RESEARCH PERFORMANCE OF THE UNIVERSITIES IN NIRF RANKINGS 2022: AN EXPLORATORY STUDY

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Abstract: *Higher education plays a critical role in the development of a nation and its people. Despite its impressive growth, India's higher education system faces significant challenges, such as low enrolment rates, lack of equity, and quality issues. To address these challenges, the Ministry of Human Resource Development (MHRD) established the National Institutional Ranking Framework (NIRF) in 2015. Here, in this study a comprehensive overview of the research performance of the ranked universities in the NIRF 2022 rankings has been examined. This study tries to highlight the strengths and weaknesses of the universities in terms of their research performance and offer insights into the extent on which research performance affects their final placement in the NIRF rankings. The study focuses primarily on the top 10 universities, as well as universities ranked at equally-spaced intervals between rank 20 and 100. The study employs regression analysis to obtain the correlation factor for the various bibliometric indices considered such as number of publications, number of citations, average citations etc., establishment year and faculty strength was also considered as independent variables. To the best of our knowledge, no similar studies have been conducted on this topic for NIRF 2022 rankings, making this study a valuable contribution to the academic literature.*

Key words: NIRF Rankings, Research Outcomes, Indian Universities.

1. Introduction

Higher education plays a critical role in the development of a nation and its people. India, with its large student population and rapidly growing higher education system, is no exception. However, despite its impressive growth, India's higher education system faces significant challenges, such as low enrolment rates, lack of equity, and quality issues. To address these challenges, the Ministry of Human Resource Development (MHRD) established the National Institutional Ranking Framework (NIRF) in 2015. NIRF serves as an indicator of the quality of higher education institutes (HEIs) in India, including colleges and universities, based on a well-defined methodology. NIRF rankings are released annually, with the top 100 ranked HEIs, as well as the rank bands of 100-150 and 151-200, being published. Ranking HEIs has become an essential tool for evaluating their quality, competitiveness, and success. In the age of globalisation, ranking lists are widely available to various stakeholders, including funding agencies, students, parents, and legislative bodies. The

NIRF ranking, in particular, is widely used for the assessment of HEIs in India, affecting both student enrolment and funding decisions. The NIRF ranking is conducted across various HEI categories, such as Overall, Universities, Colleges, Engineering, Management, Medical, Law and others. This study is going to be concerned with the NIRF Ranking (Universities), which is concerned with all universities regardless of specialisation. The NIRF score is based on five parameters, namely Teaching, Learning & Resources (TLR), Research and Professional Practice (RP), Graduation Outcomes (GO), Outreach and Inclusivity (OI) and Peer Perception. The RP parameter, which constitutes 30% of the total score, is based on the university's research output and the quality of its publications. This suggests that a university's research performance is a key factor in its placement in the NIRF rankings (University).

Academic databases are critical tools for tracking and retrieving the bibliographic information of peer-reviewed and reputable research works. These databases index the published literature by various parameters such as author, title, subject heading, keyword, and more. Bibliometrics is another feature provided by these databases, which offers a quantitative analysis of the records. Some of the widely used academic databases include Scopus and Web Of Science. Scopus is an interdisciplinary database that has gained immense popularity among the academic community. It covers over 43,000 source titles from more than 10,000 publishers across the world and indexes a wide range of literature, including journal articles, books, and conference proceedings, from various fields such as science, technology, medicine, social science, arts, and humanities. Web of Science is another widely used academic database that provides access to over 33,000 peer-reviewed journals, books, proceedings, and conference papers. It has broad coverage of the natural sciences, social sciences, and arts and humanities. Web of Science also provides bibliometric data such as the impact factor, which allows researchers to assess the influence of a particular publication or author.

The age of a university is a factor that is not often considered when evaluating its research performance. A plausible reason for older universities having a relatively stronger research performance than their younger counterparts might be their well-established infrastructure. This includes a wide range of resources such as libraries, laboratory facilities, and equipment. Older universities have had ample time to build and refine these resources, making them some of the best equipped institutions for conducting cutting-edge research. Additionally, older universities often have large endowments that provide funding for research projects, further strengthening their research capabilities. Over time, older universities have established a large number of partnerships and collaborations with

other universities, research institutes, and industry organisations. Furthermore, the prestige of older universities attracts top researchers and students, who are drawn to their excellent reputation and resources, thereby creating a feedback effect. These factors create an environment that fosters research excellence and attracts talented researchers, making older universities a major contributor to the advancement of knowledge and the scientific community.

2. Literature Review

Over the years, the number of universities in India has increased substantially, from 103 in 1970-71 to 659 in 2011-12 and a staggering 1043 in 2019-20 (MHRD, 2020; Sheikh, 2017). However, when looking at enrolment, we see that the gender distribution of the students is skewed at almost every level towards men. Furthermore, for universities of national importance, the gender gap is stark- only 24.7% of all students are comprised of women (MHRD, 2020). Despite the challenges that higher education in India faces, opportunities have been identified to improve the quality of education (Begum, 2017; Gupta & Gupta, 2012; Sheikh, 2017).

The Rashtriya Uchchatar Shiksha Abhiyan (RUSA) was established to increase Gross Enrolment Ratio (GER), establish new colleges, and convert college clusters into universities (Sirswal, 2016). Another initiative to improve the quality of education in India was the Yashpal Committee Report, which recommended redesigned syllabus and courses, practical knowledge alongside theoretical and greater emphasis on research (Pandya, 2016).

Two of the most important accreditations for higher education institutions in India are provided by the National Assessment and Accreditation Council (NAAC) and the National Bureau of Accreditation (NBA). Unfortunately, except for Tamil Nadu and Maharashtra, no other state has NAAC accreditation for at least 50% of their universities (Hota & Sarangi, 2019). Globally, accreditation is not uniformly given to all departments or programs (Stura et al., 2019). Even those universities accredited by NAAC, only 30% of them were found to be of sufficient quality to be ranked at 'A' level (Sheikh, 2017). Furthermore, the Indian accreditation system is found to be lenient when compared to rigorous global accreditation, and performance gaps are identified (Fernandes & Singh, 2022).

The globalisation of education has led to the widespread popularity of HEI rankings (Hazelkorn, 2008; Mitchell & Nielsen, 2012).Consequently, a vast body of literature has emerged that focuses on various aspects of ranking systems' methodology and their implications for the broader world. The major global HEI ranking systems have been subject to criticism on various technical and methodological grounds (Van Raan, 2005). Quality assessment of higher education institutions in India includes

both peer review and being accountable to an external constituency (Van Vught & Westerheijden, 1994). Rankings have been used as a measure of quality assessment for higher education institutions.

The QS College ranking, one of the top international rankings for higher education, relies on reputation surveys from academics and faculty citation data for 70% of its criteria (Davis, 2016). The quality assessment policy for undergraduate institutions has been studied in several countries, such as China (Liu & Rosa, 2008), Netherlands (Frederiks et al., 1994), and UK (Harvey, 2005). University research performance has been analysed using several parameters, including high citation counts, international co-publications, and co-publications with industry leaders (Frenken et al., 2017). NIRF Ranking uses parameters that are comparable to those used in major global rankings (NK et al., 2018). Research output and the corresponding NIRF rank obtained have been studied for various central-level universities (Dadhe et al., 2021; Kumar et al., 2022; Mukherjee, 2019).

Finally, the analysis of research output hinges upon bibliographic databases, of which Scopus and Web of Science are the two most comprehensive ones (Pranckutė, 2021). Both databases offer extensive coverage of research articles across various fields of study. Web of Science is managed by Clarivate Analytics and provides access to over 24,000 journals, while Scopus, managed by Elsevier, indexes more than 44,000 journals, including over 6,000 open-access journals. Both databases provide various features such as citation analysis, author identification, and metrics calculation, including the h-index (Hirsch, 2005).

The current study addresses a research gap by investigating the relationship between NIRF 2022 rankings, research performance, and age of the top ten universities in India. The study not only focuses on the top ten universities, but also includes universities ranked 20, 30, 40… up to 100, providing a comprehensive analysis of the relationship between research performance, age, and ranking for a wider range of universities in India. This approach allows for a more comprehensive analysis, by selecting representative universities from each decile of the NIRF top 100. Additionally, it allows for a more nuanced understanding of the distribution of research performance across the entire spectrum of universities beyond just the top-ranked institutions. To the best of our knowledge, there is a dearth of research examining these factors in the above context. Therefore, this study is a significant contribution to the existing literature.

3. Purpose

This exploratory study's objective is to assess the research output of the universities that received rankings in the NIRF 2022 rankings. The study focuses primarily on the top 10 universities, as

well as universities ranked at equally-spaced intervals between rank 20 and 100. This decision was taken to limit the scope of the study and to both get a high-level overview of the ranked NIRF universities as well as study the top ten ranked universities with granular detail. The study will consider various aspects of research performance, such as the number of published research works, the quality of publications, and the citations received. The study will also examine the establishment year of the universities and how it may be correlated with their NIRF rankings. By examining the research performance of these universities, this study aims to shed light on the factors that contribute to their ranking and provide valuable insights for India's HEIs.

4. Design and Methodology

As required by the purpose of the study outlined above, the data has been compiled mainly from various primary and secondary sources. The primary sources of data will be the NIRF 2022 rankings and academic databases such as Scopus and Web of Science (as NIRF collect publication data from these two databases out of few more under the heading 'Third Party Sources') to examine the research output of the universities. Research outcomes of the studied universities indexed in Scopus and Web of Science has been retrieved within the time period of 19/07/2022 to21/07/2022. The secondary sources of data will be information obtained from the university websites, such as establishment year, faculty strength and more. The study employs regression analysis to obtain the correlation factor for the various bibliometric indices considered (number of publications, number of citations, average citations, h-index, etc.). Apart from these, establishment year and faculty strength were also considered as independent variables.

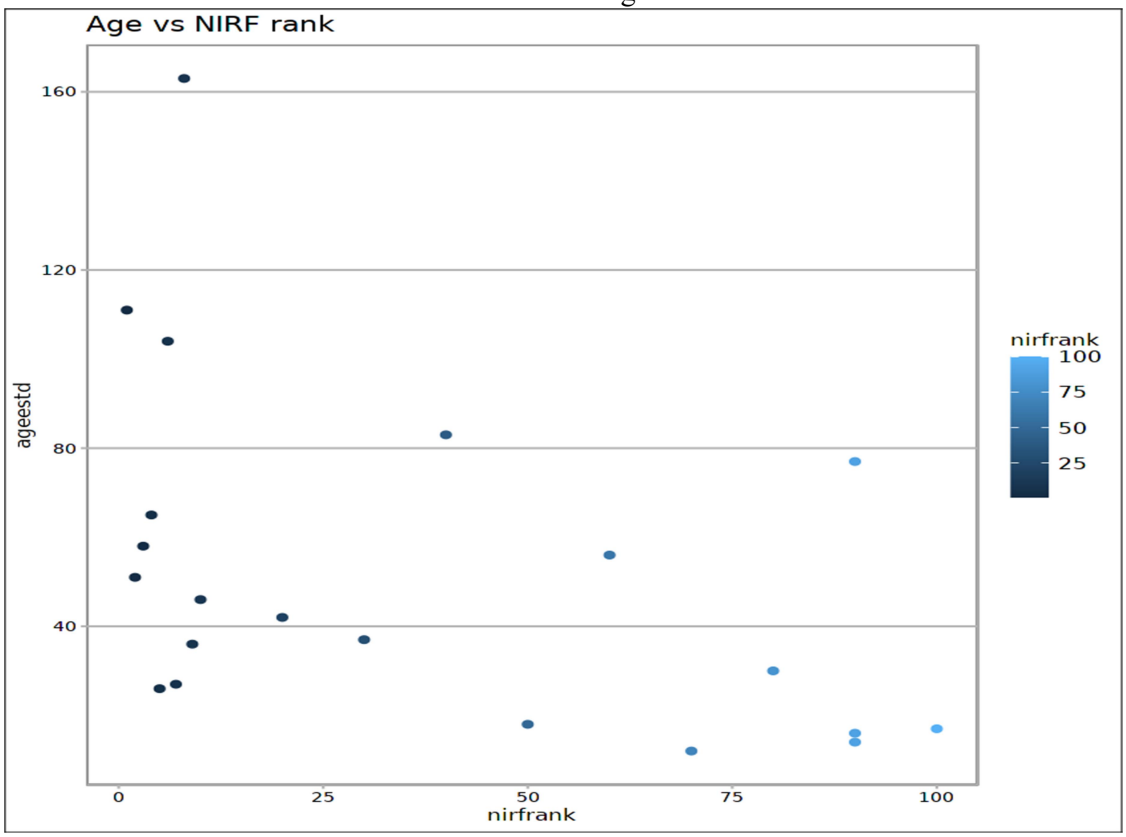
5. Analysis & Findings

The following analysis explores the universities considered, the NIRF rank, age of founding, age of establishment and research publication metrics. The study also uses aggregate metrics to properly measure the contribution of research in NIRF rankings if any. Both quantitative and qualitative analysis is being performed, and a regression test is conducted to get the estimates of the effect that the independent variables have over the NIRF score.

Table 1: University wise distribution of establishment age, founding age, NIRF score and rank.

Sl. No.	Name of the Universities	State	Year of Founding	Founding age as on 31/12/2020	Year of Estd. as deemed Univ.	Age as on 31/12/2020 as Univ.	NIRF 2022 Score	NIRF 2022 Rank
1	Indian Institute of Science (IIS)	Karnataka	1909	111	1909	111	83.57	1
2	Jawaharlal Nehru University (JNU)	Delhi	1969	51	1969	51	68.47	2
3	Jamia Millia Islamia (JMI)	Delhi	1920	100	1962	58	65.91	3
4	Jadavpur University (JU)	West Bengal	1905	115	1955	65	65.37	4
5	Amrita Vishwa Vidyapeetham (AVV)	Tamil Nadu	1994	26	1994	26	63.4	5
6	Banaras Hindu University (BHU)	Uttar Pradesh	1916	104	1916	104	63.2	6
7	Manipal Academy of Higher Education (MAHE)	Karnataka	1953	67	1993	27	62.84	7
8	Calcutta University (CU)	West Bengal	1857	163	1857	163	62.23	8
9	Vellore Institute of Technology (VIT)	Tamil Nadu	1984	36	1984	36	61.77	9
10	University of Hyderabad (HU)	Telangana	1974	46	1974	46	61.71	10
11	Anna University (AU)	Tamil Nadu	1978	42	1978	42	56.22	20
12	Mahatma Gandhi University (MHU)	Kerala	1983	37	1983	37	51.61	30
13	Kerala University (KU)	Kerala	1937	83	1937	83	49.8	40
14	King George`s Medical University (KGMU)	Uttar Pradesh	1905	97	2002	18	48.51	50
15	Tata Institute of Social Sciences (TISS)	Maharashtra	1964	56	1964	56	47.16	60
16	Sri Balaji Vidyapeeth Mahatma Gandhi Medical College Campus (SBVMGMC)	Pondicherry	2001	19	2008	12	44.72	70
17	Manonmaniam Sundaranar University (MSU)	Tamil Nadu	1878	142	1990	30	42.92	80
18	Ashoka University (AU)	Haryana	2004	16	2004	16	42.27	90
19	KLE Academy of Higher Education and Research (KLEAHER)	Karnataka	1963	57	2006	14	42.27	90
20	Utkal University (UU)	Odisha	1943	77	1943	77	42.27	90
21	Dr. M. G. R. Educational and Research Institute (MGRERI)	Tamil Nadu	1985	35	2003	17	40.39	100

Chart 1: NIRF Ranks and age as Universities



From Table 1, we can observe that the Indian Institute of Science in Karnataka (IR-O-U-0220) holds the top rank in NIRF 2022 with a score of 83.57, followed by Jawaharlal Nehru University in Delhi (IR-O-U-0109) with a score of 68.47. In addition to the founding year, the table provides information on the year in which the university was established as a deemed university. This is an important distinction, as being a deemed university provides greater autonomy and academic flexibility to the institution. Interestingly, some of the top-ranked universities in the NIRF 2022 list, such as the Indian Institute of Science (IR-O-U-0220) and Banaras Hindu University (IR-O-U-0500), were established before the concept of deemed universities was introduced in India. There is a significant variation in the establishment and founding ages of these top-ranked universities. For instance, the Indian Institute of Science was founded in 1909, making it the oldest university in the list, while Amrita Vishwa Vidyapeetham (IR-O-U-0436) was founded as recently as 1994.

From Table 1, we can see a weak positive correlation between the age and the NIRF score obtained.

Table 2: University wise distribution of NIRF rank and Scopus data for 2018, 2019 and 2020

Sl. No.	Name of the Universities	NIRF 2022 Score	NIRF 2022 Rank	Number of Publications indexed in Scopus Database				Scopus Total Citation	Scopus h-index
				Scopus (2018, 2019 & 2020)	Scopus 2018	Scopus 2019	Scopus 2020		
1	IIS	83.57	1	9387	3081	3081	3225	98827	78
2	JNU	68.47	2	3728	1278	1251	1190	50362	58
3	JMI	65.91	3	3599	1381	1216	1002	45621	82
4	JU	65.37	4	5829	1932	1905	1992	47921	69
5	AVV	63.4	5	2765	828	962	975	17521	48
6	BHU	63.2	6	4641	1488	1603	1550	77227	87
7	MAHE	62.84	7	6404	2348	2155	1901	70698	79
8	CU	62.23	8	3735	1351	1191	1193	37504	62
9	VIT	61.77	9	9619	3209	3208	3202	90794	107
10	HU	61.71	10	2818	947	961	910	25641	63
11	AU	56.22	20	5756	1974	2023	1759	56770	81
12	MHU	51.61	30	1230	426	430	374	22952	55
13	KU	49.8	40	1016	415	309	292	7551	35
14	KGMU	48.51	50	1393	497	421	475	17465	45
15	TISS	47.16	60	547	187	192	168	2108	20
16	SBVMGMC	44.72	70	335	126	100	109	3016	9
17	MSU	42.92	80	964	359	336	269	5708	140
18	AU	42.27	90	220	46	75	99	1551	16
19	KLEAHER	42.27	90	280	130	77	73	1856	22
20	UU	42.27	90	504	179	157	168	26202	43
21	MGRERI	40.39	100	736	253	254	229	2275	21

Table 3: University wise distribution of NIRF rank Web of Science data from 2018,2019 and 2020

Sl. No.	Name of the Universities	NIRF 2022 Score	NIRF 2022 Rank	Number of Publications Indexed in Web of Science (WoS) Database				WoS Total Citation	WoS h-Index
				WoS (2018, 2019 & 2020)	WoS 2018	WoS 2019	WoS 2020		
1	IIS	83.57	1	8728	2977	2912	2839	102178	95
2	JNU	68.47	2	3600	1184	1191	1225	49595	67
3	JMI	65.91	3	3013	866	1013	1134	44615	76
4	JU	65.37	4	4943	1722	1539	1682	46633	64
5	AVV	63.4	5	4055	1525	1309	1221	31571	55
6	BHU	63.2	6	5838	1747	1940	2151	93851	90
7	MAHE	62.84	7	5531	1633	1770	2128	66891	77
8	CU	62.23	8	3479	1094	1143	1242	33032	57
9	VIT	61.77	9	7774	2347	2517	2910	91840	99
10	HU	61.71	10	2494	735	877	882	26453	59
11	AU	56.22	20	5283	1519	1780	1984	59806	76
12	MHU	51.61	30	997	276	359	362	14618	48
13	KU	49.8	40	843	250	243	350	7221	34
14	KGMU	48.51	50	1523	434	531	558	17575	44
15	TISS	47.16	60	499	176	149	174	1890	18
16	SBVMGMC	44.72	70	312	98	102	112	679	10
17	MSU	42.92	80	659	227	183	249	22561	41
18	AU	42.27	90	239	43	84	112	1457	16
19	KLEAHER	42.27	90	573	152	178	243	5834	32
20	UU	42.27	90	391	133	105	153	26468	42
21	MGRERI	40.39	100	182	57	50	75	1059	13

From Tables 2 and 3, we can see the general strength of the research outputs of the universities considered. The Indian Institute of Science (IR-O-U-0220) has the highest total citation count of 98,827 in Scopus, and 102,178 in Web of Science. It also boasts the highest number of publications.

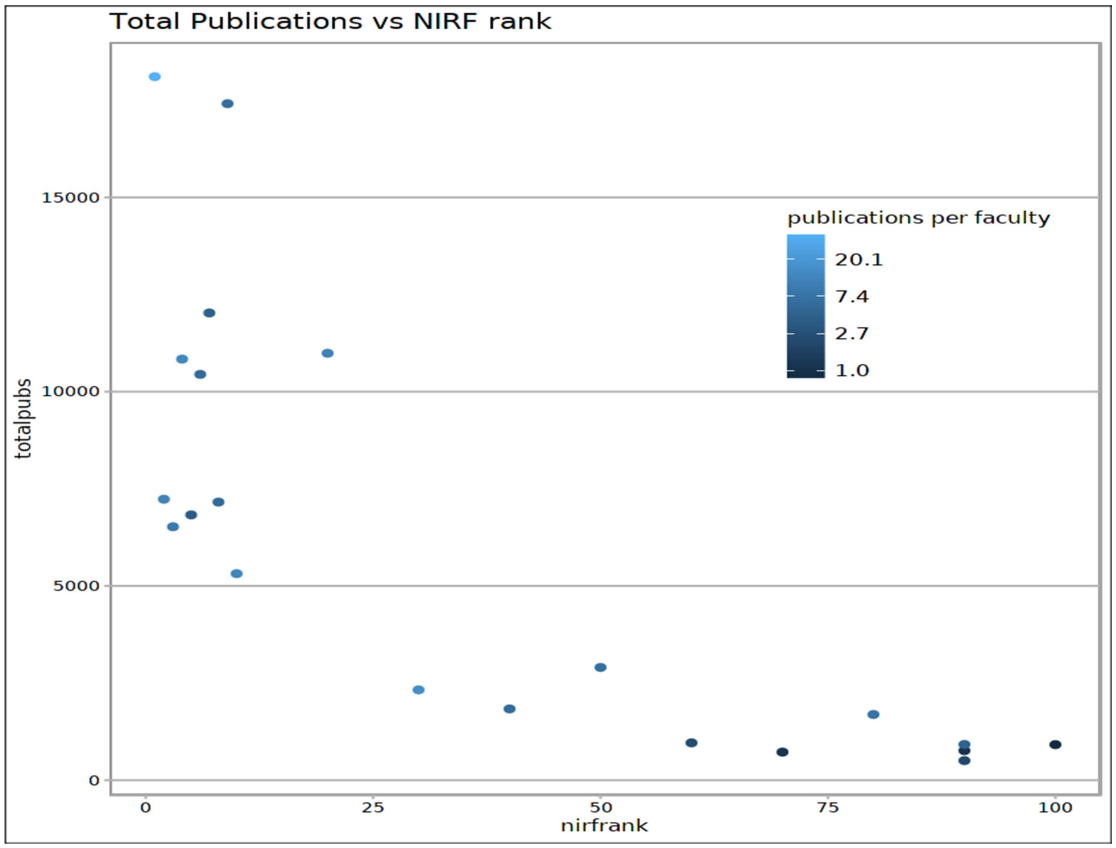
Interestingly, we can see that there are universities that are relatively lower ranked**,** such as Anna University (IR-O-U-0439) that have comparable research metrics with universities in the top 10. Similarly, Manonmaniam Sundaranar University (IR-O-U-0464) has a h-index value in both databases that is considered an outlier in its rank band (Rank 80, Scopus h-index value 140, Web of Science h-index value 41). These observations prove that the relationship between research outcomes and university rankings is not trivial to interpret and needs nuance and various factors in consideration.

To that end, this study selects a few aggregate measures that provide some insight into the likelihood of a university to be higher ranked. We measure total publications (Scopus and Web of Science), total publications per faculty, total citations per publication per faculty and age of university (after establishment).

Table 4: University wise distribution of faculty strength, aggregate metrics and age

Sl. No.	Name of the Universities	No. of Faculty members (as per NIRF 2022)	NIRF 2022 Score	NIRF Rank -2022	Total Publications	Total Publications/Faculty	Total Citations/ Publication / Faculty	Age of Estd.
1	IIS	465	83.57	1	18115	38.96	0.0239	111
2	JNU	631	68.47	2	7328	11.61	0.0216	51
3	JMI	752	65.91	3	6612	8.79	0.0181	58
4	JU	834	65.37	4	10772	12.92	0.0105	65
5	AVV	1830	63.4	5	6820	3.73	0.0039	26
6	BHU	1770	63.2	6	10479	5.92	0.0092	104
7	MAHE	2617	62.84	7	11935	4.56	0.0044	27
8	CU	1250	62.23	8	7214	5.77	0.0078	163
9	VIT	2633	61.77	9	17393	6.61	0.004	36
10	HU	423	61.71	10	5312	12.56	0.0232	46
11	AU	977	56.22	20	11039	11.3	0.0108	42
12	MHU	146	51.61	30	2227	15.25	0.1155	37
13	KU	303	49.8	40	1859	6.14	0.0262	83
14	KGMU	435	48.51	50	2916	6.7	0.0276	18
15	TISS	434	47.16	60	1046	2.41	0.0088	56
16	SBVMGMC	568	44.72	70	647	1.14	0.0101	12
17	MSU	220	42.92	80	1623	7.38	0.0792	30
18	AU	209	42.27	90	459	2.2	0.0314	16
19	KLEAHER	827	42.27	90	853	1.03	0.0109	14
20	UU	187	42.27	90	895	4.79	0.3147	77
21	MGRERI	1119	40.39	100	918	0.82	0.0032	17

Chart 2: Distribution of NIRF ranks and total publications



Note that the number of publications per faculty is calculated by using the data for the number of faculty provided by the university, and the number of publications found in the bibliographic databases. This excludes the possibility that non-faculty members (research scholars, post-doctoral fellows) can publish without a faculty being a co-author, thereby positively biassing the publications per faculty metric. Cases such as Indian Institute of Science (IR-O-U-0220) with 38.96 publications per faculty might be explained as such, which is a limitation of the analysis.

From the above data, we perform an ordinary least squares (OLS) analysis using NIRF score as our dependent variable, and Total Publications, Total Publications per Faculty, Total Citations per Publication per Faculty, and Age of Establishment as our independent variables. The results of the analysis are given below.

Table 5: Regression Analysis Results

Characteristic	Beta	95% CI*1*	p-value
(Intercept)	43.24	38.43, 48.05	<0.001
Total publications	0.0011**	0.0005, 0.0017	0.002
Total Publications/Faculty	0.45**	0.0501, 0.8500	0.03
Age as University	0.0604*	-0.0128, 0.1335	0.1
Citation/Publication/Faculty	-30.18	-70.28, 9.925	0.13

R^2 = 0.832; Adjusted R^2 = 0.790; Sigma = 5.28; Statistic = 19.8; p-value = <0.001; df = 4; Log-likelihood = -61.9; AIC = 136; BIC = 142; Deviance = 446; Residual df = 16; No. Obs. = 21

1 CI = Confidence Interval
***= Significant at 99% Confidence Interval
**= Significant at 95% Confidence Interval
*= Significant at 90% Confidence Interval

From the above table, we see that an **increase in total publications by 1 unit leads to an increase in NIRF score by 0.0011.** Similarly an increase in total publications per faculty by 1 leads to an increase in NIRF score by 0.45, again as university age increases by 1, NIRF score increases by 0.06 approximately. The coefficients for total publications, total publications per faculty and the age of establishments are found to be statistically significant at the 90% confidence interval. Furthermore, the estimates found for the total publications and total publications per faculty are statistically significant at the 95% confidence interval.

Thus, the analysis suggests that total publications, total publications per faculty as well as establishment age have positive coefficients, meaning that all of these variables affect the NIRF score positively. While the citation per publications per faculty has a negative coefficient, OR? the result is not statistically significant.

6. Conclusion and Future Scope

In conclusion, this study shows that total publications, total publications per faculty**,** and the age of establishments are significant predictors of the NIRF score. The study is limited by the relatively small sample size, and by the fact that the universities chosen for the 9 deciles might not be representative of all 100 universities that were ranked in NIRF 2022. The inclusion of the top 10 ranked universities might also provide a source of bias, as it can be argued that the universities ranked at the top might display outlier behaviour compared to the rest of the ranked universities. Thus, while this study generates important insights about the key metrics that can reasonably predict NIRF scores based on research performance, faculty size**,** and age, the findings are not conclusive as it does not consider all the universities that were ranked. Future scope for this study would be to include all 100 universities, as well as verify whether the relationship

established here holds when the sample size is larger.

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