Working Paper
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QUALITY OF SOCIAL SCIENCE RESEARCH IN INDIA

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The authors of this paper are listed in alphabetical order. We are grateful to ICSSR and IDRC for supporting this study. Comments received from three workshops at ICSSR are gratefully acknowledged. We thank Deeputty KJ, Dipannita Saharia, Jerry Poulose, Noby Mathew, Satheesh Babu, Shihabudeen P, Sivadasan TM and Vachaspati Shukla for their sincere and able research assistance.

ABSTRACT

There is a growing recognition of the importance of academic research in India and is being monitored by public institutions. However the focus in these assessments has remained largely confined to quantity dimensions, completely ignoring the dimension of quality. It is in this context that we posit our unique attempt to measure the quality of social science research ***in India*** in objective quantifiable terms. We have developed a precise and relevant index (**CDS_Index**) of quality of social science research in India, capturing multiple dimensions that are particularly important in the Indian/social science context. The index is a combined measure of an articles index and a journals index, premised on the users' perspective and the producers' perspective on quality. The results of the study shows that India's social science research contributes more to public debates and policy formulations than to pushing the frontiers of knowledge for further research. It is encouraging to note that over 90% of all articles record a positive quality index score, which implies that they do contribute to further research and/ or public discourse. Nevertheless, nearly 99% of articles still score less than 0.14. Our paper does signal towards two policy directions. First, it is absolutely essential to increase research funding for social sciences to improve its quality. Secondly, there should be a concerted effort to encourage collaborations, especially international collaborations, in social science research in India.

Keywords: Social Science, Quality, Index, India

1. Introduction

Over the past few years, there is a growing recognition of the importance of academic research in India. The University Grants Commission (UGC) has evolved new and objective (quantifiable) criteria to evaluate faculty performance by assigning different scores for different forms of research outputs produced by members of the Indian academia.[1] However, the focus on research in these assessments has remained largely confined to the volume (or quantity) dimension, completely ignoring the dimension of quality. This is somewhat natural and expected, as quality of research is very difficult to assess or measure objectively, while the volume of research, purely in terms of numbers of research output, is more readily quantifiable and available.

Needless to mention that this is a commendable step taken by the UGC to create a paradigm shift in Indian academia, often accused of paying inadequate attention to research. In fact, it is alleged that India is even falling behind many of the emerging economies like China with respect to academic research and knowledge creation. In global rankings of academic institutions, primarily determined by their research, India's presence is appalling.[2] The new policy framework of academic/faculty

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1 Please refer to the "Performance Based Appraisal System" (PBAS) for promotion under Career Advancement Scheme as indicated in Clause 6.0.02 under schedule of "UGC Regulations on Minimum Qualifications for Appointment of Teachers and Other Academic staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education, 2010" which appeared in The Gazette of India, September18, 2010. http://www.ugc.ac.in/oldpdf/regulations/englishgazette.pdf

2 In the Times World University Rankings, no Indian institution feature in the top 250, as compared to China which has 2 universities in the top 50 (see https://www.timeshighereducation.com/world-university-rankings/2016/world-ranking#!/page/0/length/25).

evaluation has perhaps been successful in providing a fillip to academic research in India by prompting the Indian academia to devote more attention to research and produce more research outputs.

However, the flipside of this policy change is also becoming all too apparent. Given the exclusive focus on volume/quantity of research in this policy framework with no reference to quality whatsoever, numerous publishing rackets (mostly fake and fly-by-night journals/ publishers) are emerging with the sole objective of generating quantities of "bogus" publications (with no attention on quality) against hefty payments from academic faculty.[3] This not only defeats the very purpose of the initial well-intended policy to promote academic research in India, but also jeopardises the future of Indian academia by creating serious moral hazard and adverse selection problems in matters of academic evaluation and faculty selections.

It is in this context that we posit our unique attempt to measure the quality of social science research ***in India*** in objective quantifiable terms. Clearly this is not the first time that quality of research is being measured. There are established norms of assessing quality of academic research using standard indices relying primarily on citations and impact factors and most of these measures have been devised in the context of academic research in the western world. There exist a number of studies attempting to assess quality of academic research – an extensive critical review of the early literature in this regard is presented by Beed and Beed (1996) who suggest that majority of the studies used citations to assess quality.[4]

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3 See an example of unsolicited advertisement for obtaining paid publications (Figure A1).

4 For instance, Laband and Piette (1994) uses number of citations received by the articles published in economics journals to assess the journal quality. Mason, Steagall and Fabritius (1997) show that there exists a high correlation between the rankings of economic journals based on citations, on one hand, and based on perceptions of economics department chairs, on the other.

Unfortunately much of Indian research outputs, especially in social sciences, are published in India and do not even reach top notch publications in global circulation. Hence they fail to meet the western norms of quality measurement, essentially driven by citation in the top notch "western" publications. They are, thus, completely left out of the quality domain so defined. But that does not mean this large segment of Indian research output is devoid of any quality. It is against this backdrop that we intend to develop a measure of quality suited to capture quality variations in social science research in India.

2. Conceptualising Quality of Social Science Research in India

The concept of 'quality of research' is subjective, value loaded and largely non-quantifiable. The subjective nature of quality essentially implies that it may be valued differently by different sets of people. In other words, there may not be a single objective criterion to measure the magnitude of quality. And even if one arrives at an acceptable definition of quality, it is extremely difficult to measure quality in quantitative terms because of the largely non-quantifiable nature of the concept of quality. Therefore, any attempt to measure quality of research proves to be a daunting task.

In our endeavour to measure quality of social science research in India, we begin with a discussion of what quality in social science research means to us. Quality of social science research must be captured from perspectives of both the users and the producers of research. Users of research judge the quality of research output based on its utility or usefulness. The underlying presumption is that higher quality research outputs will be used by more number of users and more frequently. The producers of research outputs, on the other hand, consider signalling mechanisms as a way of indicating the quality of their work. We discuss the parameters of quality from both perspectives.

Quality from user's perspective

To measure the quality of social science research from a user's perspective, we need to first understand what it is that the user is looking for from social science research. Analytically, one may distinguish between two types of users of social science research – (1) those who access social science research to gain knowledge of the world they live in and use it for policy making, public debates, social interventions etc. and (2) those who use research outcomes as inputs into further research. Based on the above distinction, we assume that the quality of a research publication is to be judged by its users for:

a) its ability to contribute to public debates
b) its ability to contribute to further research

Quality from producer's perspective

From the producer's perspective, assuming that the producer would benefit by greater dissemination of his research, he would like to send signals about its quality to users by publishing his work with 'reputed' journals and publishers. We, therefore, assume that the quality of journals/ publishers, as signals of reputation, will reflect quality of research from the producer's perspective.

Indicators of quality

There are several forms of social science research outputs, such as journal-articles, books (edited volumes/ monographs), project reports, working papers etc. We confine our study to one of the most important outputs of social science research, namely ***journal articles*** due to constraints of time and resources.[5]

5 Our initial intention was also to cover books (edited volumes and monographs) for quality assessment, based on a database of social science books collated by another ICSSR institute. However, we noticed several serious discrepancies and inconsistencies in the data on books provided to us just two months back and decided not to exclude books from our quality analysis. Given the sensitive nature of this exercise, it is not advisable to calculate a quality index for each book with wrong and imperfect information in the database.

Drawing upon the above conceptual framework, we construct two sets of indicators of quality of journal articles. From the perspective of users we construct an '***article index***' of quality and from the perspective of producers we construct a '***journal index***' of quality. The 'article index' of quality would intuitively mean that a publication which is more widely read and more frequently cited by peers can be considered as of higher quality compared to a publication that is not. The journal index of quality would intuitively mean that a journal with greater 'reputation' would signal higher quality than otherwise**.**

Article quality

We consider two dimensions of quality of an article – citation (scholarly) and readership.

Citation: The first variable we use for capturing quality of a journal article is the ***number of scholarly citations*** it receives. A paper gets more citations if its contribution to the knowledge in the field is significant and noticeable, as subsequent research cites the findings of the paper. It shows the valuation of the publication by peers and hence its ability to contribute to further research. The number of citations an article receives is, therefore, considered to be an indicator of quality by most of the popular quality indices such as impact factor, h-index etc.

Readership: The second dimension of article quality pertains to the readership base and web presence. The number of hits an article receives in a simple Google keyword search is taken to be an indicator of the readership base of that article. A larger number of hits would indicate that the article is being read and mentioned in various documents that are placed in the public domain (web), not necessarily in scholarly journals. This would indicate that the article is widely being read and disseminated, thus contributing to public debates and discussions. A high quality article that effectively addresses a relevant social issue and stimulates debates is expected to get wider readership and dissemination.

Journal quality

The 'quality' of a journal as perceived by researchers (the so-called producers of research) is essentially a reflection of the reputation of the journal, which rests on three dimensions: its presence over time, its presence across space and its depth. Thus older and regular journals, journals with wider presence and journals with deeper impact may be considered to be of higher quality than others. Let us elaborate on these three dimensions.

Impact: Number of citations received by a journal is regarded as an indicator of the impact of the journal. It is defined as the sum of the citations received by all papers published in that journal in the entire scholarly world. More citations indicate that papers published in that journal made more useful contribution to knowledge that generated further research or entered scholarly text books. A commonly used measure of citation based impact of a journal is the H-index which captures the largest number *h* such that at least *h* articles published in the journal during a reference period have at least *h* citations each.

Presence: The visibility and reach of a journal increases if it has *online presence*. Online availability of full texts, abstracts or even title (the journal contents page) of articles published in a journal facilitates easier access, which definitely widens its presence. This, in turn, may enhance the reputation of the journal. Researchers might demonstrate a clear preference to publish in such journals with online presence and this could act as a quality signal.

Age and Regularity: A journal's reputation greatly depends on its *age* and *regularity*. Age of the journal in circulation is indicative of its being in demand and sustained circulation. Younger (new) journals attract less number of submissions as it takes time to establish a journal's credentials and credibility. Naturally, the probability of acceptance will be higher in new journals and this could compromise quality. After a critical

minimum number of years of survival, a journal establishes itself and acquires academic credibility, after which its reputation increases with age.

Like age, regularity of a journal (i.e., whether the issues of the journal are coming out regularly on time) augments its reputation. Regular publication of the issues of a journal on time requires a well functioning journal management team on all fronts – academic, administrative and financial. It also requires that the journal receives sufficient number of submissions to choose from. Regularity of the journal gives a positive signal to the authors and thus attracts high quality papers.

3. Data and Methodology

Based on the conceptual framework for measuring quality of social science research, as discussed in section 2, we develop specific indices of quality in this section. At the outset, it is important to describe the database that we use for this analysis and construct the variables capturing various dimensions of quality indicators discussed in section 2.

Database

It is a herculean task to obtain a complete and comprehensive list of all journal articles published by social scientists in India. Therefore, we depend on two large databases to extract a list for this study – (1) SCOPUS – an internationally acclaimed academic database and (2) a journal database maintained by Institute of Studies in Industrial Development (ISID), a research organization affiliated to the Indian Council of Social Science Research (ICSSR).[6] The SCOPUS is a bibliographic database, which contains the abstract and citations for academic peer reviewed journal articles in Science, Medicine and Social

6 For more information on ISID, please visit the website http://www.isid.org.in/home.html

Science. It is owned by Elsevier, a leading international publisher of academic journals. It should be noted that this database contains journals not only published by Elsevier but other publishers too.[7] The ISID database is a collection of 224 Indian Social Science Journals in the fields of economics, finance, management, business, health, education, sociology and other social science subjects.

For the purpose of this study, we take all the journal articles listed in SCOPUS published by authors affiliated to Indian institutions during the five year period 2010-2014 in all social science related disciplines (excluding management and clinical psychology) and limited to articles published in English. For the ISID database, we decided to drop some of the journals on the basis of the following judgmental considerations. We discard very young journals, for instance, those started publishing from 2012 or later. We also excluded journals with irregular and erratic publications of issues and those without a proper editorial board. Journals with non-transparent peer review process are also excluded to get rid of the problems of paid publications. Finally, we discard magazines and journals in the fields of Management/Accountancy/ Commerce.

Accordingly, we ended up with 21351 journal articles from 1006 journals (902 journals from SCOPUS and 104 journals from ISID).

We categorize all articles according to the 12 social science disciplines, as decided by ICSSR. Needless to mention, social science articles cannot always be compartmentalized into strict disciplinary divides. However, by looking at the title of the article, the journal which carries it and the author's specialization, each article was assigned a unique disciplinary code as presented in Table 1.

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7 For more information on SCOPUS, visit the website http://www.scopus.com/

Table 1: Distribution of Articles according to Disciplines

Subject/ Discipline	Code	Frequency	Percent
Sociology (SOC)	10	2,460	11.52
Political Science (POL)	11	1,836	8.60
Economics (ECO)	12	9,501	44.50
International Studies (IS)	13	1,577	7.39
Social Geography, Population (G&D)	14	1,381	6.47
Social Psychology (PSY)	15	406	1.90
Education (EDU)	16	1,234	5.78
Law (LAW)	17	647	3.03
Strategic Studies (STR)	18	327	1.53
History (HIS)	19	396	1.85
Religion & Philosophy (R&P)	20	293	1.37
Others (OTH)	99	1,293	6.06
Total		**21,351**	**100.00**

Variables to capture Quality Indicators

Article quality[8]

Citation (*C*): The number of scholarly citations received by an article is obtained from *Google Scholar* search. To normalize, we calculate average citation per year by dividing it by the duration since its publication (subtracting the year of publication from 2015).

Readership – Google Hits (*G*): We obtain the number of hits an article receives in a simple Google keyword search and normalize it to

8 We would like to note that although both parameters of article quality are internet dependent, we believe that access to internet by the academic community is no longer a major constraint in India, as UGC and IFLIBNET together provide free comprehensive net access to the entire academic community in India.

average hits per year by dividing it by the number of years since it has been published (subtracting the year of publication from 2015).

Journal Quality

Impact – H-index (*H*): We obtain/calculate the H-index for each journal for 2010. As explained above H-index is the largest number *h* such that *h* articles published in year 2010 have at least *h* citations each.

Online presence (*O*): Online presence of the journal is a categorical variable, taking the value '1' if the journal has online presence (full text/ abstract/ contents) and '0' otherwise.

Age (*A*): Age of the journal can be measured as a cardinal variable (in years) from the year of its launch. One may, however, argue that age may not act as a simple linear proxy for quality and hence we decided to construct a categorical variable for age (A) as follows: if age of the journal is less than 6 years then A takes the value 1, if age is 6 years or more but less than 20 years then A is 2, if age is 20 years or more then A is 3. The cut-offs, although judgmental, reflect common perceptions of the time frame required for a new journal to stabilize (6 years) and to get established (20 years).

Regularity (*R*): Regularity of a journal is measured as the lag in the issue of a journal from the last expected issue of the journal in the year 2014. However, the actual data reflect that 97 percent of the journals are being published regularly (95 percent with no lag and 2 percent with a lag of only one issue). Given this lack of variability in this data, we are constrained to drop this variable from our final index. The respective sources of data used for these variables are summarized in Table 2 below.

Table 2: Sources of data on variables used for measuring quality

Variables	Data Source(s)
C	Number of citations for a particular article in "Google Scholar" search.
G	Number of hits obtained when a particular article is searched within quotes in Google. We did not take the total number of hits recorded by Google at the top of the search page as it includes repeated occurrences. Instead, we manually counted the total number of occurrences in all pages.
H	H-index values for every year are given against journals in the Scopus. For journals from the ISID database, we calculated the H-index from the data gathered from ISID database. We considered the H-index values for the year 2010 (a handful of missing values for this year were replaced by those for another year).
A	Data on age of journals were gathered from the respective journal websites. If unavailable from the journal websites, we used the date of publication of the first issue of the journal as recorded in the ISID database or extracted the information from research papers published by library science scholars. For a handful of journals (less than 10), data on age was not available from any of these sources and we took their age as 1 year.
O	Respective journal websites

Method of construction of an Index of Quality

Construction of an index entails combining the various dimensions of quality described above.

In so far as articles are concerned, there are two quality dimensions represented by two variables *C* and *G*. To make them directly comparable for combining them into a single index, we apply unitary scaling using the formula: [(Observed –Minimum)/(Maximum – Minimum)] that leaves their underlying distributional structures unchanged. Now we take an average of *C_scaled* and *G_scaled* to arrive at the composite index of article quality. This could either be a simple average (*s_index_art*) or a weighted average using the coefficient of variation (CV) of *C* and *G* as the weights (*cv_index_art*). The logic behind using CV based weights is to assign greater weights to dimensions with greater spread and vice versa.

In the same manner as above, we construct indices of journal quality (*s_index_jrnl* and *cv_index_jrnl*) using three dimensions captured by three variables *H, A* and *O*. Note that *H* is a cardinal variable, *A* is a categorical variable and *O* is a binary variable. *O* is already in a unitary scale. We apply unitary scaling conversion for *H* using the same formula as above and for *A* we assign the values 0, 0.5 and 1 respectively for the three categories described earlier.

Each article with its intrinsic quality score (*cv_index_art*) must be conditioned for the quality of the journal (*cv_index_jrnl*) in which it is published. In other words, two articles of the same intrinsic quality (identical scores of *cv_index_art*) but published in journals of different quality must be differently valued. To this end we construct a combined index (*comb_index*) using the formula:. $\frac{(cv\_index\_art)}{1-(cv\_index\_jrnl)}$

Unlike the other indices that ranged between 0 and 1 by construction, *comb_index* will range between 0 and infinity (as in 7 cases where the

cv_index_jrnl score is 1). These have been replaced by a value of 0.99 to arrive at a finite value of *comb_index*. Again, as before, *comb_index* is converted into a unitary scale (***CDS Index***) using the same formula as earlier indicated and the values of this scaled index range between 0 and 1.

4. Empirical Results

We begin with simple descriptive statistics of the underlying variables (C and G) for article quality and (H, A and O) for journal quality.

Table 3: Summary Statistics of Raw Variables

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max
C	21351	0.63	0.0	1.85	0	79.5
G	21351	14.17	9.0	17.97	0	497
H	1006	5.39	4.0	5.03	0	56
A	1006	27.51	21.0	23.05	0	180
O	1006	0.91	1	0.28	0	1

Citation (C)

We categorize C (Citations) into 6 categories in ascending order and present a cross-tabulation of citation categories (*cit_cat*) according to disciplines.

The overall as well as the discipline-wise distribution of citations appear to be highly skewed at the bottom end. In fact, as shown in Table 4, 61% of all articles have 0 citations and 85% have less than one average citation per year. It is of little surprise, therefore, that quality indices based solely on citations will invariably push Indian research outputs out of the quality domain.

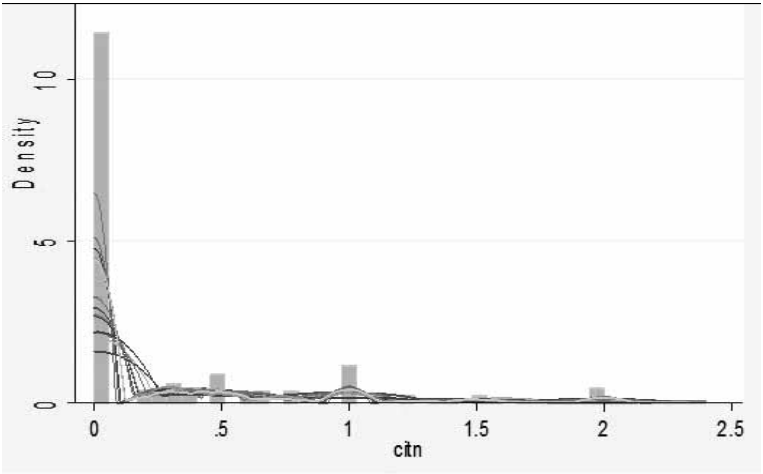
We further perform a one-way analysis of variance to test whether there is significant intergroup variation in citations and reject the null hypothesis of equal variance (see Table A1). In other words, each

discipline has a distinct distribution of citation. This comes out clearly from the following diagram depicting the discipline wise density functions.

Table 4: Distribution of *cit_cat* according to disciplines

Discipline Code		C=0	0<C≤1	1<C≤2	2<C≤3	3<C≤4	C>4	Total
10 (SOC)	Freq	1,434	678	186	73	33	56	2,460
	%	58.29	27.56	7.56	2.97	1.34	2.28	100.00
11 (POL)	Freq	1,279	387	92	37	22	19	1,836
	%	69.66	21.08	5.01	2.02	1.20	1.03	100.00
12 (ECO)	Freq	5,778	2,275	648	310	161	329	9,501
	%	60.81	23.94	6.82	3.26	1.69	3.46	100.00
13 (IS)	Freq	916	435	116	53	15	42	1,577
	%	58.08	27.58	7.36	3.36	0.95	2.66	100.00
14 (G&D)	Freq	812	288	127	64	41	49	1,381
	%	58.80	20.85	9.20	4.63	2.97	3.55	100.00
15 (PSY)	Freq	219	108	33	14	6	26	406
	%	53.94	26.60	8.13	3.45	1.48	6.40	100.00
16 (EDU)	Freq	638	350	134	45	25	42	1,234
	%	51.70	28.36	10.86	3.65	2.03	3.40	100.00
17 (LAW)	Freq	361	186	52	29	5	14	647
	%	55.80	28.75	8.04	4.48	0.77	2.16	100.00
18 (STR)	Freq	239	63	15	6	1	3	327
	%	73.09	19.27	4.59	1.83	0.31	0.92	100.00
19 (HIS)	Freq	254	111	18	9	0	4	396
	%	64.14	28.03	4.55	2.27	0.00	1.01	100.00
20 (R&P)	Freq	204	67	10	5	4	3	293
	%	69.62	22.87	3.41	1.71	1.37	1.02	100.00
99 (OTH)	Freq	867	279	76	35	14	22	1,293
	%	67.05	21.58	5.88	2.71	1.08	1.70	100.00
TOTAL	Freq	13,001	5,227	1,507	680	327	609	21,351
	%	60.89	24.48	7.06	3.18	1.53	2.85	100.00

Figure 1: Discipline-wise distribution of Citations



To further confirm this discipline-wise difference, we compare the mean and variance of citations for each discipline with the grand mean and grand variance for the entire data. We find that means of all disciplines, with the exception of international studies (13) and law (17), are significantly different from the grand mean, and variance of all disciplines (without exceptions) are different from the grand variance. It may be interesting to note that disciplines like economics (12), social geography and population (14), social psychology (15) and education (16) have higher means compared to the grand mean while the mean citations for sociology (10), political science (11), strategic studies (18), history (19), religion and philosophy (20) are lower than the grand mean (see Table A2).

Google Hits (G)

We categorize G (Google Hits) into 5 categories in ascending order and present a cross-tabulation of hit categories (*hit_cat*) according to disciplines.

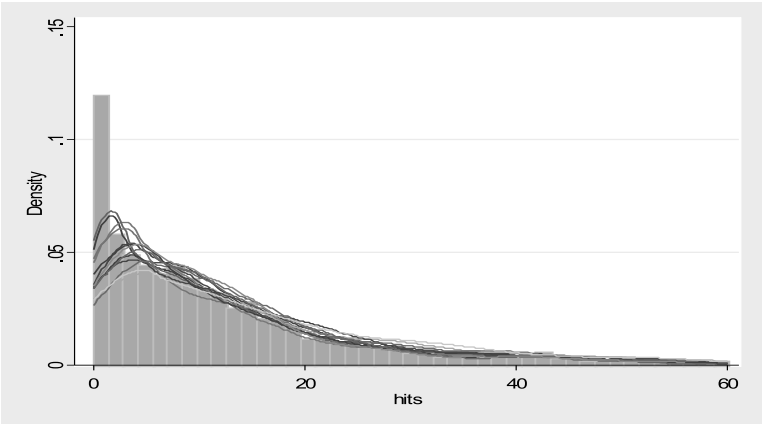
Table 5: Distribution of *hit_cat* according to disciplines

Discipline Code		G<1	1≤G<6	6≤G<12	12≤G<35	G≤35	Total
10 (SOC)	Freq	198	661	578	749	274	2,460
	%	8.05	26.87	23.50	30.45	11.14	100.00
11 (POL)	Freq	181	580	420	475	180	1,836
	%	9.86	31.59	22.88	25.87	9.80	100.00
12 (ECO)	Freq	1,425	2,452	2,060	2,683	881	9,501
	%	15.00	25.81	21.68	28.24	9.27	100.00
13 (IS)	Freq	149	353	411	495	169	1,577
	%	9.45	22.38	26.06	31.39	10.72	100.00
14 (G&D)	Freq	203	391	256	406	125	1,381
	%	14.70	28.31	18.54	29.40	9.05	100.00
15 (PSY)	Freq	48	81	89	133	55	406
	%	11.82	19.95	21.92	32.76	13.55	100.00
16 (EDU)	Freq	117	296	277	408	136	1,234
	%	9.48	23.99	22.45	33.06	11.02	100.00
17 (LAW)	Freq	50	133	160	224	80	647
	%	7.73	20.56	24.73	34.62	12.36	100.00
18 (STR)	Freq	42	98	69	93	25	327
	%	12.84	29.97	21.10	28.44	7.65	100.00
19 (HIS)	Freq	34	103	98	128	33	396
	%	8.59	26.01	24.75	32.32	8.33	100.00
20 (R&P)	Freq	24	88	69	92	20	293
	%	8.19	30.03	23.55	31.40	6.83	100.00
99 (OTH)	Freq	108	270	265	469	181	1,293
	%	8.35	20.88	20.49	36.27	14.00	100.00
TOTAL	Freq	2,579	5,506	4,752	6,355	2,159	21,351
	%	12.08	25.79	22.26	29.76	10.11	100.00

The distributions of Google Hits (overall and discipline-wise) do not appear to be as skewed as the distributions of citations. Here only 12% have 0 hits and 38% have less than 1 hit per year (Table 5). This clearly shows that the two parameters (C and G) capture two distinct dimensions of user perception of quality and we believe both are equally important, especially in the context of social science research in India. The partial correlation coefficient between C and G is as low as 0.2, but it is statistically significantly different from 0. This means that the two parameters are not strictly speaking independent, but they are not entirely responsive to each other.

Again, we perform a one-way analysis of variance to test whether there is significant inter-group variation in citations and reject the null hypothesis of equal variance (see Table A3). In other words, each discipline has a distinct distribution of citation. This comes out clearly from the following diagram depicting the discipline wise density functions.

Figure 2: Discipline-wise distribution of Hits



To further confirm this discipline-wise difference, we compare the mean and variance of citations for each discipline with the grand mean and grand variance for the entire data. We find that means of all

disciplines, with the exception of history (19), are significantly different from the grand mean, and variance of all disciplines (without exceptions) are different from the grand variance. It may be interesting to note that disciplines like sociology (10) international studies (13), social psychology (15) education (16) and law (17) have higher means compared to the grand mean while the mean citations for, political science (11), economics (12), social geography and population (14), strategic studies (18) and religion and philosophy (20) are lower than the grand mean (see Table A4).

Our results from the two parameters (C and G) thus show that social psychology and education are two disciplines enjoying higher means for both citation and hits, while political science, strategic studies and religion & philosophy display lower means for both citation and hits. Note that economics and social geography have higher citations but lower hits, while it is just the reverse for sociology. These results perhaps corroborate that the two dimensions of quality capture two distinct aspects of research impact and hence the need for combining the two into a composite index of quality.

H-index:

We convert the h-index into a categorical variable and present a summary frequency distribution below.

Table 6: Distribution of Journals according to H-index

H-value	Frequency	Percent
0	45	4.47
1-2	269	26.74
3-4	236	23.46
5-7	217	21.57
8-16	209	20.78
17+	30	2.98
Total	**1,006**	**100.00**

Age:

Our dataset includes journals as old as 180 years. The mean and median ages are 27.5 and 21 respectively. As discussed above converted this variable into a categorical variable (age less than 6, between 6 and 20 and above 20).

Table 7: Distribution of Journals according to Age

Age	Frequency	Percent
0-6	128	12.72
6-20	360	35.79
20+	518	51.49
Total	**1,006**	**100.00**

Online Presence

As evident from Table 8, 91% of the journals in our data set have an online presence.

Table 8: Distribution of Journals according to Online Presence

Online	Frequency	Percent
No	88	8.75
Yes	918	91.25
Total	1,006	100.00

One immediate question that comes to our mind is whether there is indeed any relation between the vintage of a journal and its impact factor. The simple partial correlation coefficient between the two cardinal variables (*age* and *h-index*) turns out to be 0.19 (statistically significant), implying that the two are not strictly speaking un-correlated but the degree of association is rather low. We performed an ANOVA between *age_cat* and *h_cat* (Table A5) and could not reject the null hypothesis of equal variance of *h* across *age* at 5% level.

The Indices: Overall for all disciplines combined

First, we focus on the composite article index incorporating the two quality dimensions C and G, applying equal weights (*s_index_art*). By construction, this index can take values between 0 and 1. The summary results for *s_index_art* are presented in Table 9. It is evident that the overall distribution of article is highly skewed at the bottom, with nearly 99% of articles scoring less than 0.1. The top 1 percentile (215 articles) appears to be the game changer in article quality with the score shooting up to 0.5. But even within this top percentile, only 4 articles score above 0.4 and 9 above 0.3 and 25 above 0.2. We also note once again that the two dimensions of quality (citations and hits) are not very highly correlated – the partial correlation coefficient of between the scaled values of C and G is only 0.215.

Table 9: Summary of *sindex_art*

Percentiles	Values		
1%	0	Observations	21351
5%	0	Sum of Wgt.	21351
10%	0.0006707	Mean	0.0182534
25%	0.0035211	Std. Dev.	0.0235258
50%	0.0110664	Variance	0.0005535
75%	0.024398	Skewness	4.334293
90%	0.0440157	Kurtosis	46.30575
95%	0.0600521	Smallest	0
99%	0.1041342	Largest	0.5070422

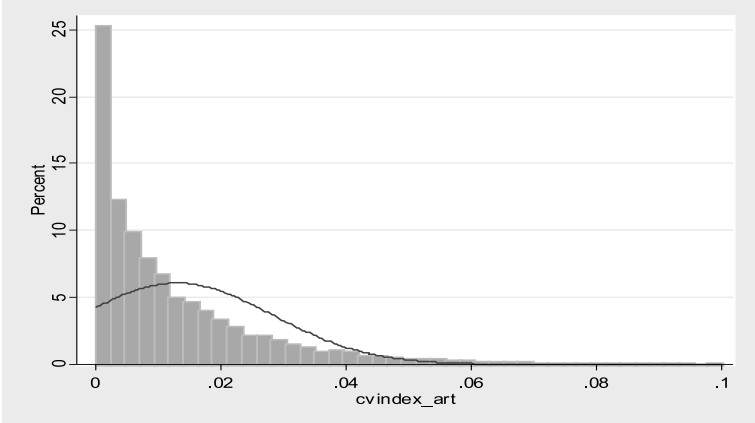
Given that the simple index places equal importance to both C and G, irrespective of their variance, we focus on the CV weighted index (*cv_index_art*), which also ranges between 0 and 1 by construction. The summary results for *cv_index_art* are presented in Table 10 and its distribution is represented in Figure 3. *This is even more skewed at the bottom with 99% articling scoring less 0.09.* For the top percentile (215

articles), the score shoots up to 0.7 but even here only 27 articles score above 0.2 and only 3 articles have scores above 0.5.

Table 10: Summary of *cvndex_art*

Percentiles			
1%	0	Observations	21351
5%	0	Sum of Wgt.	21351
10%	0.0004064	Mean	0.0142073
25%	0.0023165	Std. Dev.	0.0214575
50%	0.0077725	Variance	0.0004604
75%	0.0184049	Skewness	7.003815
90%	0.0341382	Kurtosis	124.0919
95%	0.0473926	Smallest	0
99%	0.0942026	Largest	0.7012905

Figure 3: Distribution of *cv_index_art*



As explained above, we now attempt to condition the article quality by an index of the quality of the journal in which it is published. The need for this conditioning is eminently clear if one takes a look the cross-tabulation of articles in different disciplines according to the categories of h-index described earlier. This is presented in Table 11.

It shows that articles pertaining to different disciplines are published in journals with very different distributions of h-index. We performed the mean and variance tests as before to confirm this observation.

Table 11: Cross Tabulation of Disciplines and H-index values

Discipline Code		h=0	h=1, 2	h=3,4	h=5-7	h=8-16	he≥17	Total
10 (SOC)	Freq	106	754	486	309	787	18	2,460
	%	4.31	30.65	19.76	12.56	31.99	0.73	100
11 (POL)	Freq	19	577	287	142	806	5	1,836
	%	1.03	31.43	15.63	7.73	43.9	0.27	100
12 (ECO)	Freq	171	2,301	2,394	2,214	2,360	61	9,501
	%	1.8	24.22	25.2	23.3	24.84	0.64	100
13 (IS)	Freq	40	488	290	279	471	9	1,577
	%	2.54	30.94	18.39	17.69	29.87	0.57	100
14 (G&D)	Freq	64	463	204	212	417	21	1,381
	%	4.63	33.53	14.77	15.35	30.2	1.52	100
15 (PSY)	Freq	9	93	111	103	82	8	406
	%	2.22	22.91	27.34	25.37	20.2	1.97	100
16 (EDU)	Freq	18	501	317	148	237	13	1,234
	%	1.46	40.6	25.69	11.99	19.21	1.05	100
17 (LAW)	Freq	1	129	83	220	214	0	647
	%	0.15	19.94	12.83	34	33.08	0	100
18 (STR)	Freq	3	81	74	56	113	0	327
	%	0.92	24.77	22.63	17.13	34.56	0	100
19 (HIS)	Freq	4	187	63	59	76	7	396
	%	1.01	47.22	15.91	14.9	19.19	1.77	100
20 (R&P)	Freq	13	130	65	15	69	1	293
	%	4.44	44.37	22.18	5.12	23.55	0.34	100
99 (OTH)	Freq	24	269	224	142	627	7	1,293
	%	1.86	20.8	17.32	10.98	48.49	0.54	100
TOTAL	Freq	472	5,973	4,598	3,899	6,259	150	21,351
	%	2.21	27.98	21.54	18.26	29.31	0.7	100

The three dimensions of journal quality (H, A and O) are aggregated into a CV weighted journal index (*cv_index_jrnl*) and its scores for each journal is assigned to all articles published in that journal. The distribution of the *cv_index_jrnl* scores are presented in Table A6. Interestingly, the partial correlation coefficient between *cv_index_art* and *cv_index_jrnl* turns out to be 0.22 and it is statistically significantly different from 0. This means, while the two dimensions of quality (user's perspective and producer's perspective) are not independent but their degree of association is somewhat low and it vindicates our presumption that articles of the same quality may end up in varying qualities of journals.

Finally we arrive at the combined quality index for all articles conditioned for journal quality:

$$comb\_index = \frac{(cv\_index\_art)}{1-(cv\_index\_jrnl)}$$

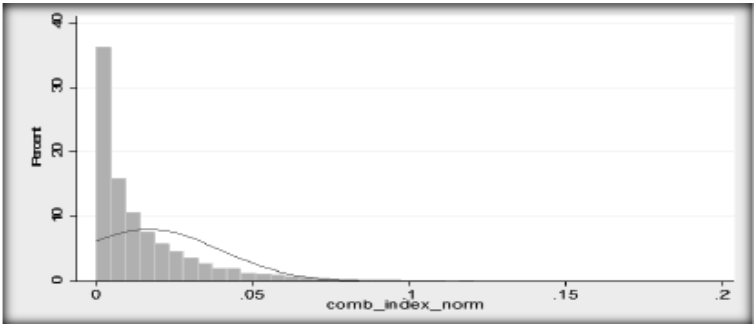
As discussed earlier, the maximum value of the above index could be infinity and hence, we resort to unitary scaling as before (***CDS_Index***). The results for the *CDS_Index* are presented in Table 12 and Figure 4 presents the distribution. It is encouraging to note that over 90% of all articles record a positive quality index score, which implies that they contribute to further research and/ or public discourse. Nevertheless,

Table 12: Summary of *CDS_Index*

Percentiles	Values		
1%	0	Observations	21351
5%	0	Sum of Wgt.	21351
10%	0.0003798	Mean	0.0185251
25%	0.0022701	Std. Dev.	0.0346282
50%	0.008584	Variance	0.0011991
75%	0.0224306	Skewness	8.566204
90%	0.0445285	Kurtosis	137.2314
95%	0.0638337	Smallest	0
99%	0.1432905	Largest	1

nearly 99% of articles still score less than 0.14. Among the top percentile of articles (215), 53 articles score above 0.3, 12 above 0.5 and 3 above 0.8.

Figure 4: Distribution of *CDS_Index*



The Indices according to disciplines

One possible source of such a high skewed quality distribution could be linked to the fact that an overall index is constructed pooling all disciplines together and using a common benchmark across all disciplines. We, therefore, felt that it may be worthwhile calculating the same index separately for each of the 12 disciplines. Naturally, the benchmark used for calculating the index will now vary discipline-wise. Table 13 gives a summary of distributional characteristics of the *CDS_Index* across each discipline.

The scenario improves considerably compared to the aggregate one. It is evident from Table 13 that the discipline-wise means (varying between 0.02 – 0.088) are strictly better than the mean of the aggregate distribution (0.018). The same holds for the median as well. The medians for the discipline-wise distributions lie between 0.008 and 0.049 as against aggregate median of 0.008. The low aggregate median marker is driven by the predominance of economics (ECO) with a low median marker of 0.008. All other disciplines have higher median values. Likewise, the P99 marker seems to be substantially improved for all

Table 13: Summary of *CDS_Index* across Disciplines

	Summary of CDS_Index							
Discipline Code	Mean	P25	Median	P75	P99	SD	Skewness	Kurtosis
10 (SOC)	0.0247	0.0029	0.0107	0.0294	0.1928	0.0481	8.503	124.374
11 (POL)	0.0254	0.0020	0.0091	0.0299	0.1974	0.0525	8.329	116.340
12 (ECO)	0.0204	0.0019	0.0080	0.0229	0.1905	0.0426	8.035	109.584
13(IS)	0.0331	0.0060	0.0170	0.0386	0.2334	0.0590	7.560	94.635
14 (G&D)	0.0269	0.0025	0.0105	0.0317	0.2407	0.0571	8.712	116.587
15 (PSY)	0.0537	0.0093	0.0281	0.0624	0.4237	0.0920	5.364	44.116
16 (EDU)	0.0383	0.0061	0.0236	0.0510	0.1974	0.0558	6.889	91.351
17 (LAW)	0.0880	0.0158	0.0499	0.1119	0.6447	0.1203	3.275	18.238
18 (STR)	0.0848	0.0093	0.0429	0.1130	0.5220	0.1184	3.216	18.679
19 (HIS)	0.0455	0.0077	0.0255	0.0554	0.3557	0.0777	6.728	69.084
20 (R&P)	0.0766	0.0112	0.0376	0.0925	0.6492	0.1173	3.685	21.462
99 (OTH)	0.0467	0.0085	0.0261	0.0629	0.2831	0.0651	5.030	51.607

disciplines (0.19-0.64) compared to that of the aggregate distribution (0.09). One more observation is worth mentioning at this point. There is little variation in the mean or the median markers in the distributions of the quality index across disciplines. However, the variation becomes more prominent as we move beyond the median towards the upper end of the distributions, especially at the 99th percentile (P99). The difference between the maximum and minimum median values is 0.04 while the difference is 0.46 for the P99 marker. In other words, the discipline-wise divergence in quality occurs essentially at the higher end. Purely in terms of the P99 quality marker, the ranking of disciplines are as follows:

1. Religion and Philosophy (R&P), Law (LAW)
2. Strategic Studies (STR)
3. Social Psychology (PSY)
4. History (HIS)
5. Social Geography, Population (G&D), International Studies (IS)
6. Sociology (SOC), Political Science (POL), Economics (ECO), Education (EDU)

Skewness of the aggregate distribution was yet another major concern. The picture that emerges from the discipline-wise indices indicates that G&D is the only discipline which is more skewed (8.712) than the aggregate distribution (8.566). SOC, POL and ECO also have high skewness levels (8.035-8.503) almost comparable with that of the aggregate distribution. All other disciplines appear to be much less skewed especially LAW, STR and R&P (3.2–3.7). Taking a look at the discipline wise article index (*cv_index_art*) in Table 14, we further observe that skewness of the quality distribution is augmented by journal quality. However, this augmentation is not uniform across all the disciplines. SOC, POL, IS and EDU exhibit major jumps in skewness level, ECO, G&D and PSY show minor jumps while the rest do not exhibit any jump at all when the article quality is conditioned for the journal quality.

Table 14: Summary of *cv_index_art* across Disciplines

	Summary of CV Index – Article							
Discipline Code	Mean	P25	Median	P75	P99	SD	Skewness	Kurtosis
10 (SOC)	0.0365	0.0058	0.0184	0.0468	0.2565	0.0535	4.367	35.882
11 (POL)	0.0278	0.0031	0.0110	0.0340	0.2217	0.0496	6.199	66.548
12 (ECO)	0.0159	0.0019	0.0075	0.0193	0.1268	0.0276	7.333	112.773
13(IS)	0.0398	0.0086	0.0227	0.0495	0.3005	0.0581	4.663	38.169
14 (G&D)	0.0224	0.0028	0.0117	0.0309	0.1428	0.0351	7.763	125.570
15 (PSY)	0.0474	0.0104	0.0284	0.0630	0.2681	0.0617	4.352	37.325
16 (EDU)	0.0732	0.0140	0.0519	0.1048	0.3873	0.0833	3.041	21.783
17 (LAW)	0.0739	0.0138	0.0452	0.0965	0.4963	0.0934	2.970	15.373
18 (STR)	0.0736	0.0103	0.0415	0.0996	0.3945	0.0954	2.838	15.417
19 (HIS)	0.0408	0.0087	0.0270	0.0533	0.2644	0.0578	6.009	62.312
20 (R&P)	0.0858	0.0179	0.0465	0.1115	0.6142	0.1159	3.172	16.115
99 (OTH)	0.0619	0.0134	0.0375	0.0829	0.3593	0.0753	3.080	18.880

The Top 1% Articles

Quality of research is a complex issue that can only be understood within a comprehensive framework linking it to the institutional affiliation, its infrastructure, resources and funding, nature of collaborative networks, as well as disciplinary focus. Unfortunately, given the limited time and resources, such a comprehensive exercise of research quality was outside the scope of the present study. However, given that the top 1% appears to play a key role in driving the quality of social science research in India, we decided to take a closer look at the top percentile of articles based on their quality score (*CDS_Index)* to understand the profile of top quality articles in terms of collaboration – national and international, affiliation and discipline (information that was readily available in our data base). We had to drop 15 of these articles from our analysis due to incomplete information about their author affiliations and hence we look at a list of 200 articles in this top quality bracket. The mean, median and the standard deviation of the *CDS_Index* scores of these 200 articles are 0.26, 0.22 and 0.14 respectively.

Table 15: Distribution of Number of Authors in the Top Percentile

Percentiles	Values		
1%	1	Observations	200
5%	1	Sum of Wgt.	200
10%	1	Mean	3.185
25%	2	Std. Dev.	2.673295
50%	2	Variance	7.146508
75%	4	Skewness	3.291501
90%	6	Kurtosis	20.17396
95%	7	Smallest	1
99%	14	Largest	23

First, we look at the number of authors for each article as an indicator of collaborative endeavour in social science research in India. Table 15 presents the distribution of this variable, reflecting a median value of 2 and a mean value of 3.1.

Any article with more than one author indicates collaboration and accordingly we construct a binary variable *collab* that takes the value 0 if the number of author is one and 1 otherwise. As evident from Table 16, 77.5% articles of the top quality percentile are collaborative in nature. From this result, one may be tempted to conclude that collaboration augments quality. However, that requires further enquiry. The mean score for the two categories (sole and collaborative) are 0.25 and 0.27 respectively but they are not statistically significantly different from each other (Table A7).

Table 16: Frequency Distribution of collaborative research

Collaboration	Frequency	Percent
No	45	22.5
Yes	155	77.5
Total	200	100

However, collaboration can be either national or international. This information was extracted from the author affiliation details and we categorized all articles into two categories – Indian (when all authors have Indian affiliation) and Mixed (when at least one author has a foreign affiliation)[9]. We find that 48.5% of the top articles have author(s) with Indian affiliation, while 51.5% have at least one author with foreign affiliation. Table 17 presents a cross-tabulation between collaboration and affiliation and indicates that two thirds of all collaborative articles have foreign collaborators while remaining one-third are collaborations within India. The mean quality scores of these two collaborative categories (Indian and Mixed) are 0.22 and 0.29 respectively and this difference is

9 Foreign affiliation does not necessarily imply foreign nationality.

statistically significant (Table A8). This shows that international collaboration perhaps produces higher quality research output compared to national collaboration.

Table 17: Cross Tabulation between Country Affiliation and Collaboration

Country Affiliation		No Collaboration	Collaboration	Total
Indian	Frequency	45	52	97
	%	100	33.55	48.5
mixed	Frequency	0	103	103
	%	0	66.45	51.5
Total	Frequency	45	155	200
	%	100	100	100

Finally, we look at the disciple-wise distribution of the top 200 articles to find out if all disciplines have uniform presence in the top quality bracket.

Table 18: Relative Presence of Disciplines in Top Percentile

Discipline Code	Relative Presence
10 (SOC)	0.781250
11 (POL)	0.406977
12 (ECO)	1.337079
13 (IS)	0.541272
14 (G&D)	1.545595
15 (PSY)	2.894737
16 (EDU)	0.692042
17 (LAW)	0.165017
19 (HIS)	0.810811
99 (OTH)	0.412541

In Table 18, we calculate an index of relative presence defined as the share of the relative frequencies of each discipline in the top percentile vis-a-vis that in the entire sample – the value of this index of relative presence will be greater/equal/less than one if the discipline has more than, equi- or less than proportionate presence in the top bracket. Accordingly, we find that economics, social geography and social psychology have more than proportionate presence in the top bracket, while the rest has less than proportionate presence. It may be noted that strategic studies and religion-philosophy do not have any presence in the top quality bracket.

Tables 19 and 20 present discipline-wise cross-tabulations for collaborations and country affiliation. With the exception of political science, law and history, collaborations dominate all other disciplines compared to sole authorship in the top quality percentile. For the collaborative articles, foreign collaborations are more common for all disciplines in the top quality bracket.

Table 19: Discipline-wise Cross Tabulation for Collaboration

Discipline Code		No Collaboration	Collaboration	Total
10 (SOC)	Freq	4	14	18
	%	22.22	77.78	100
11 (POL)	Freq	4	3	7
	%	57.14	42.86	100
12 (ECO)	Freq	24	95	119
	%	20.17	79.83	100
13 (IS)	Freq	3	5	8
	%	37.5	62.5	100
14 (G&D)	Freq	2	18	20
	%	10	90	100
15 (PSY)	Freq	2	9	11
	%	18.18	81.82	100

Cont'd.....

Discipline Code		No Collaboration	Collaboration	Total
16 (EDU)	Freq	2	6	8
	%	25	75	100
17 (LAW)	Freq	1	0	1
	%	100	0	100
19 (HIS)	Freq	2	1	3
	%	66.67	33.33	100
99 (OTH)	Freq	1	4	5
	%	20	80	100
TOTAL	Freq	45	155	200
	%	22.5	77.5	100

Table 20: Discipline-wise Cross Tabulation for Country Affiliation

Discipline Code		Indian	mixed	Total
10 (SOC)	Freq	5	9	14
	%	35.71	64.29	100
11 (POL)	Freq	1	2	3
	%	33.33	66.67	100
12 (ECO)	Freq	36	59	95
	%	37.89	62.11	100
13 (IS)	Freq	0	5	5
	%	0	100	100
14 (G&D)	Freq	5	13	18
	%	27.78	72.22	100
15 (PSY)	Freq	2	7	9
	%	22.22	77.78	100
16 (EDU)	Freq	3	3	6
	%	50	50	100
19 (HIS)	Freq	0	1	1
	%	0	100	100
99 (OTH)	Freq	0	4	4
	%	0	100	100
Total	Freq	52	103	155
	%	33.55	66.45	100

Finally, we looked the profile of institutions that feature in the top percentile of social science articles (Table 21). While it is encouraging to note that a wide range of institutions feature in this club, the major concentration is among Central Universities and institutions of national importance accounting for nearly one third of the top 1% articles. Both these categories are well funded for their research activities and hence one finds an immediate relationship between research funding and quality of research.

Table 21: Institutions in top 1% articles

Type of institution	Frequency in top 1%
Central University	35
IIM/IIT/ISI/IISc	31
ICSSR	16
NGO/ Trust	16
Research Institute	13
Private Management Institute	14
Private University	12
Medical College	9
Deemed University	8
International Organisations (India office)	5
RBI	5
State University	5
Others	7
Total	177

5. Summary and Conclusion

In this paper, we have been able to develop a precise and relevant measure (**CDS_Index**) of quality of social science research in India, capturing multiple dimensions that are particularly important in the Indian/social science context. The index satisfies desirable properties

of scale neutrality and comparability across time and space and it accounts for distributional variances of the underlying parameters. It is easily computable with available data and replicable for all types of social science research. We calculated this index for 21351 journal articles in social sciences published by scholars in India during the past five years (2010-2014) and the results provide fascinating insights on the quality of social science research in India.

Each of the dimensions of quality that we have incorporated to arrive at our composite index (***CDS_Index)*** reflects distinct characterisation of quality. While Scholarly citation (*C*) is very highly skewed at the bottom with 61% of all articles with no citations and 85% with less than one average citation per year, it hardly surprising that Indian social science research outputs get pushed out of the quality domain in terms of citation-based global indices of quality. Readership reflected in Google Hits (*H*), on the other hand, is much less skewed with only 12% with no hits and 38% with less than 1 hit per year. India's social science research contributes more to public debates and policy formulations than to pushing the frontiers of knowledge for further research. This is in line with a common academic perception that India's contribution to the global theoretical frontiers of knowledge, perhaps in all fields, is not commensurate with the rich pool of academic talent that exists in the country.

We also find that the distributions of *C* and *G* across different disciplines are very different from each other. Economics and social geography/demography enjoy higher scholarly citations but lower general readership (Google hits), while it is the reverse for sociology. One wonders whether the nature of the disciplines dictates this divergence in the type of contribution of their research outputs! For one thing, the results vindicate the position that the two parameters of quality (*C* and *G*) capture distinct dimensions of research impact (contribution to knowledge and contribution to public discourse and policy making)

and both must be combined to arrive at a meaningful composite index. Our results further show that social psychology and education are two disciplines enjoying higher means for both citation and hits, while political science, strategic studies and religion & philosophy display lower means for both citation and hits.

Turning to quality of journals, again our results confirm that articles pertaining to different disciplines are published in journals with very different distributions of *h-index*. Accordingly, it is important to arrive at the final quality index (*CDS_Index*) by conditioning the composite article index for the quality of journal in which it is published. It is encouraging to note that over 90% of all articles record a positive quality index score, which implies that they contribute to further research and/ or public discourse. Nevertheless, nearly 99% of articles still score less than 0.14. Among the top percentile of articles (215), 53 articles score above 0.3, 12 above 0.5 and 3 above 0.8.

The scenario improves considerably when we construct the quality index separately for each discipline rather than using a common benchmark for all articles across all disciplines. Discipline wise quality indices show higher mean and median quality values compared to the aggregate picture. Also the 99^{th} percentile marker seems to be significantly higher for all disciplines. With respect to the high degree of skewness that emerged from the aggregate distribution, discipline wise indices show that only four disciplines display high degree of skewness comparable to the overall distribution, but all other disciplines are much less skewed in their quality distribution. We further observe that for some of the disciplines, skewness is augmented by the highly skewed distribution of journal quality.

Finally, a closer look at the top quality percentile of articles reveals interesting insights. First of all, not all disciplines are uniformly represented in the top bracket. We find that economics, social geography and social psychology have more than proportionate presence in the

top bracket, while the rest has less than proportionate presence. It may be noted that strategic studies and religion-philosophy do not have any presence at all in the top quality bracket.

It is also noteworthy that 77.5% of the top quality articles are co-authored and two-thirds of these co-authored articles include at least one foreign collaborator, while the remaining one-third have Indian collaborators only. Our results from the top quality percentile of articles confirm that international collaborations result in higher quality (in terms of the *CDS_Index*) compared to national collaborations. Looking at discipline-wise break up of collaborations at the top quality bracket, we find that foreign collaborations dominate national collaborations in all disciplines at the top percentile. In fact, with the exception of political science, law and history, all other disciplines have more collaborative (jointly authored) than single authored papers in the top quality bracket.

Finally, looking at the institutional profile, it is encouraging to note that a wide range of institutions feature in this club of top 1% articles. But the major concentration is among Central Universities and institutions of national importance accounting for nearly one third of the top 1% articles. It may be noted that both these categories are well funded for their research activities and hence one finds an immediate relationship between research funding and quality of research.

Although, it may be a difficult proposition to provide concrete policy suggestions for augmenting the quality of social science research in India, our paper does signal towards two policy directions. First, it is absolutely essential to increase research funding for social sciences to improve its quality. The well funded institutions are the ones featuring at the top end of the quality spectrum. Secondly, there should be a concerted effort to encourage collaborations, especially international collaborations, in social science research in India. In fact, interestingly, the world over, research funding agencies (both government and non-

government) are encouraging collaborative research.[10] The probability of attracting research funds in the UK and in Europe apparently increases many-fold, if there is a foreign collaborator involved, especially from emerging/ developing countries. We should be able to institutionalise a mechanism to encourage and promote such collaborative research, which we believe will go a long way in augmenting the quality of social science research in India as shown by our results.

The authors are all faculty members of the Centre. This team was constituted to conduct the ICSSR funded project on "Quality of Social Science Research in India". This paper is an outcome of the research project. The authors may be contacted at their email ids

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10 Hudson (1996) finds a rising trend in collaborative research in Economics, considering eight leading (top) journals in the field.

APPENDIX

Table A1: ANOVA citation across discipline

Source	SS	df	MS	F	Prob> F
Between groups	420.126149	11	38.1932862	11.2	0.0000
Within groups	72797.126	21339	3.41145911		
Total	73217.2522	21350	3.42937949		
Bartlett's test for equal variances: chi2(11) = 3.8e+03 Prob>chi2 = 0.000					

Table A2: Discipline-wise mean comparison with grand mean (*citn*)

							H0: mean=0.63484		
							H1: mean< 0.63484	H1:mean!= 0.63484	H1: mean> 0.63484
Code	Obs	Mean	Std. Err.	Std. Dev.	95% Conf. Intvl.		Pr(T < t)	Pr(|T| >|t|)	Pr(T>t)
10	2460	0.5638	0.0260	1.2898	0.5128	0.6148	0.0032	0.0064	0.9968
11	1836	0.3870	0.0264	1.1323	0.3351	0.4388	0.0000	0.0000	1.0000
12	9501	0.7062	0.0218	2.1271	0.6634	0.7490	0.9995	0.0011	0.0005
13	1577	0.6110	0.0394	1.5641	0.5337	0.6882	0.2723	0.5445	0.7277
14	1381	0.8358	0.0743	2.7615	0.6901	0.9816	0.9965	0.0069	0.0035
15	406	0.9227	0.1260	2.5385	0.6750	1.1703	0.9886	0.0229	0.0114
16	1234	0.7615	0.0437	1.5337	0.6758	0.8472	0.9981	0.0038	0.0019
17	647	0.6038	0.0480	1.2202	0.5096	0.6980	0.2588	0.5176	0.7412
18	327	0.2898	0.0412	0.7443	0.2088	0.3708	0.0000	0.0000	1.0000
19	396	0.3876	0.0632	1.2572	0.2634	0.5118	0.0001	0.0001	0.9999
20	293	0.3227	0.0467	0.8000	0.2307	0.4147	0.0000	0.0000	1.0000
99	1293	0.4501	0.0303	1.0879	0.3908	0.5095	0.0000	0.0000	1.0000

Table A3: ANOVA Hits across Disciplines

Source	SS	df	MS	F	Prob>F
Between groups	38528.9128	11	3502.62844	10.9	0.0000
Within groups	6858395.96	21339	321.401938		
Total	6896924.87	21350	323.040978		
Bartlett's test for equal variances: chi2(11) = 186.9501 Prob>chi2 = 0.000					

Table A4: Discipline-wise mean comparison with grand mean (*hits*)

							H0: mean=14.17509		
							H1: mean< 14.17509	H1:mean!= 14.17509	H1: mean> 14.17509
Code	Obs	Mean	Std. Err.	Std. Dev.	95% Conf. Intvl.		Pr(T < t)	Pr(|T| >|t|)	Pr(T>t)
10	2460	14.9475	0.3623	17.9672	14.2372	15.6579	0.9835	0.0331	0.0165
11	1836	13.3661	0.4078	17.4722	12.5663	14.1658	0.0237	0.0474	0.9763
12	9501	13.3560	0.1853	18.0602	12.9928	13.7192	0.0000	0.0000	1.0000
13	1577	15.4348	0.4987	19.8034	14.4567	16.4130	0.9942	0.0116	0.0058
14	1381	13.2271	0.4737	17.6029	12.2978	14.1563	0.0228	0.0455	0.9772
15	406	16.6132	0.9414	18.9691	14.7625	18.4639	0.9950	0.0099	0.0050
16	1234	15.3616	0.4759	16.7160	14.4280	16.2951	0.9936	0.0128	0.0064
17	647	16.1255	0.7016	17.8453	14.7479	17.5031	0.9972	0.0056	0.0028
18	327	11.8869	0.7326	13.2475	10.4457	13.3281	0.0010	0.0019	0.9990
19	396	13.7521	0.8055	16.0287	12.1685	15.3356	0.2999	0.5997	0.7001
20	293	11.9663	0.7107	12.1656	10.5675	13.3651	0.0010	0.0021	0.9990
99	1293	17.6838	0.5260	18.9145	16.6518	18.7157	1.0000	0.0000	0.0000

Table A5: ANOVA h-index (*h_cat*) across journal age (*age_cat*)

Source	SS	df	MS	F	Prob>F
Between groups	131.341247	2	65.6706236	43.69	0.0000
Within groups	1507.5017	1003	1.50299272		
Total	1638.84294	1005	1.63068949		
Bartlett's test for equal variances: chi2(2) = 5.1653 Prob>chi2 = 0.076					

Table A6: Summary of *cvindex_jrnl*

Percentiles			
1%	0.0169628	Observations	21351
5%	0.1756332	Sum of Wgt.	21351
10%	0.241626	Mean	0.4641372
25%	0.3512664	Std. Dev.	0.1612639
50%	0.5335225	Variance	0.026006
75%	0.6098552	Skewness	-0.7065564
90%	0.6352994	Kurtosis	2.867797
95%	0.6352994	Smallest	0
99%	0.6607437	Largest	0.99

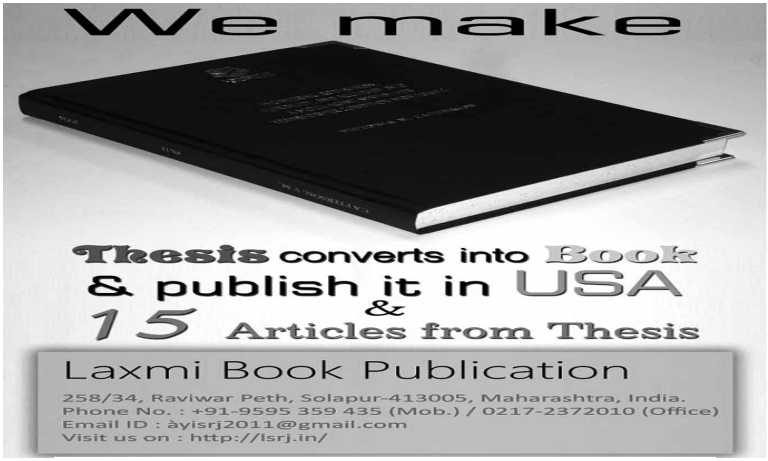
Table A7: Mean Comparison of *CDS_Index* across *collab*

Group	Observation	Mean	Std. Error	SD	95% Conf. Interval	
0	45	0.24782	0.0157874	0.105905	0.216002	0.279637
1	155	0.268652	0.0120003	0.149403	0.244945	0.292358
combined	200	0.263964	0.0099573	0.140818	0.244329	0.2836
Diff		-0.02083	0.0198305		-0.06018	0.018511
H0: diff = 0						
H1: diff<0		H1: diff‘≠ 0			H1: diff>0	
Pr(T < t) = 0.1480		Pr(|T| > |t|) = 0.2960			Pr(T > t) = 0.8520	

Table A8: Mean Comparison of *CDS_Index* for Country Affiliation

Group	Observation	Mean	Std. Error	SD	95% Conf. Interval	
Indian	52	0.220035	0.01122	0.080908	0.19751	0.24256
Mixed	103	0.293196	0.016668	0.169157	0.260136	0.326256
combined	155	0.268652	0.012	0.149403	0.244945	0.292358
Diff		-0.07316	0.020092		-0.11286	-0.03347
H0: diff = 0						
H1: diff<0		H1: diff≠0			H1: diff>0	
Pr(T < t) = 0.0002		Pr(|T| > |t|) = 0.0004			Pr(T > t) = 0.9998	

Figure A1: Advertisement for paid publications



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