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A COMPARATIVE ANALYSIS OF CO AUTHORSHIP PATTERNS OF IRANIAN RESEARCHES IN LIFE SCIENCES (2002-2011): A BIBLIOGRAPHIC RESEARCH IN SCOPUS AND ISC DATABASES

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ABSTRACT

This study aims at discovering of co authorship patterns in agriculture and life sciences in both Scopus and ISC databases. We also tried to find the relation between citation and co authorship features. The number of articles increased in Scopus while the number of articles of ISC has some fluctuations. It is also found that the pattern of three or more co author is the main pattern. It is approved that there is a meaningful relation between co authorship and citations and between co authorship and productivity.

Keywords: Co Authorship Patterns

INTRODUCTION

This paper investigates the co authorship patterns of Iranian life sciences as evidenced by Iranian Researchers' articles indexed in Scopus and ISC. Along with the national circumstances, and scientific policies of universities and organizations, international environment of Iran affects the scientific productivity and co-authorship so play an important role in explaining the changes of co authorship patterns or citations and the relation between them in ten years. Co authorship can help the diffusion of knowledge in universities far from metropolitans and in research organizations and researchers. So in this article we examine it. The growth of Iran in scientific productivity especially in 2011, gaining the 17th in the world, which showed, Iranian researchers besides the sanctions, have found the path of growth through the document of future view 1404, defined by their leader. It seems that Iranian researchers tend to collaborate with their colleagues in Iran or in other countries to gain the right, fair and highest level in the region; co authorship can be measured by the percentage of publication written by at least two researchers. In the document of 1404, the importance of collaboration emphasized, so we tried to answer the following four questions in this article:

a) How is the productivity trend of Iranian researchers in life sciences in 2002-2011? b) How are citations to the articles and is there any correlation between citations and co authorship in life sciences articles in 2002-2011? c) What is the Iranians' co authorship pattern in life sciences in 2002-2011? d) How is the DC (degree of collaboration) and IC (index of collaboration) in Iranian researchers' article in 2002-2011?

In this research, just English articles are collected and used as an indicator of co authorship. The aim of this paper is to examine the co authorship patterns of Iranian researchers of life sciences and degree of collaboration and also index of collaboration was calculated.

Related and Previous Works on co Authorship

According to the Martin and Katz's definition (1997)"collaboration is working together of researchers to achieve the common goal of producing new scientific knowledge".

There are varieties of reasons for collaboration and co authorship, which investigated by Harirchi and his colleagues in (2007) and summarized by them. Their results showed that the main motives behind collaboration were sharing laboratory, and devices, accessing knowledge, increasing efficiency of the study at hand.

The results of Harirchi and his colleagues are reflected Melin and Persson's definition (1996) as followed:" collaboration is an intense form of interaction that allowed for effective communication as well as the sharing of competence and other resources". Kim (2006) attaining knowledge and techniques through collaboration and ultimately writing of a co authored article. Getting more citations, higher

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prestige, motivate some researchers to co authored in writing papers. Co authorship eases transmission of information and technology between researchers, organizations and countries. Collaboration also increases quality of work, but less labor for each co author. Georghiou (1998) believed that immigration of researchers to other countries play an important role in collaboration.

There is another important reason. It was during the twentieth century that the professionalization of science had its greatest impact on the members of the scientific community. And because of this, there has been an increasing trend toward collaboration in almost all fields of science and technology with time. However, the extent of collaboration and their growth rate is observed to vary from one subject to another (Gupta and Karisiddappa, 1998)

Glanzel & De Lang (1997) believed that, there are economic, political reasons. In fact, it depends on the subfields, which factor or reason is prominent among its researchers.

Many researchers have also studied the relation between productivity and co authorship and also citations. Most of them showed that co authorship and correlated. Some research also showed that co authorship cause more citations.

Braun & his colleagues (2001) study patterns of 58400 neuroscience journals. They divided authors into four categories as followed: continuants, transients, newcomers, and terminators. The results showed that, while cooperativity is slightly but permanently increasing, the trend in productivity is by far not so clear: it is fluctuating or stagnating. The maximum of the collaboration value is three.

Newman (2004) by using data from three databases in biology, physics, and mathematics showed patterns of collaboration is different among subjects. Also Gupta and his colleague, Karisiddappa (1998) studied co authorship in Genetics papers. They concluded that there is a systematic increase with time in the average productivity per author in the funded and co authors' subset, and with time, the focus of research is slowly shifting from internal collaboration to domestic and international collaboration.

MATERIALS AND METHODS

Methodology and Data Sources

One the most commonly used databases to analyze co authorship patterns is ISI but we used two other databases. We use Scopus data because as Leydesdorff said" I deliberately used the data since 2000 because Scopus data are only reliable since 1996 ...and the database was gradually improves in terms of coverage during the initial years. As against the web of science, Scopus claims to include, or regional journals among the 18,000 journals covered by this database..." also Leydesdorff's paper showed that the focus of Web of science is on Europe and the USA more than Scopus (Leydesdorff, 2012).

All articles indexed bibliographical and online databases like Scopus in the period 2002-2011 was taken in to consideration and papers like reviews, letters, conferences, editorials, book reviews and corrections have been omitted in this study. Papers with at least two co authors are considered collaborative articles.

Subject classification was based in Scopus classification. According to this classification life sciences including following these subfields: 1) agriculture and Biology; 2) Biochemistry, Genetics, and Molecular Biology; 3) Immunology and Microbiology; 4) Neurology; 5) Pharmaceutics, toxicology.

It raises several problems when collecting data from ISC. Exactly like Scopus, just articles in ISC in the period 2002-2011 was collected manually and pasted in excel file. No correction has been made for spelling variants of co author names in both databases. Citations were counted according to the databases in ten years 2002-2011. All articles which have "Iran" in their affiliation and addresses were searched.

Several mathematical indices were used to evaluate co authorship but in this research we use DC and IC.

DC or degree of collaboration is an index showed the ratio of the number of collaborative articles to the total. DC is a ration between 1 and zero, so the articles have one author take zero. DC is followed this formula:

$$DC=1-\frac{f_1}{N}$$

f_j = those articles written by only one author

N =all the articles

Degree of collaboration in Scopus (95.76 %) is less than Degree of collaboration in ISC (91.3%).

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CI (collaboration Index) is the mean number of authors per paper. This index used by Lawani (1986) for the first time then corrected and interpreted by other researchers. And this is:

$$CI = \frac{\sum_{j=1}^k j * f_j}{N}$$

f_j = number of articles which are written by j authors

N = all the articles written in a period of time

K = the maximum of co authors per article

RESULTS AND DISCUSSION

Results

We have found 33235 articles in Scopus and 248 articles in ISC in the field of life sciences.

Firstly an analysis of the co authorship conducted based on the number of productivity of Iranian authors wrote each year. Figure 1 showed the productivity trend in 2002-2011 in both databases. In Scopus we see an increase in the number of articles in each year. The most productive year were seen in 2006 (92.2%) but in 2007 there were a decrease trend. In 2009-2011, 50 percentages of articles were produced in 2009-2011. In ISC database indexed 88 articles, and we have seen fluctuations in each year. Most articles were written in 2008 (31.8%). There were decrease in 2007, 2009 and 2010.

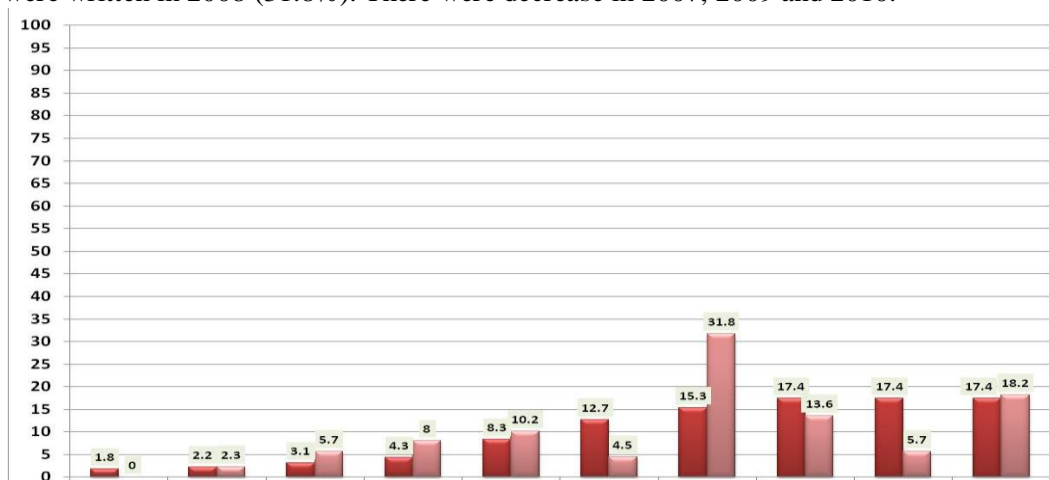


Figure 1: Frequencies of time distribution of papers in both databases

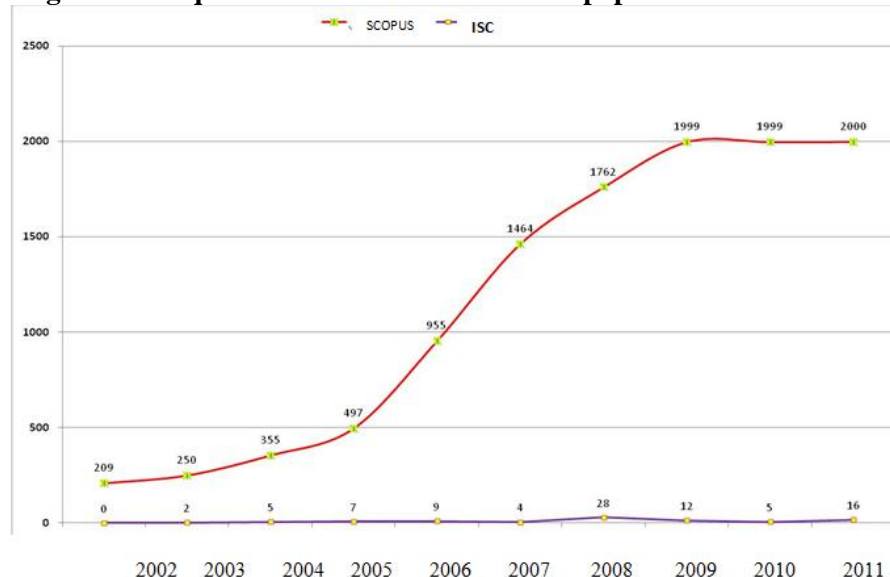


Figure 2: Productivity of articles in life sciences in Scopus and ISC (2002-2011)

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Citations to Articles of Iranian Researchers' Articles in life Science in Scopus and ISC Databases

In Figure 3, we show the average number of citations that Iranian researchers' papers have in 2002-2011. The Scopus line is quite similar, although, the line defines ISC trend, has fluctuations through ten years. But it is clear that the average number of citations in ISC in two first years has a great uprising, and the most citations belong to 2005. At the other hand the maximum number of citations in Scopus belongs to the first year (2002) and has almost a decrease through ten years.



Figure 3: Histogram of the citations in each database

Iranian Researchers' co Authorship Patterns in Life Sciences

6 percents of articles of Scopus (686 articles) and 1.1 percents of ISC (one article) was written by one author so there is no co authorship among these articles. Maximum numbers of articles in Scopus were done by two, three, and four authors, but maximum numbers of articles in ISC were written by four, five, and six co authors. More than 50 percents of articles in Scopus have three co authors and in ISC more than 75 percents.

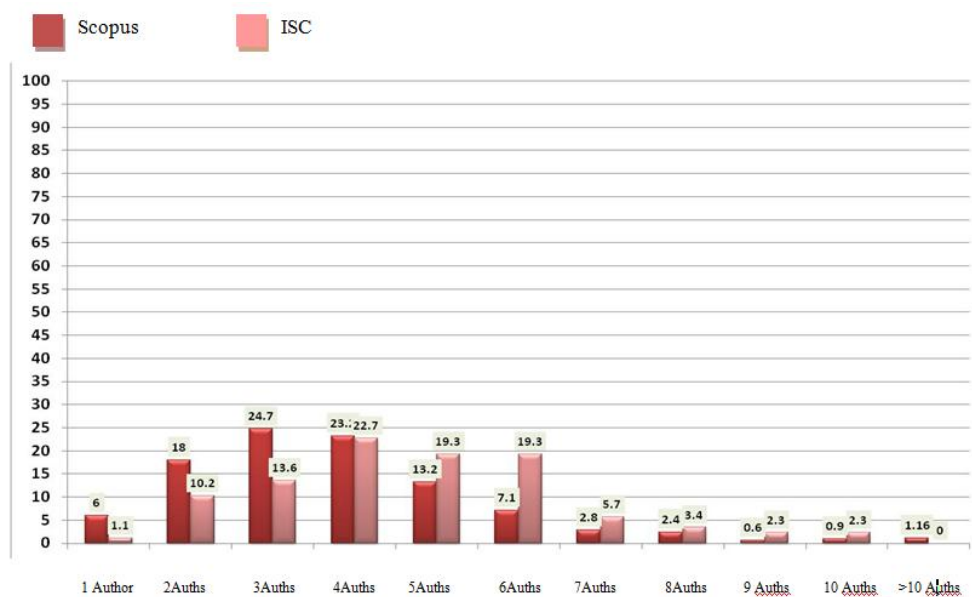


Figure 4: Co authorship patterns among Iranian researchers In Scopus and ISC (2002-2011)
Collaboration Index and Degree of Collaboration in Articles of Life Sciences

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As is showed in table 1, Index of collaboration in Scopus is 4.28 and in ISC are 5.06.

Table 1: DC and IC of Iranian researchers in life sciences in Scopus and ISC

ISC	Degree of collaboration	Number of articles	Index of collaboration (IC)	Scopus	Degree of collaboration	Number of articles	Index of collaboration (IC)	Publication year
-		0	0	94/62%		762	3/61	2002
100/00%		2	2/50	93/99%		965	3/73	2003
100/00%		5	5/20	94/60%		1296	3/93	2004
100/00%		13	4/85	98/40%		1565	5/20	2005
94-44%		25	4/32	95/21%		2609	4/03	2006
98/08%		18	5/72	95/66%		3664	4/12	2007
97/87%		52	5/06	96/01%		4407	4/24	2008
100/00%		47	5/38	96/15%		5115	4/31	2009
97/50%		46	4.98	95/83%		5992	4/38	2010
98/39%		40	5/10	95/51%		6860	4/37	2011
91/30%		248	5/06	95/76%		33235	4/28	Total

Hypothesis

The first hypothesis says: "There is a relation between number of co authorship in life sciences in ISC and Scopus databases".

We used two samples T-test to find if there is such relationship between these two variables.

Table 2: Results of two samples two test

Test for equality of means			Test for equality of Variances		Descriptive statistics			Database	field
Significance level	Degree of freedom	T statistics	Significance level	F statistic	Standard deviation	average	No.		
0/000	33481	-4/748	0/935	0/007	2/581	4/28	33235	Scopus	Life sciences
					2/202	5/06	248	ISC	
					1/333	2/98	123	ISC	

The results showed that: as the significance level of two sample t-test in life sciences is lower than level of test (type I error) $\alpha=0/05$ so with 95 % certainty this hypothesis is disapproved, and the number of co authorship in ISC is greater than SCOPUS.

The second hypothesis says: "There is a relation between number of authors as a independent variable and the number of citations as a dependent variable?"

$$\begin{cases} H_0: \rho_{\text{number of co authorship and citations}} = 0 \\ H_1: \rho_{\text{number of co authorship and citations}} > 0 \end{cases}$$

We used Z- test Fischer and Pearson correlation coefficient and the results showed in table 3.

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Table 3: Results of Z- test Fischer and Pearson correlation coefficient between two variables: the number of co authorship & citations

Statistics		Index	Majors
0/186(**)	Pearson correlation coefficient		Agriculture and Biology
0/000	Significance level		
11578	Number of samples		Biochemistry and Genetics
0/105(**)	Pearson correlation coefficient		
0/000	Significance level		
10942	Number of samples		Immunology and Microbiology
0/239(**)	Pearson correlation coefficient		
0/000	Significance level		
3991	Number of samples		
0/000	Significance level		
15691	Number of samples		neuroscience
0/126(**)	Pearson correlation coefficient		
0/000	Significance level		
1643	Number of samples		Pharmacology, pharmaceuticals and taxonomy
-0/004	Pearson correlation coefficient		
0/748	Significance level		
5318	Number of samples		

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Because in most fields _ Agriculture and Biology, Biochemistry and Genetics, Immunology, neuroscience _ a significant level of correlation between two variables including the citations and co authorship were less than (type I error $\alpha=0/05$) so with 95 percents (in this test, 99 percents) there is a Positive and significant relationship between citations and co authorship. So if the number of authors increases they will be more cited.

Conclusion

It is observed that Iranian researchers' productivity in Scopus increased in 2002 up to 2009, but then from 2009 up to 2011 showed static, but in ISC, showed fluctuations in ten years.

The maximum number of articles in ISC is written in 2008 as twice much more than the previous year and the next years. The most interesting is that in 2011, both databases became almost similar in productivity, the reason for this growth may be the encouraging policies for students and staff and considering more credits to producing science.

According to Vision Document for 1414, one of the most important goals of Iran is gaining the first of sciences in the region.

Although we see, fluctuation in the number of citation to articles of ISC, but it is actually more than the number of citations to articles indexed in Scopus. It showed that Iranian researchers tend to use and cite to journals related to Islam world or Iranian journals publish in English.

The analysis presented in this paper offered clear evidence to support the hypothesis that as the number of scholarly productivity of Iranian researchers in life sciences increases, the number of co-authored papers **also** increases. The other hypothesis approved and showed the meaningful relationship between citations and co authorship in most of the fields in life sciences.

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