JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Citation Analysis of Ph. D. Thesis in Economics Submitted to London School of Economics and Political Science

Dr. Muneshwar Bhimabai Subhash*, Dr. Khaparde Vaishali S**

Author's Affiliation:

*Librarian in Modern College of Computer Science and Information Technology, Aurangabad, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra 431004, India E-mail: bhimabaimuneshwar123@gmail.com

** Senior Professor Dept. of Library & Information Science, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra 431004, India.
Email: khapardevaishali@gmail.com

Corresponding Author: Khaparde Vaishali S, Senior Professor Dept. of Library & Information Science, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra 431004, India.E-mail: khapardevaishali@gmail.com

Abstract:

The present study is based on 31,123 citations appended at the end of 254 Ph.D. theses on Economics, submitted to The London School of Economics and Political Science (LSE). London. During 1909 to 2018 on Citation analysis is worthwhile area of research. A study on 110 Year data it can also observed that, the majority of the theses were submitted in the year 2012 that is 29. Journals contributed the maximum number of citations, accounted 17,511 (56.26%) of the total citations. This indicates that Journals are the most preferred form of information used by researchers in Economics, the oldest documents published as in 1614 have been cited, the authorship patterns of citation are arranged Lotka's law of scientific productivity. From the authorship dataset given below, calculate the estimated and standardized number of authors using n-values obtained from inverse square root law, Least-squares method formulations and Lotka's original formulation. The attempt was made to test applicability of Bradford's law of scattering, Bradford,s law as well as Leimkuhler models both are tested to verity the scattering of literature in Economics. Language wise and country wise have been used for the data analysis.

Key words: Citation analysis, Economics, Bradford,s law, Leimkuhler models, Lotka's law.

Introduction:

Citation analysis is to evaluate and to interpret citations received by articles, authors. Institutions and other aggregate of scientific activities. It is also used as a tool for measuring communication links in sociology and science. Each of any authors cited works along with its citing authors and their papers is arranged in chronological

order, which helps the researchers to easily trace developments, since the publication of a particular article by identifying the authors and their papers related to the primary works (Kumar, 2002).

Definition Analysis:

The definition of the study of the used terms in the present study are as under:

Citation Analysis:

One of the research method used in the field of library and information science is 21 citation analysis, it is a type of in –house evaluation often used by librarians to assist in collection maintenance (Gooden, 2001). Citation analysis is the examination of the frequency, patterns and graphs of citations in articles and books. It is a tool used to identify the core references in a subject by counting the citations appended at the end of each scientific article (Deshmukh, 2011).

Economics:

1. Economics is a social science that studies how society choose to allocate its scarce resources. Which have alternative uses, to provide goods and services for present and future consumption". (Hoag, 2010).
2. According to 'Halcrow', "Economics is a scientific discipline concerned with the allocation of limited resources to satisfy unlimited wants". (Halcrow, 1981).

Thesis (Ph.D.):

Paul and Roy (1983) defined citation analysis as, "Citation is one branch of bibliometrics where the unit of analysis is a document that is being cited as a bibliographic reference or as a footnote in a citing document".

Literature Review:

The review of literature provides a direction to the proposed study. It helps to identify previous conclusions drawn in different studies in the area of interest of the researcher.

Citation analysis has become a key area of bibliometric. Citation analysis denotes the statistical and mathematical analysis of references appended at the end of documents. A citation implies relationship between a part or the whole of the cited documents and a part or the whole of the citing documents. It is one of the techniques adopted to determine the core collection of the particular subject. These techniques can be used for identifying the characteristic of a discipline such as authorship pattern, scatter of literature in different bibliographical forms, and subjects etc., (Mondal, 2011).

Analysed of the citation analysis of doctoral theses submitted to ICFAI University, Dehradun which was established under ICFAI University Act 2003. The main objective of this study is to determine the use of information sources by the research scholars of the University for completing their doctoral theses. There are a total of 23 numbers of doctoral theses awarded from the year 2012 to 2020.Among those theses thirteen theses are from social science departments and remaining ten theses belong to science departments. The study is conducted on the 8979 citations appended in these theses. Bibliographical entries illustrated at the end of the theses were collected and analyzed on several parameters like bibliographic form, authorship pattern, geographic distribution of citations, scattering of

Indian and foreign author's citations and chronological distribution of citations. The image that will come out from this study would serve as a user study of library users hence it helps the librarians to enrich library collection as per the needs of the user demand for the learning resources and in designing of user services in libraries**.** (Rounak, Roy and Modak 2021).

Scope and Limitation

The present study is based on 31,123 citations appended at the end of 254 Ph.D. theses on Economics, submitted to The London School of Economics and Political Science (LSE). London. During 1909 to 2018.

Research Methodology

The present study adopted Quantitative method. The method is very old and popularly known in Present day it is widely used. The present study entitled, "Citation Analysis of Ph. D. Thesis in Economics Submitted to London School of Economics and Political Science (LSE)". For this study 254 Ph.D. theses of Economics were chosen as a sample from the year 1909 to 2018, there are 31,123 citations appended in 254 theses. The data was collected from the bibliographical entries listed at the end of the theses, which was used by the researcher for completing the theses The citations were photocopied and from LSE Theses Online the data was collected. The analysis was done by using various parameters.

Data Collection

Data was collected from 31,123 citations appended to 254 Ph.D. theses of Economics submitted to The London School of Economics and Political Science (LSE) The citations was collected online for further Analysis.

Data Analysis

Analysis of 31,123 citations appended at the end of the 254 Ph.D. theses was done by using various parameters like, to identify the core journals, to rank the cited author, to rank the cited journal, to find out chronological distribution of citation, to find out the geographical distribution of citations, to find out the types of cited document etc.

The data was analyzed using MS-Excel, various statistical tools like Lotka's Inverse Square Root Law and Least-squares method, Bradford's Law of Scattering and Leimkuhler model was applied.

Objectives of the research

The main objectives of the present study are

- To find out Year Wise Distribution of Theses in Economics
- To study the Form wise distribution of cited literature in Economics
- To study the Chronological distribution of citations in Economics
- To estimate Authorship Pattern of Total Citations in Economics
- To find out Author productivity and the application of Lotka's Law
- To find out Ranking of Authors in Economics (Top Twenty)

- To find out the Ranking of Journals in Economics
- To study the Bradford's Law of Scattering in Economics
- To study the Application of Leimkuhler model in Economics
- To find out Language wise distribution of citations in Economics
- To study the Geographical distribution of Citations country wise in Economics

Table 1. Year Wise Distribution of Theses in Economics

Year Wise Distribution of Theses in Economics				
Sr. No.	**Submission Year**	**Available**	**Not Available**	**Total**
1	1909	1	0	1
2	1933	1	0	1
3	1952	1	0	1
4	1971	1	0	1
5	1974	1	0	1
6	1975	1	0	1
7	1977	1	0	1
8	1984	1	0	1
9	1990	1	0	1
10	1991	1	0	1
11	1992	1	0	1
12	1993	2	0	2
13	1994	1	0	1
14	1995	1	0	1
15	1996	4	0	4
16	1997	1	0	1
17	1998	6	0	6
18	1999	2	0	2
19	2001	3	0	3
20	2003	3	0	3
21	2004	7	0	7
22	2005	7	0	7
23	2006	4	0	4
24	2007	4	0	4
25	2008	9	0	9
26	2009	10	0	10
27	2010	10	0	10
28	2011	18	0	18
29	2012	29	0	29
30	2013	22	0	22
31	2014	17	0	17
32	2015	25	0	25
33	2016	15	0	15
34	2017	16	0	16
35	2018	27	0	27
Total		**254**		**254**

It is observed form the above table that, the researchers at The London School of Economics and Political Science (LSE). London submitted 254 theses in Economics during 1909 to 2018, and all 254(100%) of the theses were

available for the study, it can also observed that, the majority of the theses were submitted in the year 2012 that is 29.

Form wise distribution of cited literature in Economics

The distribution of cited literature among different forms in Economics is presented in table no. 2 A total number of 31,123 citations of 254 Ph.D. thesis are distributed in different sources as shown in table no. 2.

Table 2. Form wise distribution of cited literature in Economics

Form wise distribution of cited literature in Economics			
Sr. No.	**Name of Document**	**Total Citation**	**Percentage**
1	Journals 5	17511	56.26
2	Books	4940	15.87
3	Working paper	2236	7.18
4	Paper	1113	3.58
5	Book Chapter	977	3.14
6	Reports	645	2.07
7	Discussion papers	541	1.74
8	Handbook	419	1.35
9	Website	411	1.32
10	Technical Report	266	0.85
11	Manuscript	192	0.62
12	Review	171	0.55
13	Magazine	115	0.37
14	Conference	107	0.34
15	Chapter	96	0.31
16	Proceedings	93	0.30
17	Ph.D thesis	87	0.28
18	Research Paper	59	0.19
19	Monograph	57	0.18
20	Others	1087	3.49
	Total	**31,123**	**100.00**

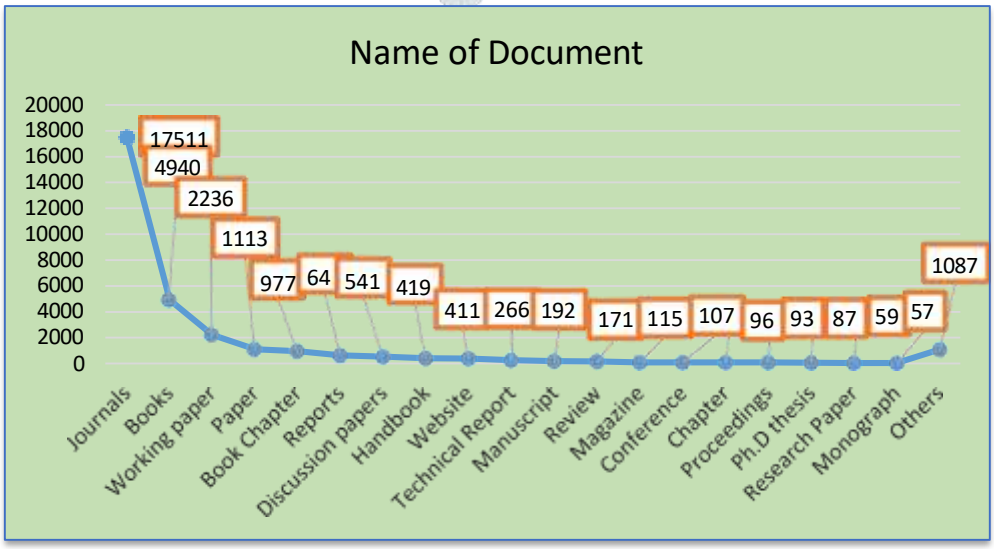

Figure No. 1. Form wise distribution of cited literature in Economics

It is observed from the above table that, the frequency distribution of different forms of literature used by researchers in Economics. It was found that, the Journals contributed the maximum number of citations, accounted 17,511 (56.26%) of the total citations. This indicates that Journals are the most preferred form of information used by researchers in Economics. Books are the second most cited form of information accounted 4940 (15.87%) of the total citations, followed by Working paper with 2236 (7.18%) citations respectively.

Chronological distribution of citations in Economics

The literature published in different periods and this period comes under chronological distribution. The citation ranging from the earliest published document to the latest published. These citations are distributed in different groups of years. This purpose the whole time span of the documents used was divided into period group, each of 10 years' duration.

A total number of 31,123 citations of 254 Ph.D. thesis are distributed among different groups of year as shown in table no. 3 and figure no. 3

Table 3. Chronological distribution of Citations in Economics

Chronological distribution of Citations in Economics			
Sr. No.	**Year**	**Total Citation**	**Percentage**
1	1614-1699	244	0.78
2	1700-1799	61	0.2
3	1800-1899	68	0.22
4	1901-1910	26	0.08
5	1911-1920	26	0.08
6	1921-1930	47	0.15
7	1931-1940	97	0.31
8	1941-1950	143	0.46
9	1951-1960	548	1.76
10	1961-1970	1167	3.75
11	1971-1980	1841	5.92
12	1981-1990	4555	14.64
13	1991-2000	6398	20.56
14	2001-2010	9518	30.58
15	2011-2018	4813	15.46
16	N/A	1571	5.05
Total		**31,123**	**100**

The oldest citation date in 1614 is as follows:

Raleigh. Sir Walter (1614). The History of the World., Oxford University Press, London. The above table reveals that, the oldest documents published as in 1614 have been cited. Out of 31123 citations, the majority of the cited documents have been published between the years 2001 to 2010 accounted 9518(30.58%) of total citation, followed by 6398(20.56%) citation published between the year 1991 to 2000. 4813(15.46%) citation published between the year 2011 to 2018. and the without year citations accounted 1571(5.05%) during the period of the study.

Authorship Pattern of Total Citations in Economics

The authorship patterns of citation are arranged as Single, Two, Three, Four, Five, Six, Seven, Eight, Nine, Ten, and More Than Ten authors. The citations are arranged under each category for counted their percentage in authorship pattern for showing the trends of research as solo or corporate in Economics research.

Table 4. Authorship Pattern of Total Citations in Economics

Authorship Pattern of Total Citations in Economics			
Sr. No.	**Number of Authors**	**Total Citations**	**Percentage**
1	Single Author	13645	43.84
2	Two Author	11491	36.92
3	Three Author	4523	14.53
4	Four Author	1013	3.25
5	Five Author	290	0.93
6	Six Author	77	0.25
7	Seven Author	27	0.09
8	Eight Author	22	0.07
9	Nine Author	10	0.03
10	Ten Author	11	0.04
11	Eleven Author	5	0.02
12	Twelve Author	3	0.01
13	Thirteen Author	2	0.01
14	Twenty Two Author	1	0.00
15	Twenty Five Author	1	0.00
16	Twenty Eight Author	1	0.00
17	Thirty Six Author	1	0.00
Total		**31123**	**100.00**

It is observed form the above table that, out of 31,123 authors citations, the single authorship is most prominent with 13674(43.94%) of total citation, followed by two authors with 11461(36.82%) citations, three authors with 4523(14.53%) citations, four authors with 1013(3.25%) citations, five authors with 290(0.93%) citations, six authors with 77(0.25%) citations, seven authors with 27(0.09%) citations, Eight authors with 22(0.07%)citations, Nine authors with 10(0.03%)citations, ten authors with 11(0.04%) and More Than Ten Author citations are 15(0.05%) citations and More Than Ten authors respectively.

Author productivity and the application of Lotka's Law

Lotka's law of scientific productivity. From the authorship dataset given below, calculate the estimated and standardized number of authors using n-values obtained from inverse square root law, Least-squares method, formulations and Lotka's original formulation.

Table 5. Lotka's Inverse Square Root Law of Author Productivity.

Lotka's Inverse Square Root Law of Author Productivity.					
X(no.of authors)	**Y(no.of publication)**	**Log of x**	**Log of Y**	**XY**	**x2**
1	13645	0	4.13497	0.00000	0
2	11491	0.30103	4.06035	1.22229	0.09061

3	4523	0.47712	3.65542	1.74407	0.22764
4	1013	0.60206	3.00561	1.80956	0.36247
5	290	0.69897	2.46239	1.72114	0.48855
6	77	0.77815	1.88649	1.46797	0.60551
7	27	0.84509	1.43136	1.20963	0.71417
8	22	0.90309	1.34242	1.21233	0.81557
9	10	0.95424	1.00000	0.95424	0.91057
10	11	1.00000	1.04139	1.04139	1.00000
11	5	1.04139	0.69897	0.72790	1.08449
12	3	1.07918	0.47712	0.51490	1.16462
13	2	1.11394	0.30102	0.33532	1.24086
22	1	1.34242	0.00000	0.00000	1.80209
25	1	1.39794	0.00000	0.00000	1.95423
28	1	1.44715	0.00000	0.00000	2.09424
36	1	1.55631	0.00000	0.00000	2.42211
Total	**31123**	**15.53808**	**25.49751**	**13.96073**	**16.97773**

Lotka's law was proposed by US mathematician and statistician Alfred J. Lotka in 1926 for analyzing the productivity of authors. Lotka's law is defined as "the number of authors making n contributions is about 1/na of those making one contribution, Table 5 shows the author productivity of Economics. The applicability of Lotka's law.

The first step in the testing of Lotka's law is to determine the value of n (Table 4.1). The formula of Lotka's law states that Yx = C X X^{-n}, where by expected number of authors (y) with a given number of citations (x) can be obtained by calculating the constant c and the exponent n. The calculation of n is given by the following formula:

Using Inverse-squares Root method, The Values of n is found to be 3.36621$n =$

$$\frac{N * \sum XY - \sum X * \sum Y}{N \sum X^2 - (\sum X)^2}$$

$$= \frac{17 * 13.96073 - 15.53808 * 25.49751}{17 * 16.97773 - (15.53808)^2}$$

$$n = \frac{-158.84994}{47.18947}$$

n= 3.36621

The values of n can be used to calculate c using the formula:

$$C = \frac{1}{1/X^n}$$

$$C = \frac{1}{1.57660}$$

C = 0.63427

Table No. 5.1 Least-squares method, Author Productivity for Lotka's Law

Least-squares method, Author Productivity for Lotka's Law					
X(no.of authors)	Y(no.of publication)	Estimated (n=2	Standardized(n=2)	Estimated (n=3.36621)	Standardized(n=3.36621)
1	13645	13645	19740.50805	13645	27249.05662
2	11491	3411.25	4935.127012	1323.25443	2642.538284
3	4523	1516.1	2193.373708	337.97392	674.9337106
4	1013	852.8125	1233.781753	128.32556	256.2660645
5	290	545.8	789.6203218	60.54715	120.9126214
6	77	379.027	548.3463205	32.77577	65.45319256
7	27	278.469	402.8669502	19.50725	38.95596627
8	22	213.203	308.4452574	12.44465	6036256151
9	10	168.456	243.7088328	8.37129	16.71746099
10	11	136.45	197.4050805	5.87169	11.72576132
11	5	112.768	163.1438337	4.26017	8.507556873
12	3	94.756	137.0854951	3.17851	6.347482517
13	2	80.739	116.8068068	2.42776	4.848235229
22	1	28.192	40.78595843	0.41313	0.825020356
25	1	21.832	31.58481287	0.26866	0.536513855
28	1	17.404	25.17873229	0.18345	0.366349537
36	1	10.528	15.23107869	0.07872	0.157203792
Total	**31123**	**21512.7865**	**31123**	**15584.88211**	**6036287249**

Lotka's law describes the frequency of publications by the authors in given subject Table 5.1 presents author productivity data for Lotka's Law. Of the 31323 Unique author names 13645(43.84) produced one citations, 11491(36.92) produced Two citations, 4523

(14.53) produced three citations and so forth. The Number of authors who produced more than ten authors is only 14 citations.

Using least-squares method the values of N and C are found to be 3.36621 and 0.63427 respectively.

Table No. 6 Ranking of Authors in Economics (Top Twenty)

Sr. No.	Name of Authors	Total Citations	Percentage	Rank
1	Besley Timothy,	129	0.35	1
2	Acemoglu Daron	120	0.33	2
3	Bloom Nicholas,	82	0.22	3
4	Banerjee Abhijit V.,	72	0.20	4
5	Aghion Philippe	62	0.17	5
6	Autor David H.,	57	0.16	6
7	Duflo Esther,	53	0.14	7
8	Angrist Joshua D.;	51	0.14	8
9	Slemrod Joel	50	0.14	9

10	Saez Emmanuel	49	0.13	10
11	Caselli Francesco.	47	0.13	11
12	Glaeser Edward L	45	0.12	12
13	Bernanke Ben S.,	43	0.12	13
14	Becker Gary S.,	42	0.11	14
15	Jean Tirole.	42	0.11	14
16	Pissarides Christopher A.,	42	0.11	14
17	Barro Robert J.	41	0.11	15
18	Christiano,Lawrence J.,	40	0.11	16
19	Card, David.	38	0.10	17
20	Holmstrom, Bengt.	38	0.10	17

It is observed from the above table that, a total of 36,554 authors appeared from 31,123 citations of 254 Ph.D. theses, the ranking of authors in terms of their number of contributions reveals that, the highest number of citations is cited from Basley Timothy with 129(0.35%) total citations, followed by Acemoglu Daron with 120(0.33%) citations,

Bloom Nicholas with 82(0.22%) citations, Banerjee Abhijit V. with 72(0.20%) citations, Aghion Philippe with 62(0.17%) citations respectively.

Table No. 7. Ranking of Journals in Economics. (Top Twenty)

Table No. 7 Ranking of Journals in Economics			
Sr. No.	**Ranking of Journals**	**Total**	**Percentage**
1	The American Economic Review,	1724	9.85
2	Journal of Econometrica,	900	5.14
3	The Quarterly Journal of Economics,	622	3.55
4	The Journal of Political Economy.	605	3.45
5	International Economic Review,	506	2.89
6	Journal of Monetary Economics,	504	2.88
7	Review of Economic Studies.	499	2.85
8	The Journal of Finance,	326	1.86
9	Journal of Development Economics,	325	1.86
10	Journal of Econometrics,	270	1.54
11	Journal of Public Economics,	244	1.39
12	Journal of Economic Theory,	221	1.26
13	Journal of Financial Economics,	215	1.23
14	The Economics Journal,	215	1.23
15	Journal of International Economics,	210	1.2
16	Journal of Economic Literature,	200	1.14
17	European Economic Review,	180	1.03
18	The Review of Economic Studies.	155	0.89
19	Journal of Economic Dynamics and Control,	154	0.88
20	The Review of Economics and Statistics.	150	0.86

The table 7 shows the rank list of journals that have been cited by the researchers in Economics. These citations have been arranged in descending order of the numbers of journal citations. There are total 1713 journals which are cited by the researchers in Economics during the period of the study. The study shows that, the journal of "The American Economic Review," is cited by the maximum number of researchers in Economics with 1724(9.85%) total citations, "Journal of Econometrica," comes to next in citation by the researchers with 900(5.14%) citations, followed by "The Quarterly Journal of Economics," with 622(3.55%) citations, "The Journal of Political Economy." with

605(3.45%) citations, "International Economic Review." with 506(2.89%) citations respectively.

Bradford's Law of Scattering in Economic

Bradford's law states that "If scientific journals are arranged in decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to subject and several zones of groups containing the same number of articles as the nucleus, then the zone will be as, 1: n: n^2.

In the present set of data numbers of journals have been arranged in order of decreasing productivity of articles (Table No. 7.1). They were divided in a nucleus of 3 equal zones. Numbers of articles in each zone were more or less equal, which is shown in table no. 7.1

Table 7.1 Bradford's Law of Scattering in Economics.

Bradford's Law of Scattering in Economics		
Zone	**No. of Articles**	**No. of Journal**
I	6011	9
II	5750	62
III	5750	1642
Total	**17,511**	**1713**

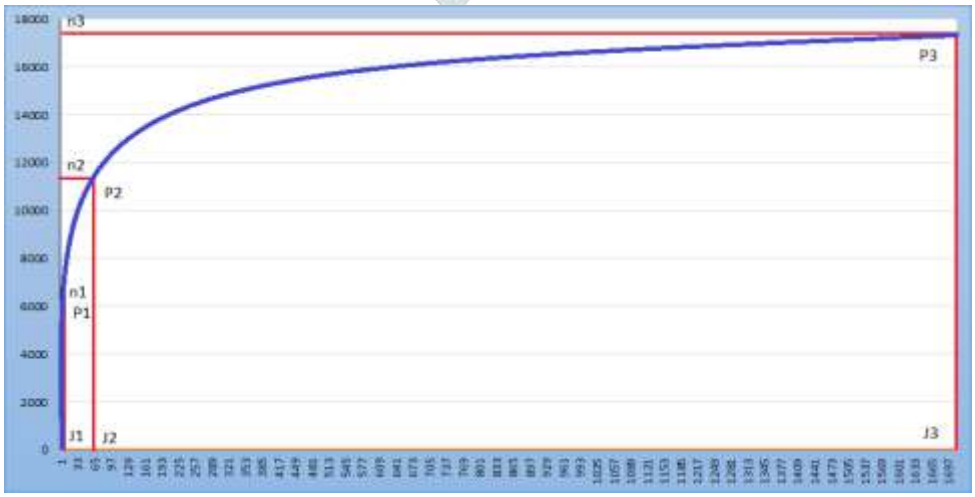

Figure no. 2 Bradford's Law of Scattering in Economics (No. of Journals)

The attempt was made to test applicability of Bradford's law of scattering, as shown in table no. 7.1 and figure no. 2 The total numbers of journal articles were grouped into 3 equal zones producing similar number of articles, i.e. 6011 articles in each zone. It was observed that, 9 core journals grouped in zone 1 published 6011 articles accounting for one third of the total output. Similarly, the second zone comprises of 62 journals with 5750 articles and 1642 journals with 5750 articles grouped in third zone. Accordingly, the relationship is the zone will be 9: 62: 1642. Even though data does not fit Bradford's law of scattering mathematically but verbally it fits in to it. The 9 journals coming under first zone are core journals.

The Bradford's algebraic interpretation of the law is 1: n: n^2. The connection of each zone in this study is 9: 62: 1642. Here, 6 is the number of journals in the nucleus zone and mean Bradford's multiplier is the 6.89.

Hence,

1x9: 9x6.89: 9x$(6.89)^2$ x3.84

9:62.01: 1640.64>1711.65

$\text{Percentage of Error} = \frac{1711.65-1713}{1713}100$

= 1.35/1713=-0.000788091

= -0.000788091x100

= **-0.08**

Here the percentage of error is negligible. It is also observed that, the number of journals contributing citations to each zone increases by a multiplier of 6.89. So it can be said that the distribution in present study follow Bradford's law, for more confirmation of this law we can apply one more law i.e. Leimkuhler model.

Application of Leimkuhler model.

In the present study Bradford,s law as well as Leimkuhler models both are tested to verity the scattering of literature in Economics. Leimkuhler has developed a model based on Bradford's verbal formulation as shown below:

For application of Bradford's law, the citation distribution was divided in three equal zones (p). Bradford's assumes that there should be minimum three equal zones, here also 'p' is to be 3. Than by using the mathematical formula for calculating the Bradford's multiplier 'k' as; (Paliwal S.,2016).

$k = (e^y x y_m)^{1/p}$

Where e^y= 1.781

P is Bradford number of zones = 3

y_m is the number of citation of rank first journal = 1724 K = (1.781x1724) ⅓ = (3070.444) ⅓

K = 14.53

y_o = A/P

Where y_o = No. of citation/articles in each zone. A = No. of citation/articles

y_o = 17511/3 = 5837

The nucleus zone r_o can be defined as:

r_o = T(k-1)/(k_p -1)

r_o= 1713(14.53-1)/(14.53^3-1)

= 1713(14.53-1)/(3067.58-1)

= 1713x (13.53)/(3066.58)

= 23176.89/3066.58

r_o **= 7.55**

Different Bradford's zone can be obtained using the value of 'k' and 'r_o'.

Nucleus zone = r_o = r_ox1 = 7.55x1 = **7.55**

First zone = r_1 = $r_o$xk = 7.55x14.53 = **109.702**

Second zone = r_2 = $r_o$xk2 = 7.55x$(\mathbf{14.53})^2$ = **1593.97**

Table No. 7.2. Using Leimkuhler Model, Bradford's Zone and Number of Journals.

Bradford's Law of Scattering in Economics		
Zone	**No. of Articles**	**No. of Journal**
I	6011	9
II	5750	62
III	5750	1642
Total	**17,511**	**1713**

Hence,

1: k: k^2 = 7.55: 7.55x14.53: 7.55x $(14.53)^2$

= 7.55:109.7015:1593.97= **1711.22**

Percentage of error = 1711.22-1713/1713x100

= **-0.10**

Hence, it can be noted from the above calculations that, the nucleus zone is having 7.55, the first zone is having 109.7015 and the last zone is having 1593.97. i.e., from the above table we can find it is 9, 62 and 1642 respectively. Therefore, the Bradford's law of scattering is not fits in the present data set for Bradford multiplier k=14.53.

Table No. 8. Language wise distribution of citations in Economics

Language is a one medium of communication. The literature published in various languages. It is hardly possible that a research scholar gets satisfactory information acquired for his purpose in the language familiar to him.

In the present study a total 31,123 number of citations of 254 Ph.D. thesis are distributed among language used is shown in Table no. 8.

Table 8. Language wise distribution of citations in Economics

Language wise distribution of citations in Economics				
Sr. No.	**Language Wise**	**Total Citation**	**Percentage**	**Rank**
1	English	30,465	97.89	1
2	Spanish	291	0.93	2
3	French	133	0.43	3
4	German	70	0.22	4
5	Portuguese	66	0.21	5
6	Swedish	30	0.10	6
7	Italian	29	0.09	7
8	Romanian	18	0.06	8
9	Latin	8	0.03	9
10	Japanese	3	0.01	10
11	Norwegian	3	0.01	10
12	Azerbaijani	2	0.01	11
13	Chinese	1	0.00	12
14	Dutch	1	0.00	13
15	Esperanto	1	0.00	13
16	Galician	1	0.00	13
17	Mandarin	1	0.00	13
Total		**31,123**	**100.00**	/

It is observed from the above table that, out of 31,123 citations, the English language scores the top position with 30465(97.89%) citations, Spanish language goes to second position with 291(0.93%) citations, followed by, French language with 133(0.43%) citations, German language with 70(0.22) citations and the Portuguese language with 66(0.21) citations. This again shows that English language is dominant over other languages.

Table 9. Geographical distribution of Citations country wise in Economics

Sr. No.	**Name of Country**	**Total**	**Percentage**	**Rank**
1	United States	3975	12.77	1
2	United Kingdom	2357	7.57	2
3	France	232	0.75	3
4	Netherlands	217	0.7	4
5	Germany	212	0.68	5
6	Venezuela	111	0.36	6
7	Switzerland	95	0.31	7
8	Mexico	83	0.27	8
9	Brazil	74	0.24	9

10	India	74	0.24	9
11	Italy	57	0.18	10
12	Sweden	54	0.17	11
13	Japan	53	0.17	12
14	Canada	40	0.13	13
15	Pakistan	40	0.13	13
16	Belgium	25	0.08	14
17	Spain	23	0.07	15
18	Argentina	21	0.07	16
19	Australia	21	0.07	16
20	Thailand.	21	0.07	16

Regarding the country of origin of the research output found in the citations of Ph.

D. theses in Economics, it is found that, there are total 58 countries has contributed from 31,123 citations of 254 Ph.D. theses. The highest numbers of contributions are from US with 3975(12.77%) total citations, followed by, UK with 2357(7.57%) citations, France with 232(0.75%) citations, Netherlands with 217(0.70%) citations, and Germany with 212(0.68%) citations respectively. Hence we can say that, the research output of literature published from US, UK, France, Netherlands and Germany are most helpful to the researchers in Economics.

Findngs & Conclusion

It is observed form the above table that, the researchers at The London School of Economics and Political Science (LSE). London submitted 254 theses in Economics during 1909 to 2018, and all 254(100%) of the theses were available for the study, it can also observed that, the majority of the theses was submitted in the year 2012 that is 29. the Journals contributed the maximum number of citations, accounted 17,511 (56.26%) of the total citations. This indicates that Journals are the most preferred form of information used by researchers in Economics. the oldest documents published as in 1614 have been cited, the single authorship is most prominent with 13674(43.94%) of total citation, Lotka's law of scientific productivity. From the authorship dataset given below, calculate the estimated and standardized number of authors using n-values obtained from inverse square root law, Least-squares method, formulations and Lotka's original formulation. Bradford,s law as well as Leimkuhler models both are tested to verity the scattering of literature in

Economics. the English language scores the top position with 30465(97.89%) citations, The highest numbers of contributions are from US with 3975(12.77%) total citations, followed by, UK with 2357(7.57%) citations.

REFERENCES

Amsaveni, N. and Manjula, M. (2014). Scientometric Analysis of Research output in Soybean Research. International Journal of Library and Information Studies, Vol. 4(4),
pp. 1-8.

Deshmukh, P.P (2011). Citation in Annals of Library and Information Studies during 1997 to 2010. Annals of Library and Information Studies. 2011,58(4), 355-361.

Gooden, A.M. (2001). Citation Analysis of doctoral dissertation: An Ohio State University Case Study. Journal of Information Science 23 (3), 225-238

Halcrow Harold G., (1981). Economics of Agriculture. Mcgraw Hill International Book Com. Tokyo. Pp. 4.

Hoag Arleen J. and Hoag John H., (2010). Introductory Economics-4 th ed., Cambridge University press India Pvt. Ltd., New Delhi. Pp. 3.

Mondal S. Bandyopadhyay A. K and Roy B. K. (2017), International Research: Journal of Library & Information Science. 7 (3): 576-594.

Sandip B. Khandare (2019) Mapping of intellectual assets in economics research in Dr. Babasaheb Ambedkar Marathwada University, Aurangabad: A Scientometric study. Department of Library & Information Science. http://hdl.handle.net/10603/293482.

Tupe S. K. & Khaparde V. S. (2019). A Scientometric Evaluation of Publications in Stem Cell Regenerative Medicine Journals Among German Society 2009 – 2018, *International Journal of Library & Information Science*, 8(3), 2019, pp. 16-25.

Tupe, S. K., & Khaparde V. S (2016). Scientometric study on journal of information technology & librarieson DOAJ. "Knowledge Librarian" *An International Peer Reviewed Bilingual E-Journal of Library and Information Science*,3(3) ,10-26.

Rounak B., Roy T. and Modak S. (2021), Citation Analysis of Doctoral Theses in Science and Social Sciences Submitted to ICFAI University, Dehradunduring 2012 – 2020. *Library Philosophy and Practice.*

Rousseau, R (2007), The Influence of missing publications on the Hirsch Index. *Journal of Informetrics.* 1(1), 2-7.

Roy S. B. (2019), Research Output of Biological Science during 1901-1945: A Scientometric Analysis. *DESIDOC Journal of Library & Information Technology,* 39(3) 96-103.

Ramesh, L. S. R. C. V. and Nagaraju, A. V. S. S., (2000). Citation Analysis of the Indian Journal of Information, Library and Society. *Indian Journal of Information, Library and Society,* Vol. 13(3), pp. 171-179.

Sengupta, I. N. (1991). Four measuring techniques in library and information science. Indian Journal of Information and Library Society, 4(3-4), 197-227.