AUTHORSHIP PATTERN AND COLLABORATIVE MEASURES IN ECONOMICS

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ABSTRACT

{*In the present paper an attempt has been made to study relative research publications of the collaboration and authorship pattern of Economics subject. Discusses the types of collaboration and describe the measures of collaboration. The study gives the actual impact of collaboration intensity on the performance of Scientific Productivity. Collaborative Index (CI) is 2.06. Degree of Collaboration (DC) is 0.58 and Collaboration Co-efficient (CC) is 0.30*}

Keywords: ***Research collaboration, Authorship pattern in Economics, Scientometrics***

1. INTRODUCTION

The productivity of authors in the context of Research and Development (R&D) is normally measured in terms of scientific and technical output. The principle means of communication of authors is the publication process, which allows authors to verify the reliability of information, to acquire a sense of relative importance of a contribution, and to obtain critical response to work. Correspondingly, it is through publication that authors receive professional recognition and esteem, as

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well as promotion, advancement, and funding to future research work. Publication is so central to an author productivity that the "research work" carried by him becomes a 'work' only when it takes a conventional physical form which can be received, assessed, and acknowledged by the scientific community. Usually Collaboration will be held with Intra-Department Collaboration; within an organisation. Intra - Institutional Collaboration i.e. Collaboration between two or more organizations. International Collaboration; the collaboration between two or more organizations; or institutions located in more than one country. Guide – Research Scholar Collaboration; this is a very common mode of collaboration in an academic setting. The professor in a university department provides the ideas and guidance, and sometimes also the required funds from a research grant, and the research assistant or student does most of the bench work. The resulting project report, conference paper, or journal article usually carries the names of both the professor and the student. It is not uncommon for a professor to be guiding several students in different research projects at the same time. Collaboration among Colleagues; it is a very common practice in corporate research centres for a number of colleagues to be working on one or more projects, each contributing expertise in a different aspect of the project. In interdisciplinary fields such as environment, energy, or space research, scientists and engineers from a wide variety of specialties often collaborate. In recent days it is common for specialists working together in an interdisciplinary project. In the present paper an attempt has been made to study the research productivity versus scientific collaboration in the field of Economics.

2. METHODOLOGY

Data for the study has been collected from Social Science Citation Index of ISI Web of Knowledge published by Thomson Reuters database for the period 2000-2014. The data is used to find the Authorship Pattern and Measures of Authorship, Collaborative Index, Degree of Collaboration and Collaborative Co-efficient in the field of Economics.

3. ANALYSIS OF THE DATA

3.1 Authorship Pattern

Table 1 show that the single authored papers are more than multi authored papers. 1504 (41.67%) papers are contributed by single authors, followed by 746 (20.66%) papers by two authors; 694 (19.23%) papers by three authors and four and above authors 666 (18.44%). The highest numbers of papers are contributed by single authors, when we see total contributed papers clearly shows that out of 1504 articles 2106 articles are multi authored articles, which indicates the collaborative research trend.

Table-1 Authorship Pattern

Year	Single Author	Two Author	Three Author	Four & above authors	Total Articles	Total Authors
2000	58(53.21)	15 (13.76)	7 (6.43)	29 (26.60)	109	386
2001	62 (49.20)	34 (26.98)	14 (11.11)	16 (12.71)	126	453
2002	50 (42.01)	15 (12.60)	30 (25.23)	24 (20.16)	119	396
2003	73 (52.89)	37 (26.81)	10 (7.26)	18 (13.04)	138	488
2004	81 (55.47)	20 (13.69)	12 (8.24)	33 (22.60)	146	520
2005	38 (32.47)	52 (44.44)	19 (16.23)	8 (6.86)	117	452
2006	59 (32.41)	36 (19.78)	40 (21.97)	47 (25.84)	182	563
2007	102 (43.40)	20 (8.510	59 925.12)	54 (22.97)	235	602
2008	113 (39.23)	68 (23.61)	75 (26.05)	32 (11.11)	288	752
2009	123 (38.55)	49 (15.36)	73 (22.89)	74 (23.20)	319	831
2010	146 (39.67)	91 (24.72)	49 (13.33)	82 (22.28)	368	647
2011	152 (40.10)	89 (23.48)	71 (18.73)	67 (17.69)	379	858
2012	163 (46.57)	58 (16.57)	95 (27.15)	34 (9.71)	350	518
2013	149 (41.16)	78 (21.54)	79 (21.84)	56 (15.46)	362	735
2014	135 (36.29)	84 (22.58)	61 (16.39)	92 (24.74)	372	738
Total	**1504 (41.67)**	**746 (20.66)**	**694 (19.23)**	**666 (18.44)**	**3610**	**8939**

3.2 Measures Of Authorship

The measures Degree of Collaboration (DC), first suggested by Subramanyam[1], which take the proportion of co-author publications in total publications, the Collaborative Index (IC), which takes the mean number of authors per publication has been studies Lawani[2] (1980). Ajiferuke & Tague[3] (1983) have proposed a measure called Collaborative Coefficient (CC), which reflects both the mean number of authors per paper and the proportion of multi-authored papers.

3.2.1 Collaborative Index (CI)

This is one of the early measures of degree of collaboration derived by Lawani (1980).

$$CI = \frac{\sum^{A} j=1 jfi}{N}$$

It is a measure of mean number of authors. Although it is easily computable, it is not easily interpretable as a degree, for it has no upper limit moreover; it gives a non-zero weight to single-authored papers, which involve no collaboration.

Calculation: CI = [(f1) 1 + (f2) 2 + (f3) 3 + … (fk) k] / N

Using data in the table-1, During 2000

CI = (58 + 15 X 2 + 7 X 3 + 29 X 4) / 109

= 58 + 30 + 21 + 116 = 225

= 225 / 109 = 2.06

Table 2 shows that the Collaborative Index (CI), we can see the variation in the Collaborative Index. It varies from 1.80 in 2003 and highest Collaboration we can notices in 2014 i.e. 2.29.

Table-2 Collaborative Index (CI)

Year	Single Author	Two Author	Three Author	Four & above authors	Number of publication	% of Total Publications	CI
2000	58	15	7	29	109	3.01	**2.06**
2001	62	34	14	16	126	3.49	1.87
2002	50	15	30	24	119	3.29	2.23
2003	73	37	10	18	138	3.82	1.80
2004	81	20	12	33	146	4.04	1.97
2005	38	52	19	8	117	3,24	1.97
2006	59	36	40	47	182	5.04	2.41
2007	102	20	59	54	235	6.50	2.27
2008	113	68	75	32	288	7.97	2.09
2009	123	49	73	74	319	8.83	2.30
2010	146	91	49	82	368	10.19	2.18
2011	152	89	71	67	379	10.49	2.13
2012	163	58	95	34	350	9.69	2.00
2013	149	78	79	56	362	10.06	2.11
2014	135	84	61	92	372	10.34	2.29
Total	**1504 (41.67)**	**746 (20.66)**	**694 (19.23)**	**666 (18.44)**	**3610**	**100**	**2.14**

3.2.2 Degree of Collaborative (DC)

In recent years, most countries have realized the importance of scientific research for its socio-economic development, and have initiated programs that encourage and support collaboration among scientists and researchers, both at the national and the international levels. In order to measure the collaborative research pattern, an indicator known as the degree of collaboration proposed by Subramanyam, K (1983) as below:

Degree of collaboration,

$$DC = \frac{Nm}{Nm+Ns}$$

Where

Nm = number of multi authors during a specific period in a discipline

Ns = number of single authors publication in a discipline during a given period of time

Calculation: DC = Nm / (Nm + Ns)

Based on the data in the table -3, DC for two authored publications;

Nm = 2106 & Ns =1504 DC = 2106 / (2106 + 1504) = 0.58

Table 3 shows the Degree of Collaboration measures, It may be noted that the value of the highest degree of collaboration (DC) was 0.58 during the period 2000-2014. The DC among two authors was 0.33 and the minimum was 0.30 among the four above authors.

Table-3: Authorship pattern with Degree of Collaboration measures (DC)

Authorship Pattern			
	Number of publication	**% of Total Publications**	**DC**
Total number of Single/Multi Authored Publication	3610	100	
Number of Co- Authored Publication (NM)	2106		**0.58**
Number of Single Authored Publication (NS)	1504	41.67	
Number of two Authored Publication	746	20.66	0.33
Number of three Authored Publication	694	19.23	0.31
Number of Four above Authored Publication	666	18.44	0.30

4.2.3 Collaborative Co-Efficient (Cc)

Ajiferuke, Burell and Tague have shown the mean number of authors per paper: the proportion of multiple authorship; as a measure of degree of collaboration in a discipline, according to them, is inadequate, and therefore, they have proposed a measure combining some of the merits of both measures into what is known as Collaborative Coefficient (CC).

Suppose, if a paper has a single author, the author receive one credit; if a paper has a single author the authors receives one credit; if two, each receives ½ credit and in general, if we have 'n' authors each receives 1/n credits. Hence, the average credit awarded to each author of a random paper is E[1/n], a value which lies between 0 and 1. If '0' is to correspond to single authorship, then the Collaborative Coefficient is defined as:

$$CC = 1 - E[1/n]$$

$$= 1 - (1/j)\, p(N=j)$$

And its sam $\sum$ rate is

$$= \frac{1-f1+(1/2)f2+(1/2)f3+\ldots(1/k)fk}{N}$$

Where: Fj = the number of j-authors research papers published in a discipline during a certain period of time.

N = the total number of research papers published in a discipline during a certain period of time: (excluded anonymous authors)

K = the greatest number of authors per paper in a discipline.

Ajiferuke et al were of the opinion that the Collaborative Co-Efficient incorporates the sum of the merits of both collective index and degree of collaboration. It lies between 0 and 1 (0<= cc>1). Tends to zero

as single-authored papers dominate and differentiates among levels of multiple authorship.

Calculation: CC = 1 – [f1 + (1/2) f2 + (1/3) f3 +... + (1/k) fk] / N

Based on the data in the table 4, CC for the year 2001

CC = 1 – { [62 + (1/2) 34 + (1/3) 14 + (1/4) 16] / 126 / N}

= 1 – { [62 + 17 + 4.66 + 4] / 126 }

= 1 – [87.66 / 126] = 1 – 0.695 = 0.305

Table 4 shows the Collaborative Co-efficient has increased from 0.31 in 2000 to 0.41 in 2014 indicating that research among scientists is fairly collaborative with an average CC of 0.38.

Table-4 Collaborative Co-efficient (CC)

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Year	Single Author	Two Author	Three Author	Four & above authors	Number of publication	% of Total Publications	CC
2000	58	15	7	29	109	3.01	0.31
2001	62	34	14	16	126	3.49	**0.30**
2002	50	15	30	24	119	3.29	0.38
2003	73	37	10	18	138	3.82	0.28
2004	81	20	12	33	146	4.04	0.29
2005	38	52	19	8	117	3,24	0.38
2006	59	36	40	47	182	5.04	0.44
2007	102	20	59	54	235	6.50	0.38
2008	113	68	75	32	288	7.97	0.38
2009	123	49	73	74	319	8.83	0.40
2010	146	91	49	82	368	10.19	0.38
2011	152	89	71	67	379	10.49	0.37
2012	163	58	95	34	350	9.69	0.34
2013	149	78	79	56	362	10.06	0.37
2014	135	84	61	92	372	10.34	0.41
Total	**1504 (41.67)**	**746 (20.66)**	**694 (19.23)**	**666 (18.44)**	**3610**	**100**	**0.37**

5. FINDINGS

The main findings of the present study are summarized as below:

1. The number of single authorship publications has been decreased; and multiple authorship has increased which shows the collaborative trend in the field.
2. The average number of authors for each paper has increased from 2.06 to 2.29 during 2000-2014 (CI).
3. Multi authors (58.33%) contributed more than single author and degree of collaboration is 0.58.
4. The Collaborative Co-efficient has increased from 0.31 in 2000 to 0.41 in 2014.
5. The computed value of CI, DC and CC of different periods is almost consistent, reflecting growing collaboration and pointing towards increasing professionalization in Economics.
6. The results are useful for Librarians and Economists to identify the trend in the field.

6. CONCLUSION

The extent of collaboration between authors has been studied in almost all the branches of science and technology, social science and humanities. In view of this, it is suggested here that essential studies should be conducted in other fields of Economics in order to identify the collaborative research. The study should be both qualitative and qualitative so as to throw more light on the scientific communication process. Such study may be found useful in understanding various

disciplines, and hence would be helpful in planning more effective research.

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"You have to grow from the inside out. None can teach you, none can make you spiritual. There is no other teacher but your own soul.
You cannot believe in God until you believe in yourself.
The world is the great gymnasium where we come to make ourselves strong."
---Swami Vivekananda