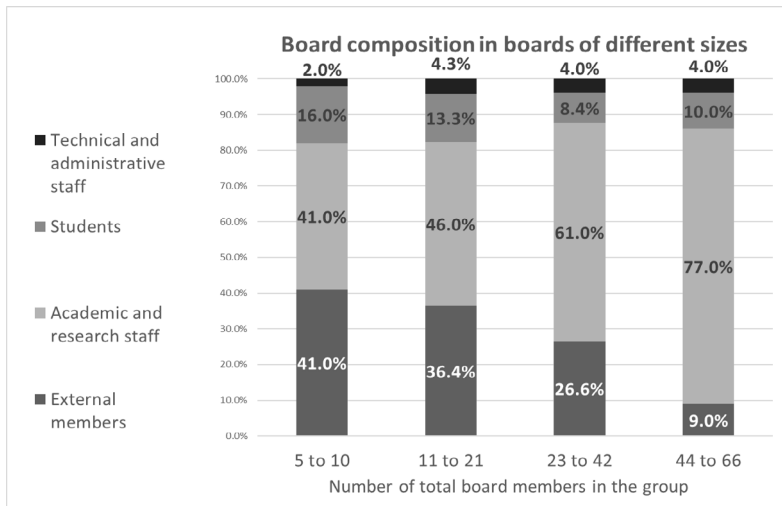


Figure 2. Board composition in boards of different sizes

Senate composition in universities analyzed in all three clusters is similar – academic and research staff in all cases holding majority mandates and technical and administrative staff – least. A full list of countries and their board and senate type bodies’ composition can be found in Appendix 2.

Correlations between a number of different types of members represented in the board-type internal governance bodies

To test whether there are linear relationships between variables of internal governance bodies, Pearson’s correlation is used. Bermig and Frick (2010) use the same method to test the correlation. Between boards’ sizes and effectiveness (Bermig & Frick, 2010). In this research, correlations are tested between:

- a) Measures of effectiveness: datasets of number of full-time students, number of international students, students per staff ratio, ranking indicator.
- b) Boards’ sizes: total board members, total senate members, board and Senate compositions in percentages (proportion of external,

academic, and research staff, technical and administrative staff, and student representatives).

Akoglu (2018) suggests that the level of correlation (strong, moderate, or weak) varies by research field; however, by reviewing multiple sources, correlation of 0.31 to 0.6 is accepted as moderate, higher being strong and lower weak (Akoglu, 2018).

The correlation model shows no two variables with a strong significant linear relationship; however, some of the indicators have moderate. Appendix 3 includes a full correlation analysis. Number of international students have moderate positive relationship with students per staff ($r = 0.314, p < 0.05$) and also ranking indicator ($r = 0.304, p < 0.01$). External members on the board have a positive relationship with many international students ($r = 0.304, p < 0.05$). It is also expected that universities with more international students will have a higher representation percentage of students in the Senate ($r = 0.404, p < 0.01$). A negative relationship is detected between the percentage of students on the board-type body and senate-type body ($r = -0.396, p < 0.01$), showing that universities that include a higher proportion of students in the Senate are expected to involve less proportion in the board and vice versa.

Conclusions

The research's main goal was to analyze the impact of internal governance and characteristics of the country of residence on universities' performance in world university rankings. We have studied European-based universities ranked top 800 in three of the most popular world university rankings (THE, QS, and ARWU). Ninety-seven universities were analyzed in-depth; they were located in 17 countries. As factors that might characterize universities, the following were chosen – GDP, GDP per capita and population of the residence country, number of students, the proportion of international students and students per staff, university internal governance characteristics – board and senate size and composition. We offer the following concluding research highlights:

- Previous studies have opposing views on GDP indicators' influence on universities' ability in the country to succeed in WUR. Some argue that higher total GDP contributes to creating economies of scale and providing more financial resources, while others argue that these indicators leave more impact on research-intensive universities. This study found that GDP per capita might have a positive relationship with countries' ability to score higher in world university rankings. However, the sample studied of universities in Europe reveals that countries with lower GDP per capita exceed others. For example, Estonia was found to

have better median results on rankings than six countries with higher and eight lower GDP per capita.

- The literature reviewed advises that decision-making in universities must be shifted from academic staff to executive boards that are responsible for the university's strategy and reassure that external members are involved. Findings indicate that university internal governance characteristics vary across institutions; however, some similarities can be found regarding governance bodies and the proportion of members included. A shared characteristic is found regarding the governance board's existence – only 10% or ten universities from the sample do not have board-type bodies; they are in Latvia, Turkey, and Greece.
- This research indicates the importance of the implementation of board-type bodies with external members representation in university internal governance structures as 90% of the universities in this study is governed by boards. Research also found a negative relationship between the proportion of external members on the residence country's board and GDP, indicating that countries with larger GDP might include fewer external members in the board-type bodies. This finding can be interpreted as a signal for countries with smaller GDP (as our residence country – Latvia) to include a larger proportion of external members in the university boards. Estonian universities analyzed in this research are an example of this approach – having majority external members representation in the board and achieving a high score in the World university rankings.
- Linear solid relationships are not recognized between variables representing internal governance and general university characteristics; however, there are significant moderately strong relationships, which can have a greater impact in the long term. These results indicate that there are no factors of internal governance of universities that influence the institution's success significantly more than others; however, as moderate relationships between variables exist, it is concluded that these factors have influence as a whole over a long period of time.

Limitations

For further developments of the research, the authors suggest widening the scope of the governance indicators chosen for the analysis as there are other factors characterizing university governance apart from governance body structures. This research was performed for the sample, which consisted of 97 universities located in Europe and countries with similar GDP indicators as for Latvia; therefore, larger sample size is needed to make conclusions about all the top 800 universities governance. Also, the authors suggest that in further research, a wider spectrum of indicators

characterizing countries might be used to choose the universities by residence countries to be included in the sample.

University internal governance is investigated from an institutional structure perspective, not considering other issues related to effective governance, for example, transparency, voting rights of the executive, state regulations, etc. As country-describing indicators, GDP per capita, total GDP, population, and location are selected, while these are not the only measures that characterize the country and might influence the position in WUR. The study also includes three university rankings – THE, QS, and ARWU – reflecting universities' success in these WUR, although there are more rankings. Data has been collected from multiple websites and documents that are either in English or automatically translated into English from another language; therefore, there is the possibility of human error in entering or reading data.

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Appendix 1

The coefficient of variation is a measure of the dispersion of the dataset; a lower ratio is interpreted as a measure of smaller variance in the dataset (Wong & Wu, 2002). Brown (1996) explains that the coefficient of variation is expected not to exceed value 0.3 to indicate the normal dispersion of data (Brown, 1996). As for all four clusters, coefficients of variation were small – data is not overdispersed in any of the samples. Also, there are no significant differences between the mode, median, and mean of each cluster. Therefore, four clusters, selected by k-means clustering, are analyzed separately.

Clusters of board-type bodies

	Group 1 (5–10 members)	Group 2 (11–21 members)	Group 3 (23–42 members)	Group 4 (44–66 members)
mean	8	12	34	54
median	9	11	33	53
mode	9	11	31	53
standard deviation	1.89	2.65	6.25	6
Coefficient of variation (CV)	0.24	0.21	0.18	0.11

Clusters of senate-type bodies

	Group A (9–35 members)	Group B (40–150 members)	Group C (199–303 members)
mean	25	63	276
median	25	50	296
mode	29	50	300
standard deviation	7.5	29.13	33.06
Coefficient of variation (CV)	0.31	0.46	0.12

Appendix 2

	Nr. of board members in the cluster	Nr. of universities in the cluster	Countries represented in the cluster
Cluster 1	5–10	21	Slovenia, Hungary, Poland, Italy
Cluster 2	11–21	25	Iceland, Cyprus, Estonia, Luxembourg, Lithuania, Croatia, Portugal
Cluster 3	23–42	14	Malta, Portugal, Czech Republic, Spain
Cluster 4	44–66	27	Czech Republic, Spain
No board	–	10	Latvia, Turkey, Greece

	Nr. of senate members in the cluster	Nr. of universities in the cluster	Countries represented in the cluster
Cluster A	9–35	37	Estonia, Luxembourg, Czech Republic, Turkey, Luxembourg, Italy, Cyprus, Slovenia.
Cluster B	40–150	28	Latvia, Malta, Slovenia, Lithuania, Croatia, Hungary, Poland, Czech Republic, Turkey, Greece, Spain, Italy.
Cluster C	199–303	24	Spain
No Senate		9	Iceland, Portugal

Appendix 3

	Full_time_students	Students_per_staff	International_stud	Ranking_indicator	Total_board	External_B%	Acad_res_B%	Students_B%	Tech_admin_B%	Total_senate	Acad_res_S%	Students_S%	
Full_time_students	1												
Students_per_staff	0.402**	1											
International_stud	-0.245*	-0.296*	1										
Ranking_indicator	0.292*	-0.052	0.122	1									
Total_board	0.071	-0.278**	0.070	-0.053	1								
External_B%	-0.189	-0.092	0.304**	-0.150	-0.709	1							
Acad_res_B%	0.199**	-0.064	-0.138	0.038	0.805	-0.854	1						
Students_B%	0.112	0.314**	-0.313**	0.304*	-0.260**	-0.228***	-0.183***	1					
Tech_admin_B%	-0.108	0.081	-0.154	-0.133	0.195	-0.325*	0.042	0.191***	1				
Total_senate	0.123	-0.322*	-0.025	-0.033	0.801	-0.733	0.765	-0.079	0.269***	1			
Acad_res_S%	0.155	0.510	-0.329*	-	-0.585	0.449	-0.574	0.102	-0.004	-0.494	1		
Students_S%	-0.238	-0.588	0.404*	0.218***	0.122	0.476	-0.079	0.308*	-0.396*	-0.076	0.328*	-0.885	1
Tech_admin_S%	0.091	-0.064	-0.008	0.295*	0.315*	-0.635	0.505	0.389*	0.144	0.530	-0.606	0.196	