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Determinants of World University Rankings: Examining the Role of Research Output, Faculty Quality, and Internationalization

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Abstract

Global university rankings play a critical role in shaping institutional reputation, student mobility, and policy decisions in higher education. This study examines the key determinants of world university ranking performance using a multi-year dataset derived from the Center for World University Rankings (CWUR). The analysis focuses on the relative impact of research output, faculty quality, and graduate employability on institutional scores. A quantitative approach is adopted, incorporating descriptive statistics, correlation analysis, and multiple regression techniques to evaluate the relationships among variables. The findings indicate that faculty quality is the most significant predictor of ranking performance, highlighting the central role of academic prestige and intellectual capital in global rankings. Graduate employability also shows a statistically significant effect, suggesting that labor market outcomes contribute meaningfully to institutional evaluation. In contrast, individual research indicators such as publications, citations, and influence exhibit limited significance in multivariate analysis, largely due to their high intercorrelation. However, innovation output, measured through patents, demonstrates a notable contribution. The results suggest that global rankings are primarily driven by prestige-oriented and research-intensive indicators, which may not fully capture the broader dimensions of university performance. The study contributes to the ongoing discourse on ranking methodologies and provides empirical insights for institutional strategy and policy formulation.

Keywords: University Rankings, Research Output, Faculty Quality, Employability, Higher Education, Institutional Performance

1. Introduction

University rankings on a global scale have emerged as a key tool of identifying institutional performance, shaping student decisions, academic mobility, granting and revocation of funding and national higher education policies. A wide range of institutional quality proxies, including CWUR, QS and THE, are heavily utilized in the contemporary institutional quality research, although their approach remains controversial due to the methodological nature of their drawbacks and premises. These rankings are based on a combination of various indicators such as research output, quality of the faculty and international activity to come up with a composite measure of university performance. Because of this, the issue of determining the determinants of ranking results has become a significant, scholarly question.

Research performance is one of the most important factors that cause the rank of universities. Empirical data indicate that the number of publications, Citations impact, and research factors assume a leading role in determining institutional appearance and esteem. Universities that have increased productivity in their research are more likely to get a higher position in international rankings as they possess a high priority given to the quantifiable output of research (Ngoc and Tien, 2023). Meanwhile, research disparities at the global level lead to uneven representation of institutions around the world that uphold the hierarchies of higher education (Kim and Kim, 2025). This brings up questions related to the amount of validity in rankings in terms of the true quality of institutions as opposed to structural benefits.

Another important decisive factor of ranking performance is the quality of the faculties. Such high-quality and internationally-established faculty improves the productivity of research and image. Research has revealed that various indicators of faculty internationalization (like the share of international faculty) might have a profound effect on rankings (Shin and Lee, 2022). Faculty excellence has been shown to help in the production of knowledge as well as build an institution prestige, an essential element in ranking approaches. Additionally, institutional awareness of global rankings may influence institutional strategies and academic action, especially in developing nations where higher education institutions are interested in getting a better global reputation (Islam, 2024).

Another aspect where internationalization is an important issue in education has been in global ranking. The global cooperation, inter-national student mobility and international partnerships are more and more considered as the new signs of institutional competitiveness. According to research, the strategies of internationalization, especially in the emerging economies, are strongly associated with the research cooperation, and the exchange of knowledge which consequently affects the ranking performance (Fan et al., 2022). Universities are thus being advised to embrace the global engagement strategies in order to increase their visibility and image. On a larger scale, globalization is influenced by the institutional

requirements and specificity of the sectors, and rankings serve as a booster toward globalization (Buckner, 2022).

Besides research and internationalization, academic reputation is an important factor in connection with the outcomes of rankings. The process of reputation can be built in terms of historical performance, research excellence or the process of institutional learning. Latin American university experience points to the role of organizational learning and long-term research activities to boost academic reputation, hence, to ranking positions (Escandon-Barbosa et al., 2023). Nonetheless, ranking and academic quality are a controversial issue as rankings can be biased in favor of specific quantifiable parameters at the expense of more global education goals (Kayyali, 2023).

Though the literature is increasing, there remains a gap in terms of practical studies that effectively study the relative role of various determinants of ranking performance based on quantitative data. The existing literature has been subjected to recent reviews, which identified gaps in the literature specifically when it comes to implementing a set of different dimensions of institutional performance into a single analytical paradigm (Teixeira & Picinin, 2024). Moreover, although it is a well-known aspect of internationalization, its measurement is not consistent, and a range of indicators known to be used in different studies have been offered (Ghasab et al., 2022).

The current research fills this research gap by empirically examining the determinants of world university rankings on the multi-year data. It is centred on important institutional aspects such as research productivity, quality of the faculty, and employability of graduates to assess them in terms of their respective contribution on ranking performance. The best part is that the study offers a quantitative evaluation of such associations to the on-going debate on the credibility and intent of university rankings in the world.

2. Methodology

2.1 Research Design

The research design used in the study is the quantitative and explanatory research design, to examine the determinants of performance of world university rankings. The method is based on positivist paradigm where institutional features are viewed as measurable and observable features. The goal is to establish statistically significant correlation between ranking outcomes and explanatory variables which are critical including research output, quality of faculty and graduate employability.

To show the variation both cross-sectional and time-related a longitudinal structure is employed with having the repeated observations of the universities by a time period. This design enhances the strength of inference than pure cross-sectional designs and allows a more subtle apprehending into the relationship between institutional performance and rank-outcomes.

2.2 Data Source

The empirical study uses a secondary dataset gained at Kaggle, consisting of those data collections by the Center of World University Rankings (CWUR). The data contains institutionalized measures of performance of world-ranked universities in a variety of years. It also contains variables concerning the research productivity, citation impact, faculty, education quality, employability outcomes and the overall ranking scores.

This dataset is significantly employed in the empirical studies on the performance of higher education because it is consistent and comparable across institutions and countries (O'Neill, 2020).

2.3 Sample/Unit of Analysis

The unit of analysis is the university-year observation whereby each observation is represented by a university in a particular year. The dataset contains about 2,000 + observations of a wide range of countries and institutional type. This design allows studying cross-country, as well as temporal dynamics, in the ranking of performance.

The numerous years included in the study can permit the study to consider the diversity in the institutional characteristics over years, hence avoiding the possibility of biased estimates that is a source of bias in static analysis.

2.4 Variable Operationalization

The dependent variable will be the overall institutional performance score that will be given by CWUR. It is a continuous variable which is used to show the composite ranking performance of universities. It is more desirable than ordinal rank since it is better suited to be subject to regression analysis. Alternatively, as another specification the variable world rank is employed in the robustness analysis where particular attention is paid to the interpretation of the inverse meaning of this variable.

There are three conceptual dimensions in terms of which the independent variables are arranged. Production of research is in terms of publications, citation, impact, and patents. All these indicators (quantity and influence of scholarly output, and capacity of innovation) are encompassed. The quality of faculty is used in faculty quality measurement and it is based on quality faculty indicator which is a measure of academic prestige and distinguished scholars. Alumni employment measures graduate employability, which is a measure of success of graduates in the job market.

The inclusion of control variables is to take into consideration more institutional and contextual effects. Quality of education is also a proxy to teaching effectiveness and academic basis. To allow both year effects and country effects, year effects are added to allow variation over time whereas country effects are added in order to ensure

that the variation captured within a year is due to the countries having existing higher education systems and policy environments.

2.5 Data Preprocessing and Treatment

A couple of preprocessing steps are done on the dataset to provide an analytical validity. Those variables where the number of missing variables are too high are not to be considered in the analysis to be consistent across models. Special care is taken in regards to the character of CWUR indicators since many are rank-based whereby the lower the numerical values, the better the performance. These variables are treated sensitive in order to have directional consistency in regression analysis.

Outliers, especially in the highest rank institutions, are analysed so that they do not have a greater impact on results. Moreover, to deal with multicollinearity diagnostic tests, the variances inflation factors are used to ensure that explanatory variables are not so highly correlated.

2.6 Empirical Strategy

The empirical study started with descriptive statistics to present a summary of the distribution of variables between institutions and years. Correlation analysis is then done to determine initial relationships and determine possible multicollinearity issues.

The empirical analysis will start by to analyzing the descriptive statistics to investigate the distribution and variation of variables, across universities and years, and then with the correlation analysis to determine the pre-relationships and evaluate multicollinearity. Then, multiple regression models are used to determine how the quality of faculty and employability have an effect on rank performance. Measure of output, such as publications, citations, influence, and patents are then added to measure their added explanatory value. The last model uses the quality of education, year and country as control variables. Robust standard errors Ordinary Least Squares estimation is used with standard errors which are robust in the sense that they provide reliable estimates even taking into consideration the heteroskedasticity and unobserved time and cross country variations.

3. Results

3.1 Descriptive Statistics

The data comprises 2,200 observations of years in a number of countries and years. The mean institutional score stands at about 47.8 and the standard deviation of the performance is 7.76 and there is a mean dispersion of performance. The lowest score is 43.36 and its highest is 100 which indicates the existence of highly ranked

elite colleges and universities with low rank. The proportion of major countries in connection to the scores is illustrated in Figure 1.

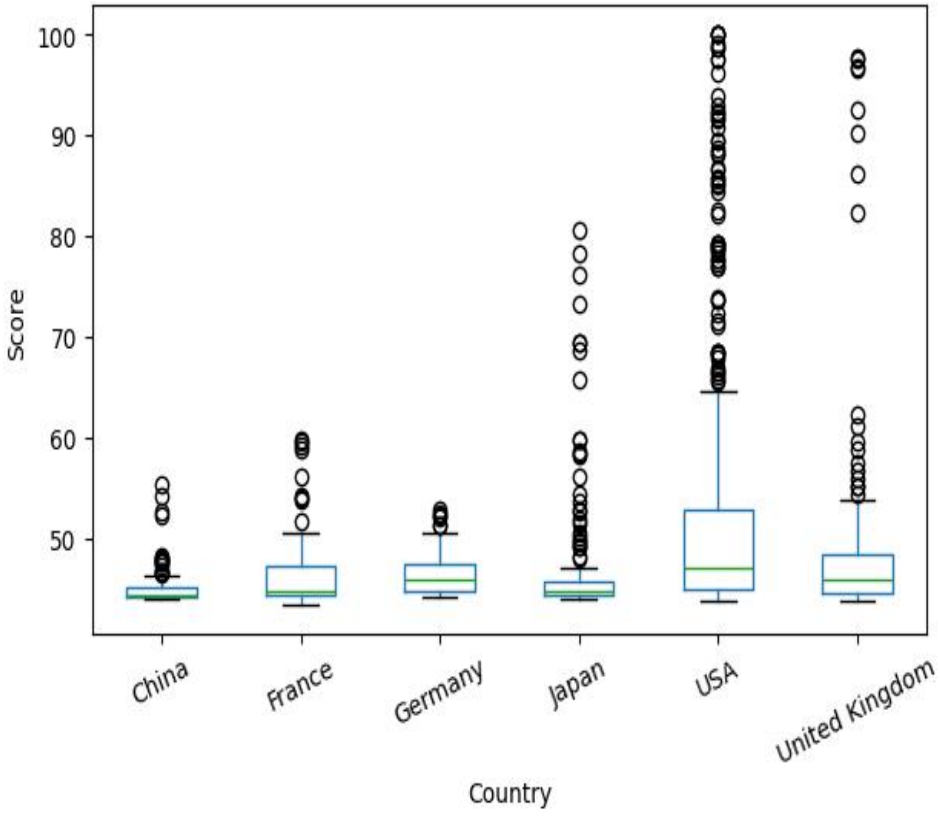

Figure 1: Score Distribution Across Major Countries

World rankings are highly, but not completely symmetrical; they vary between 1-1000 measuring a highly skewed distribution of institutional performance. The data is skewed towards mid-ranking universities, with median more in the lower range of performance in the sample, which indicates that the top-performing institutions are represented by a comparatively small fraction of the sample. Descriptive statistics of variables that will be used in the analysis are given in Table 1.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Score	47.80	7.76	43.36	100.00
World Rank	459.59	304.32	1	1000
Quality of Faculty	500.32	289.45	1	1000
Quality of Education	446.76	295.12	1	1000
Alumni Employment	433.28	273.21	1	1000
Publications	501.10	289.03	1	1000
Citations	501.56	288.74	1	1000
Influence	459.80	303.33	1	991
Patents	433.35	273.99	1	871

3.2 Correlation Analysis

The correlation analysis shows that there are strong correlations between ranking performance and key institutional characteristics. The strongest relationship in score relates to faculty quality, and quality of education. There are also moderate correlations between alumni employability, indicator of research related factors like publications, citation, and influence with the dependent variable. The correlation matrix is presented in Table 2, showing the relationships between the study variables.

Table 2: Correlation Matrix

Variable	Score	Faculty	Education	Employability	Publications	Citations	Influence	Patents
Score	1.00	-0.69	-0.60	-0.51	-0.52	-0.52	-0.52	-0.47

Faculty	-0.69	1.00	0.79	0.56	0.63	0.65	0.66	0.56
Education	-0.60	0.79	1.00	0.57	0.64	0.65	0.65	0.53
Employability	-0.51	0.56	0.57	1.00	0.52	0.53	0.53	0.53
Publications	-0.52	0.63	0.64	0.52	1.00	0.87	0.87	0.67
Citations	-0.52	0.65	0.65	0.53	0.87	1.00	0.85	0.60
Influence	-0.52	0.66	0.65	0.53	0.87	0.85	1.00	0.61
Patents	-0.47	0.56	0.53	0.53	0.67	0.60	0.61	1.00

There are negative values between all major explanatory variables and score. This can be explained by the design of CWUR indicators according to which low numerical values imply a higher level of performance of institutions. Correlations between research variables are rather large which suggests the possibility of multicollinearity. This implies that research indicators are used in different studies to measure overlapping aspects of institutional performance. Figure 2 shows the correlation between variables.

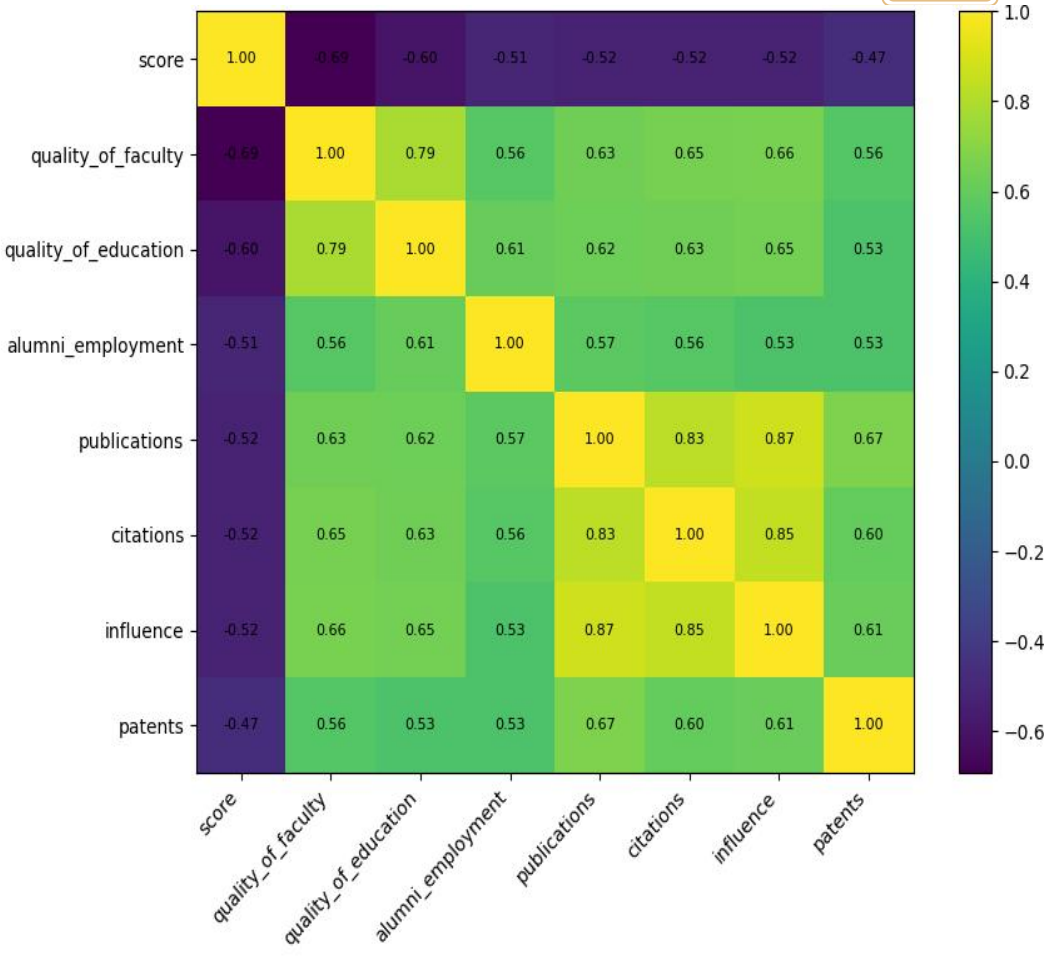

Figure 2: Correlation Heatmap of Key Variables

3.3 Regression Results

The regression analysis gives information on the relative significance of the various factors in different institutions in explaining ranking performance. The total model accounts about 51 percent of the difference in university scores, which means that it has a moderate power of explanation. The most predictive of the ranking performance is the quality of the faculty. Institutions which have a stronger faculty profile are statistically significant meaning that institutions that have better ranking results. The important aspect of this finding is the fact that academic prestige and

faculty excellence is central in global ranking systems. The results of the regression analysis in order to study the determinants of the ranking performance are given in Table 3.

Table 3: Regression Results (OLS)

Variable	Coefficient	Std. Error	p-value
Constant	63.120	0.355	0.000
Faculty Quality	-0.0617	0.0032	0.000
Alumni Employment	-0.0054	0.0008	0.000
Publications	-0.0007	0.0009	0.402
Citations	-0.0004	0.0009	0.666
Influence	-0.0003	0.0009	0.781
Patents	-0.0017	0.0006	0.005
Education Quality	-0.0036	0.0017	0.033

The statistically significant effect on alumni employability is also observed, implying that the outcomes related to the labor market play an important role in the institutional performance. A higher score is given to universities that have a better employment outcome amongst graduates, which indicates the increasing significance of the market-oriented indicators on ranking methodologies. Figure 3 is used to depict the correlation between the faculty quality and the score.

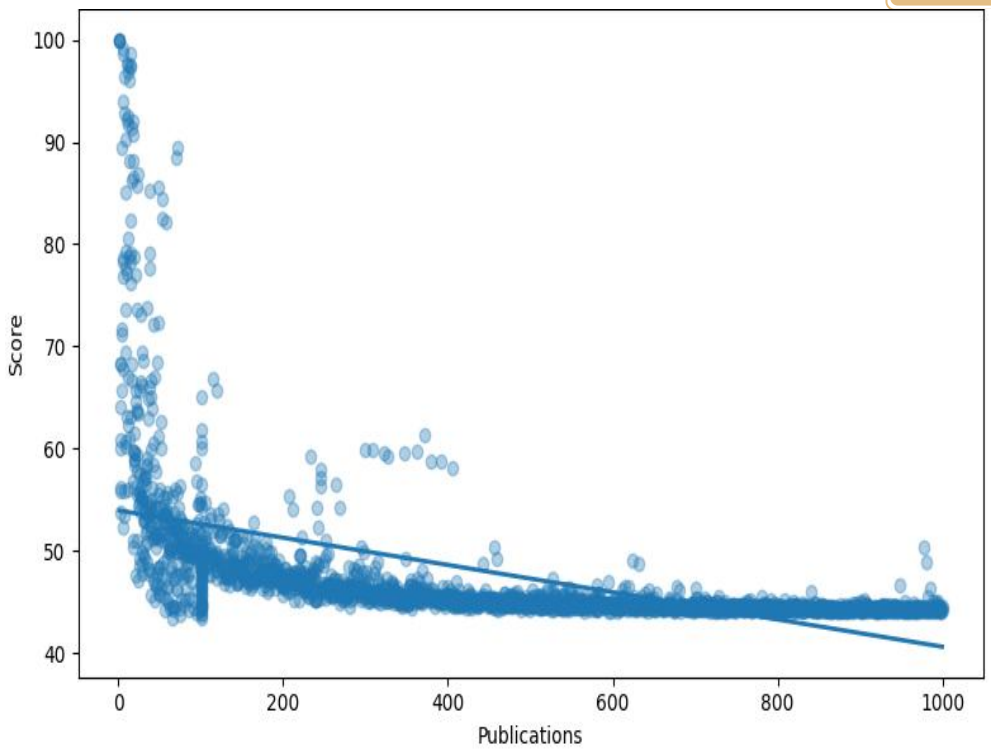

Figure 3: Faculty Quality and University Score

Patents are alone of the research indicators that have a statistically significant relationship with ranking performance, thus innovation output does have a quantifiable impact. Conversely, publications, citations and influence do not seem significant when they are added to the model concurrently. This inconsequence is probably attributed to the multicollinearity of such variables, as they are very similar, capturing similar dimensions of research performance. Figure 4 illustrates the correlation between the research output and score.

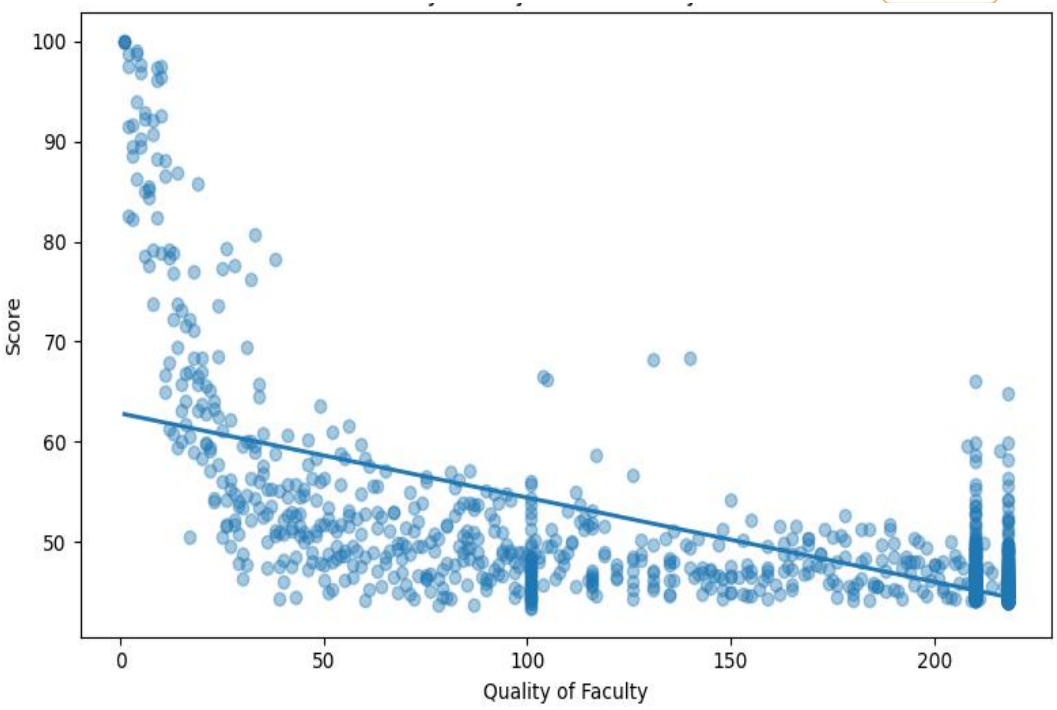

Figure 4: Research Output and University Score

The education quality also exhibits a statistically significant impact, but it is denied a very large one as compared to the faculty quality. This implies that as much as the quality of teaching can be used to rank results, it is not as overpowering as research prestige and faculty-related results.

3.4 Interpretation of Findings

The findings explain that the ranking of performance is mainly encouraged by prestige based indicators especially faculty quality. The output of research is still significant but when they are modeled as combined pieces then the pressure of a composite research performance is realized. Employability has its own impact implying that tables are becoming more externally validated using the outcomes of the labor market.

Faculty quality dominance means that quality rankings favor institutions which have good academic reputations and scholars of high caliber. This importance of patents implies that the innovation oriented output is also the one that is appreciated, but

the classic research indicators do not seem to be so clear in the context of multivariate ones.

3.5 Diagnostic Observations

The results of the regression model reveal that the model has a multicollinearity problem especially between the variables that are related to research since they have a strong inter-correlation, and the coefficients have a weak stability. The residual distribution indicates non-ratios to normality, which indicates skewed distribution of data in the form of ranking.

With these constraints, the overall model is statistically significant, and key results are not particular to specifications, which shows that there is a strong spiral amidst institutional characteristics to ranking performance. Table 4 will have the values of variance inflation factor (VIF) to determine the multicollinearity of predictors.

Table 4: Multicollinearity Diagnostics (VIF)

Variable	VIF
Faculty Quality	3.04
Alumni Employment	1.84
Publications	5.48
Citations	4.22
Influence	5.53
Patents	1.98
Education Quality	3.07

This empirical data shows that faculty quality is the best predictor of performance in world university ranking the next best, then employability and output of innovation. Although research indicators are important, their overlapping effects lower the explanatory powers of each of the research indicators. The results demonstrate the structural orientation of the ranking systems on prestige, visibility of research and graduate results.

4. Discussion

The results of the current study offer empirical data about the factors that determine the performance of world university rankings with the best influence on the quality of its faculty, the next factor is the graduate employability and the choice of the indicators of innovation. These findings support the claim that the global rankings

are largely based on the values of prestige and reputation and are not necessarily objective measures of the performance of the institutions. The substantial and statistically significant influence of faculty quality indicates that academic reputation and presence of a distinguished scholars continues to be at the center of ranking systems that favors previous studies on the role of intellectual capital in institutes where knowledge is important (Vitolla et al., 2023).

The fact that the indicators of individual research outputs including publications, citations and influence included in the regression model at the same time recognize the existence of overlapping effects. This upholds the idea that performance in research is multidimensional and a ranking system tends to take the form of composite indicators (Kochetkov, 2024). The hotmap indicates that there is a high inter- correlation of these variables hence it is also evidence that various research metrics are likely to measure the same underlying constructs. Because of this, their explanatory power is lowered individually in multivariate environments, although the result of research on institutions in terms of institutional visibility and ranking will always be of importance.

The importance of patents underscores the importance of innovation and applied research in developing performance in universities. This conclusion implies that the rankings might also pay more attention to the knowledge transfer and commercialization efforts, besides academic publications, in the future. This shift reveals larger trends in higher education systems, in which universities are supposed to have a role in economic development, and technological growth.

Another notable determinant is graduate employability, which shows that the results on the labor market are a valuable aspect of performance rankings. This is in line with the current move towards outcome-based assessment of higher education institutions, which also gauge their performance based not just on their academic output, but the output of marketable citizens. The introduction of employability indicators is indicative of a more widespread movement of matching higher education to market needs and expectations of stakeholders (Li and Xue, 2022).

The findings can be discussed as far as internationalization was not directly measured in the dataset; however, it could be interpreted regarding the current literature. Globalization policies, such as mobility of faculty personnel and overall research productivity, have been reported to increase institutional reputation and productivity in research (Avolio and Benzaquen, 2024). The close correlation with the quality of the faculties and the ranking performance might also be indicative of the indirect impact of internationalization in that the internationalized faculty, in most cases, can lead to an increase in research output, as well as the academic prestige. Equally, the institutional reactions towards policies to internationalization,

especially in non-Anglophone groups, may affect research practices and performance results (Moldashev & Tleuov, 2022).

The noticeable trends are also contributed by the geopolitical trends in the higher education. Rankings focusing on institutions in areas that already have research infrastructures and have more access to funds support the existing inequalities in knowledge production (Shahjahan and Baizhanov, 2023). This argument is reinforced by the fact that in the descriptive analysis, some countries come to dominate which implies that the rankings are not objective scales and attributes structural and geopolitical influences to the rankings. What is more, the rise of regionalized ranking schemes emphasizes the conflict between internationalization and localization of universities in terms of their performance assessment (Darwin and Barahona, 2024).

The multicollinearity diagnostics and correlation analysis reveal the presence of a lot of ranking indicators which are closely correlated with each other and the presence of redundancy at the measurement level should also be questioned. This result is in line with recent directions to map and refine key performance measures to evaluate higher education and highlight the potential of achieving a better understanding of conceptual differences between the measures (Makrydakis et al., 2025). In the absence of such refinement, without ensuring that a ranking system focuses more on certain dimensions and less on others, the law of overemphasis on a specific dimension and a lack of focus on other ones can happen, resulting in biased measurement of institutional quality.

The findings are also valuable towards the current debate on the university rankings across the world. Although rankings offer an easily comprehensible framework of comparison between institutions, it might reduce the complexity involved in the educational procedures and also encourage a focus on quantifiable results, rather than on overall academic and communal output (Kayyali, 2023). The high level of facility excellence and research-related measures implicates that the rankings promote previous excellence instead of reflecting the entire range of the institutional performance. This is especially a drawback to those universities in developing nations, which can be doing well in areas like teaching or community service and be in the world rankings as an underrepresented institution.

In general, the analysis reveals the necessity of a more sophisticated meaning of the university performance and ranking mechanisms. Future studies need to merge direct measurement of internationalization and experiment with other assessment frameworks taking into account wider diversity of higher education institutions.

5. Conclusion

The research investigated factors in the performance of university rankings in the world with a multi-year data with research outputs, faculty quality, and graduate employability as indicators. The results show that the faculty quality factors most and the role of academic prestige and relevance and presence of renowned scholars cannot be overlooked in determining the ranking performance. The impact on graduate employability also indicates that there is an increasing trend of basing institutional performance on labor market outcomes.

Research-related indicators show high levels of inter-correlation with other indicators, indicating that much is overlapping the dimensions of institutional performance. Although conceptually significant, research related indicators have low individual significance in multivariate analysis. The importance of patents also indicates the importance of innovation and transfer of knowledge in modern ranking systems.

On the whole, the findings indicate that prestige-focused and research-intensive indicators are the major factors when developing global rankings, and these metrics are not able to fully reflect on the overall contributions of universities. The implications of these findings on the institutional strategy are significant as they suggest that faculty excellence, research presence, and graduate outcomes should be the focus areas when the institutional strategy is aimed at performing better on rankings. The research that will be conducted in the future ought to include direct indicators of internationalization as well as introduce alternative frameworks, which would allow offering more comprehensive evaluations of the university performance.

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