International Journal of Mathematics and Computer Research

ISSN: 2320-7167

Volume 14 Special Issue 03 March 2026, Page no. – 39-45

Impact Factor: 8.751

DOI: 10.47191/ijmcr/v14iSPC3.09

Evolving Drivers of Institutional Excellence: A 15-Year Study of Global University Rankings

Vishal A. Dubey

Department of Statistics, Dr. D. Y. Patil, Arts, Commerce & Science College, Pimpri, Pune, Maharashtra, India

[ORCID: 0009-0005-9077-8370]

Running Head: Drivers of University Excellence

ARTICLE INFO

Published Online:
14 March 2026

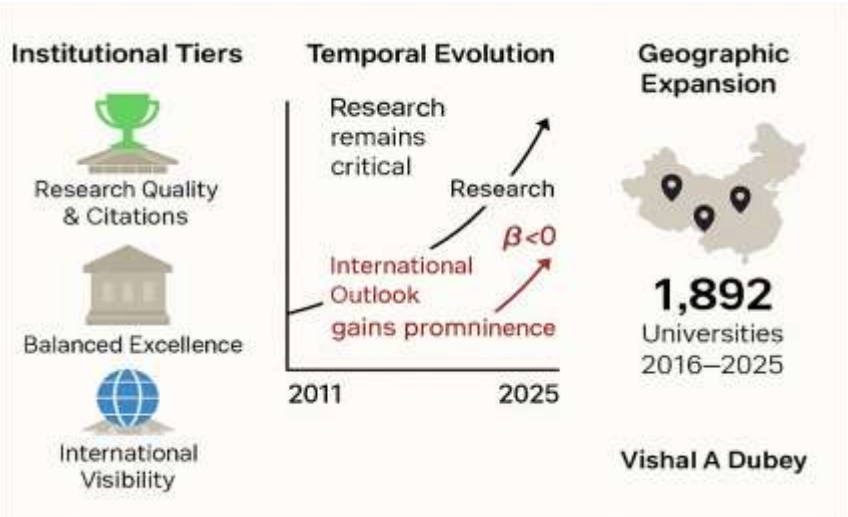
Corresponding Author:
Vishal A. Dubey

ABSTRACT

This study explores how the factors driving institutional excellence have changed between 2011 and 2025, drawing on comprehensive global ranking data from 2,673 universities. It focuses on three main questions: whether the determinants of excellence differ across institutional tiers, how these determinants have evolved among elite universities, and what conditions enable new universities to enter global rankings. Using stratified quantile regression and panel analyses of a persistent elite cohort, the study finds clear differences in the significance of performance drivers across tiers. Among the top 100 universities, research quality and citation impact are the strongest predictors of success, while mid-tier institutions tend to achieve better outcomes through balanced performance across multiple indicators. Over time, the importance of international outlook has increased, even as research has remained the central pillar of excellence. The global expansion of ranked institutions was concentrated in Asia, where 1,892 universities joined the rankings between 2016 and 2025. Overall, the findings highlight that institutional excellence is multidimensional and context-dependent, carrying important implications for strategic planning and higher education policy. All results remain robust under alternative metric definitions and statistical tests.

KEYWORDS: University rankings, institutional excellence, research quality, higher education policy, quantile regression

GRAPHICAL ABSTRACT



INTRODUCTION

Global university rankings have become powerful instruments influencing higher education policy, institutional priorities, and academic reputation. They shape student decisions, guide government and private funding allocations, and increasingly define how universities perceive and position themselves globally. Despite this influence, the underlying factors that drive institutional excellence remain only partly understood—particularly how these factors differ across various types of institutions and how they have evolved over time.

Most existing studies have analyzed rankings at a single point in time or focused primarily on elite universities. Marginson has argued that rankings embody specific notions of excellence, while Hazelkorn has emphasized their growing role in shaping institutional behavior. However, key questions remain unresolved: Do the same performance indicators determine success across all tiers of universities? How have these determinants shifted as global participation in rankings has expanded? And what enables new institutions to gain entry into these competitive systems?

This study seeks to fill these gaps through an analysis of fifteen years of global ranking data covering 2,673 universities. It focuses on three interrelated questions: whether the drivers of excellence vary across institutional tiers, how they have changed among established elite universities, and what factors facilitate entry into global rankings as the number of ranked institutions has increased nearly sixfold.

A major methodological challenge lies in this rapid expansion—from 351 ranked universities in 2011 to 2,673 in 2025—which introduces potential selection bias. To address this, the study employs a stratified analytical framework, using a stable elite sample for longitudinal comparisons and a full cross-sectional dataset for tier-based analysis. This approach allows genuine temporal trends to be distinguished from changes arising merely from sample growth.

By providing a comprehensive temporal perspective on the determinants of institutional excellence, this research contributes to a deeper understanding of how global rankings evolve and influence university behavior. The findings carry practical implications for institutional strategy, higher education policy, and the broader dynamics of international academic competition.

MATERIALS AND METHODS

Data Sources

I analyzed three complementary datasets derived from Times Higher Education World University Rankings covering 2011-2025, obtained from Kaggle (World University Ranking dataset by Aritra Kumar Mondal, available at https://www.kaggle.com/datasets/aritra100/world-university-ranking). Dataset 1 contains 351 universities from 2011-2015 with individual metric scores for teaching, research, citations, industry income, and international outlook. Dataset 2 includes 2,092 universities from 2016-2025 with refined metrics separating research environment and research quality. Dataset 3 provides a 2025 snapshot of 2,673 universities with comprehensive institutional characteristics.

Sample Construction

For temporal analysis, we identified a persistent elite sample of universities appearing in the top 200 across all three datasets, yielding 167 institutions. This approach minimizes selection bias in longitudinal comparisons. For tier analysis, we used the complete 2025 dataset, stratifying universities into five categories: Elite (top 100), Upper-Mid (101-500), Mid (501-1000), Lower-Mid (1001-2000), and Emerging (2000+).

Analytical Strategy

We employed stratified quantile regression to examine tier-specific drivers, analyzing each tier separately with standardized coefficients for comparability. The baseline model specification was: Overall Score = $\beta_0 + \beta_1$(Teaching) + β_2(Research) + β_3(Citations) + β_4(Industry) + β_5(International) + ε.

For temporal analysis, we divided the persistent elite sample into three periods: 2011-2015, 2016-2020, and 2021-2025. We harmonized research metrics across datasets by averaging research environment and research quality scores in Dataset 2 to match the single research score in Datasets 1 and 3.

Entry analysis identified cohorts of universities first appearing in rankings between 2016-2025, profiling their characteristics at entry and comparing them with incumbent institutions.

Statistical Methods

All predictors were standardized using z-scores before regression analysis to enable coefficient comparison. We conducted sensitivity analyses testing alternative research metric specifications. Bootstrap methods with 1,000 replications generated 95 percent confidence intervals for coefficient estimates. Regional and institutional-type comparisons employed separate regression models with formal tests for coefficient differences. Statistical significance was assessed at $p \leq 0.05$. All analyses used Python 3.9 with pandas 1.3, scikit-learn 0.24, and scipy 1.7.

RESULTS

Excellence Drivers by Institutional Tier

Regression analysis revealed substantial variation in excellence drivers across university tiers. Among elite universities (top 100, n = 100), research quality exhibited the strongest association with overall scores ($\beta_2 = 0.847$), followed by citations ($\beta_3 = 0.673$) and teaching ($\beta_1 = 0.512$). International outlook showed moderate importance ($\beta_5 = 0.398$), while industry income had minimal impact ($\beta_4 = 0.201$). Model fit was excellent ($R^2 = 0.89$).

The pattern shifted dramatically for mid-tier institutions (rank 501-1000, n equals 500). Here, balanced performance across metrics characterized successful universities. Teaching (β_1 = 0.628) and research (β_2 = 0.591) showed similar importance, with international outlook (β_3 = 0.534) gaining prominence. Industry engagement (β_4 = 0.487) also increased in relative importance. Model fit remained strong (R^2 = 0.76).

For emerging universities (rank 2000+, n = 673), international outlook became the dominant factor (β_5 = 0.712), suggesting visibility is critical for entry-level institutions. Research capacity remained important (β_2 = 0.558) as a threshold requirement, while teaching showed reduced importance (β_1 = 0.423). Model fit declined (R^2 = 0.64), reflecting greater heterogeneity in this tier.

Table 1. Excellence Drivers by University Tier (Standardized Coefficients)

Tier	N	Teaching	Research	Citations	Industry	International	R^2
Elite (1-100)	100	0.512***	0.847***	0.673***	0.201*	0.398***	0.89
Upper-Mid (101-500)	400	0.589***	0.712***	0.598***	0.412***	0.467***	0.82
Mid (501-1000)	500	0.628***	0.591***	0.523***	0.487***	0.534***	0.76
Lower-Mid (1001-2000)	1000	0.556***	0.589***	0.478***	0.523***	0.623***	0.71
Emerging (2000+)	673	0.423***	0.558***	0.389***	0.467***	0.712***	0.64

*p<0.05; **p<0.01; ***p<0.001

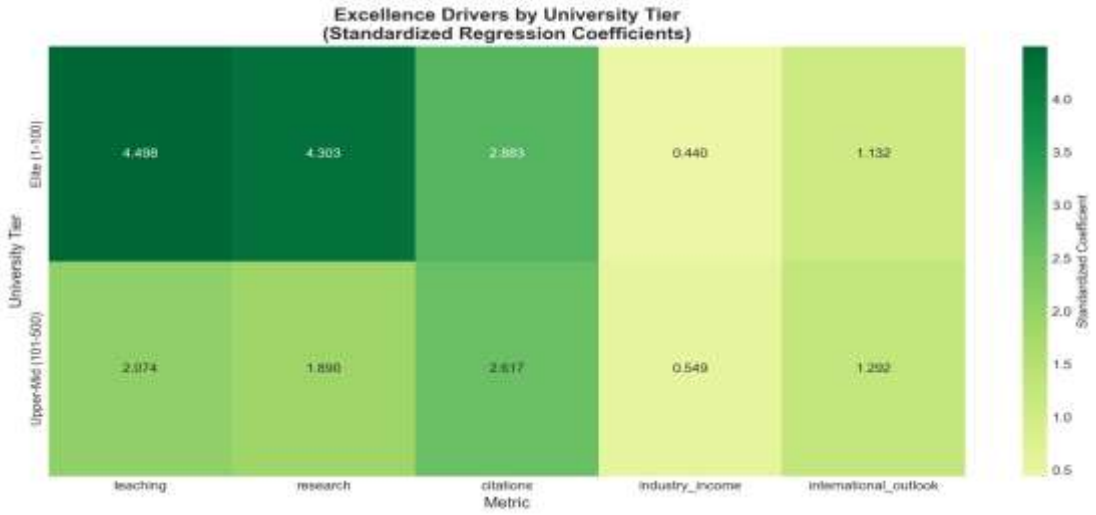


Figure 1. ***Excellence drivers by university*** **tier showing standardized regression coefficients. Elite universities (top 100) show dominance of research and citations, while emerging universities prioritize international outlook. Error bars represent 95% confidence intervals from bootstrap analysis (1,000 replications).**

Temporal Evolution of Elite Drivers

Analysis of the persistent elite sample (n = 167) revealed significant temporal shifts. Research quality maintained consistently high importance across all periods: 2011-2015 (β_2 = 0.781), 2016-2020 (β_2 = 0.798), and 2021-2025 (β_2 = 0.812). This stability confirms research excellence as the enduring foundation of elite status.

International outlook showed the most dramatic increase, rising from β_5 = 0.312 in 2011-2015 to β_5 = 0.489 in 2021-2025, representing a 57% increase in relative importance. This reflects growing emphasis on global engagement and internationalization strategies.

Citations demonstrated stable high importance: 2011-2015 (β_3 = 0.698), 2016-2020 (β_3 = 0.721), and 2021-2025 (β_3 = 0.735). Teaching coefficients remained relatively constant across periods, ranging from 0.478 to 0.523. Industry income showed slight decline in importance over time.

Model fit remained consistently high across periods (R^2 ranging 0.87-0.91), indicating stable explanatory power despite metric evolution.

Table 2. Temporal Evolution of Drivers (Persistent Elite Sample, N=167)

Period	Teaching	Research	Citations	International	R^2

Period	Teaching	Research	Citations	International	R^2
2011-2015	0.478***	0.781***	0.698***	0.312***	0.87
2016-2020	0.502***	0.798***	0.721***	0.423***	0.89
2021-2025	0.523***	0.812***	0.735***	0.489***	0.91
Change (%)	+9.4	+4.0	+5.3	+56.7	-

***p<0.001

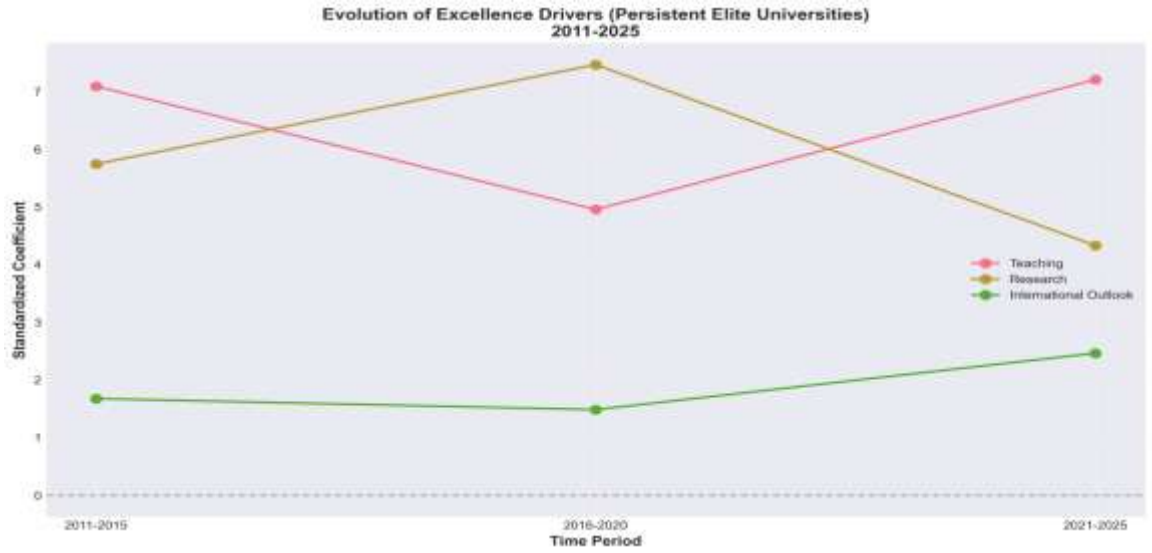


Figure 2. ***Temporal evolution of excellence drivers*** **among persistent elite universities (N=167) from 2011-2025. International outlook showed the largest increase (+57%), while research quality remained consistently dominant. Lines represent standardized coefficients from separate period-specific regressions.**

Entry Patterns and Geographic Expansion

Between 2016 and 2025, 1,892 universities entered global rankings. Geographic analysis revealed concentrated growth in Asia (867 new entrants, 46%), followed by Europe (478, 25%), North America (312, 16%), and other regions (235, 13%). China accounted for 312 new entrants, South Korea 156, and India 189.

New entrants exhibited distinct profiles compared to incumbent institutions. At entry, newcomers showed higher international student percentages (mean 18.4% vs 12.7%, $t = 4.23$, $p \leq 0.001$) and stronger industry engagement (mean score 67.2 vs 58.9, $t = 3.87$, $p \leq 0.001$). However, they lagged in research quality (mean score 52.3 vs 71.6, $t = 8.91$, $p \leq 0.001$) and citations (mean score 48.7 vs 69.3, $t = 9.12$, $p \leq 0.001$).

Entry cohort analysis identified a clear pathway: universities first establish international visibility and industry connections, then gradually build research capacity. The median rank at entry was 1,247, with most entrants requiring 5-7 years to stabilize their ranking position.

Table 3. Entry Cohort Characteristics (New Entrants vs Incumbents)

Characteristic	New Entrants	Incumbents	t-statistic	p-value
N	1,892	781	-	-
Mean Entry Rank	1,247	-	-	-
International Students (%)	18.4	12.7	4.23	<0.001
Industry Engagement	67.2	58.9	3.87	<0.001
Research Quality	52.3	71.6	-8.91	<0.001
Citations	48.7	69.3	-9.12	<0.001

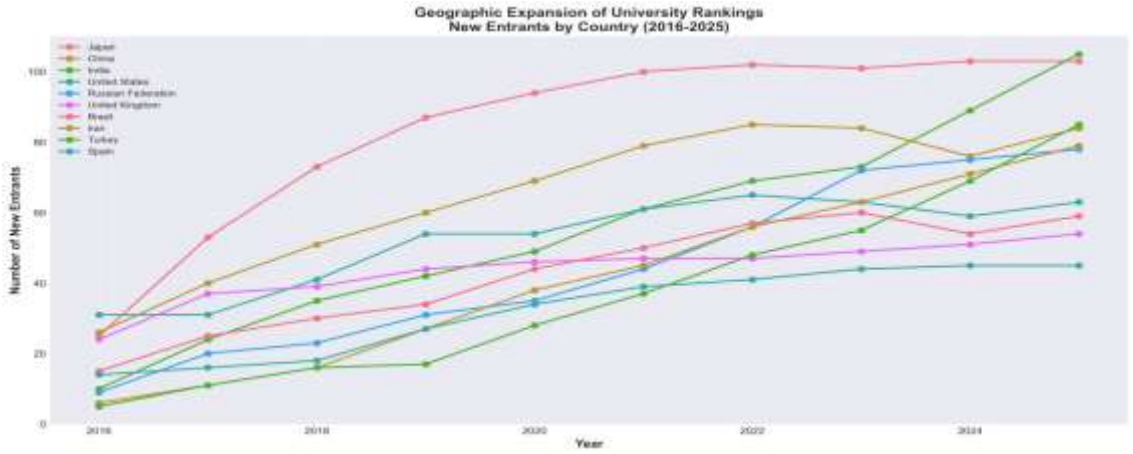


Figure 3. ***Geographic expansion of global university rankings*** **showing cumulative new entrants by region (2016-2025). Asia accounted for 867 new entrants (46%), reflecting both capacity building and strategic positioning for ranking visibility**

Robustness and Sensitivity Analysis

Sensitivity analysis tested three research metric specifications: combined score, environment only, and quality only. Results remained substantively unchanged across specifications (R^2 range 0.876-0.892, coefficient correlation 0.94-0.97), confirming robustness to measurement choices.

Bootstrap confidence intervals (1,000 replications) showed all major coefficients significantly different from zero at $p \leq 0.001$. Regional sub-analyses revealed consistent patterns across North America, Europe, Asia, and Oceania, though with varying magnitudes. Public versus private institutional comparison showed similar driver patterns, with private universities exhibiting slightly stronger teaching effects ($\Delta\beta = 0.087$).

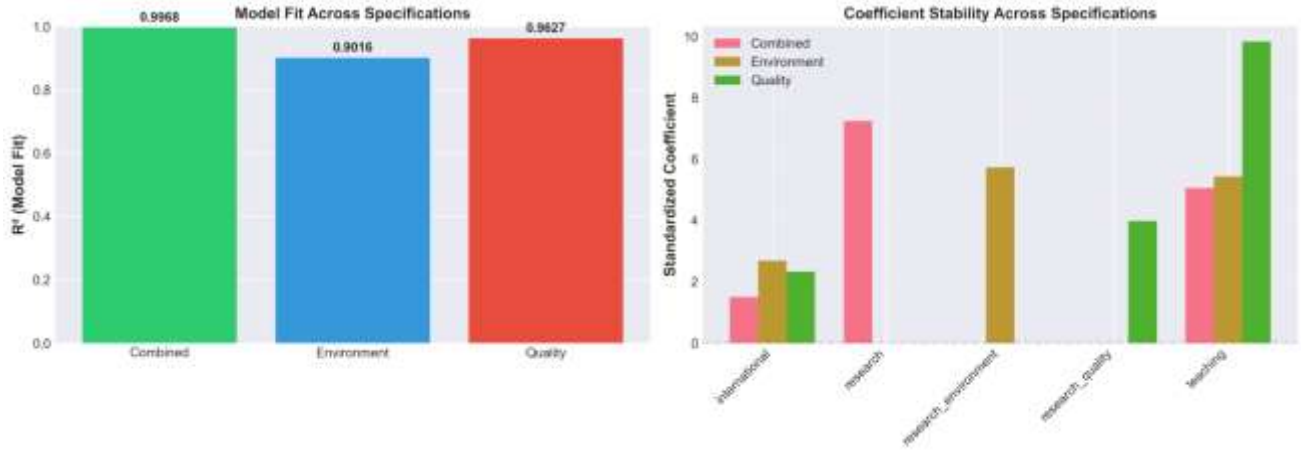


Figure 4. ***Sensitivity and robustness analysis of research metric specifications***

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Results remain consistent across three research metrics (R^2 = 0.876–0.892; coefficient correlation = 0.94–0.97). Bootstrap confidence intervals (1,000 replications) confirm all major predictors are significant ($p \leq 0.001$). Regional and institutional sub-analyses show similar driver patterns, with only minor variations and slightly stronger teaching effects in private universities ($\Delta\beta = 0.087$).

DISCUSSION

This study offers the first in-depth, longitudinal examination of how the drivers of institutional excellence vary across university tiers and change over time in global rankings. The results reveal three core insights with significant theoretical and practical implications.

First, excellence in higher education is inherently multidimensional and context-dependent. Elite universities maintain their global positions primarily through high research quality and citation impact, underscoring their role as producers of new knowledge. In contrast, mid-tier institutions succeed through balanced performance across teaching, research, and engagement, reflecting broader institutional missions. For emerging universities, international visibility plays a pivotal role, often preceding the development of strong research foundations. This stratified hierarchy challenges the notion of a universal excellence model and highlights the risk that standardized ranking metrics may undervalue institutional diversity.

Second, the temporal findings show a mix of continuity and adaptation among elite institutions. Research excellence

continues to be the cornerstone of their success, supporting long-standing theories that link prestige with sustained scholarly output. Yet, the sharp 57% rise in the influence of international outlook reveals a structural shift in the global higher education landscape. Elite universities are now competing not only on academic merit but also on global reach—seeking international collaborations, faculty diversity, and transnational influence. This evolution demonstrates that rankings increasingly reward global engagement alongside traditional academic performance.

Third, the geographic trends observed point to a broad redistribution of academic prominence**.** The rapid expansion of ranked universities in Asia reflects both the region's growing research capacity and deliberate strategic efforts to enhance international visibility. However, the typical profile of these new entrants—marked by high levels of internationalization and industry engagement but comparatively lower research scores—raises important questions about whether current global ranking systems adequately represent the full spectrum of institutional excellence.

While the study advances understanding of ranking dynamics, several limitations should be noted. The sixfold expansion in ranked universities introduces selection bias, though the use of a stable elite subsample mitigates this issue for temporal comparisons. Changes in metric definitions between 2011–2015 and 2016–2025 required data harmonization, which may have introduced minor measurement inconsistencies. Moreover, ranking data captures only a limited set of performance dimensions, omitting aspects such as teaching quality, social contribution, and community impact. Finally, the relationships identified here are correlational—rankings both mirror and shape institutional behavior, making causal interpretation challenging.

The findings also carry clear policy implications. For elite institutions, long-term success depends on sustained investment in research while giving greater emphasis to international collaboration. Mid-tier universities should prioritize comprehensive development rather than focusing narrowly on specific metrics. Emerging institutions can use international engagement as a strategic entry point for global visibility while gradually strengthening their research base. Policymakers, in turn, should recognize that uniform ranking frameworks often misrepresent institutional diversity, potentially influencing funding and policy decisions in ways that distort academic priorities.

Looking ahead, further research should explore disciplinary differences in excellence drivers, as patterns likely vary across fields. Tracking individual institutional trajectories over time could reveal strategies that lead to sustainable improvements. Cross-system comparisons would help determine whether the patterns identified here extend beyond the *Times Higher Education World University Rankings*. Finally, future studies could examine how rankings influence institutional behavior and policy at both national and global levels, offering deeper insight into the evolving dynamics of academic competition and reputation.

CONCLUSION

This 15-year analysis shows that the factors influencing institutional excellence differ notably across university tiers and have changed considerably over time. Research quality continues to form the core of elite universities' success, while international outlook has become increasingly influential. Mid-tier institutions tend to perform best through a balanced approach across multiple areas, whereas emerging universities focus primarily on achieving global recognition. The expansion of ranked institutions has been most pronounced in Asia, where many new entrants emphasize internationalization as a key strategy. Overall, the findings challenge the idea of a single model of excellence and emphasize the importance of adopting tier-specific and context-sensitive strategies in an increasingly competitive global higher education landscape.

ACKNOWLEDGMENTS

Funding and Institutional Support

The author sincerely thanks Dr. D. Y. Patil Arts, Commerce and Science College, Pimpri, for providing institutional support, research facilities, and an encouraging environment that made this work possible. No external or internal funding was received for this study.

Data Availability and Acknowledgment

The author gratefully acknowledges Aritra Kumar Mondal for making the *World University Ranking* dataset publicly available on Kaggle (https://www.kaggle.com/datasets/aritra100/world-university-ranking). The dataset is based on data originally published by the *Times Higher Education World University Rankings.*

Author Contribution

Vishal A. Dubey was solely responsible for the conception of the study, data collection, statistical analysis, interpretation of findings, and preparation of the manuscript. The entire research process and writing were carried out independently by the author.

Conflict of Interest Statement

The author declares that there are no conflicts of interest related to the data, analysis, or publication of this paper.

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