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## Scientific Productions and Authorship Patterns of Top Ten Iranian Scientists

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### Abstract

Using bibliographic records from the Social Science Citation Index, Science Citation Index, and Arts & Humanities Index, this paper tries to give a complete view of the characteristics of top ten Iranian authors during 1990-2007 according to their authorship pattern. Findings revealed that during 1990-2007 a total of 2650 articles were written by top ten Iranian authors. Findings showed that M. Shamsipour with 463 articles is the most productive scientist of Iran during the studied period. M. M. Heravi with 365 articles and M. Ganjali with 283 articles appeared in the table at second and third positions, respectively. Findings revealed that overwhelmingly the majority of articles (97/69%) written by Iranian top authors are the result of collaborative works and the authors are highly inclined towards collaborative rather than non-collaborative research. There was a remarkable relationship between co-authorship and number of citations. More-than-three-author articles received the most number of citations. On the other hand, it seems that international collaboration of Iranian top authors is not significant.

**Keywords:** Social Science Citation Index, Science Citation Index, Arts & Humanities Index, Scientific Productivity, Authorship Pattern, Iran, Top Scientists.

### Introduction

It is widely assumed that collaboration in research is 'a good thing' and that it should be encouraged. Numerous initiatives have been launched with the aim of developing collaboration among individual researchers – bringing them together, for instance, in new or larger centers of excellence, or alternatively in interdisciplinary research groups. There have also been policies aimed at improving the links between science and technology through fostering research collaboration across sectors – in particular, between university and industry. Furthermore, most governments have been keen to increase the level of international

collaboration engaged in by the researchers whom they support believing that this will bring about cost-savings or other benefits (Katz, 1997).

Collaboration is one of the remarkable characteristics of contemporary basic research. By collaboration, scientists can share and pass knowledge, set up network of academic communication and generate new academic thoughts, meanwhile decrease research cost and increase research productivity (He, 2009).

Collaboration can take various forms, one of the results being the co-authorship of research papers. In this regard, it is more and more common for papers to be signed by a growing number of authors and organizations. A co-authored paper is the main type of outcome of research collaboration in fields of basic and applied research (Liang and Zhu, 2002).

Also, co-authorship in scientific production has been interesting for the Iranian researchers. Scientific production of Iran and its scientific growth rate are shown in several studies (Moin, Mahmoudi, & Rezaei, 2005; Chakoli, Hassanzadeh, & Nourmohammadi, 2008; Harirchi, Melin & Etemad, 2007). According to Harirchi, Melin, and Etemad (2007) "there may be reason to believe that the structure and the characteristics of Iranian research collaboration partly differ from that of many other similar countries, especially when it comes to international research collaboration. This difference could be the result of Iran's often complicated relationships vis-à-vis many western countries, but also because Iran has experienced a large brain drain that might be of importance". However, issue of single- versus co-authored papers clearly needs further study (Harirchi, Melin, and Etemad, 2007). Therefore, it is interesting to investigate the authorship pattern of ten top Iranian scientists to have a better understanding of research collaboration in Iran.

### Review of Literature

Collaboration is among the most studied and least understood aspects of information infrastructure (Borgman, 2007). Studies of research collaboration have been frequent in the field of Scientometrics and Bibliometrics, and co-authorships are often used as an indicator (Harirchi, Melin, & Etemad, 2007). However, there is not much research on regional differences of science production within a single country (Arruda et al., 2009). After a comprehensive search, the authors found some related studies as follows:

Ma & Guan (2005) conducted an exploratory study on collaboration profiles of Chinese publications in Molecular Biology and found that only 1.58% of papers were non-collaborative ones. Manuelraj & Amudhavalli (2008) investigated the degree of collaboration and correlation between productivity and collaboration pattern among Health Care professionals in India. They also identified the most prolific author of India in the field of Health Science during the study period of 2000 to 2007. Mukherjee (2008) analyzed the authorship pattern of scientific productions of the four most productive Indian academic

institutions for the eight-year period of 2000-2007. Osca-Lluch, et al. (2009) examined cooperation patterns in Spain among History researchers by analyzing co-authorship in the scientific productions of these researchers indexed in SSCI and SCI databases. Sooryamoorthy (2009) analyzed the scientific collaboration in South Africa and concluded that collaboration has been growing steadily across the regions.

Several reasons and incentives for co-authorship have been identified. Receiving more citations is one of the main reasons for scientists to take part in writing a co-authored paper. "The general assumption in collaboration literature is that collaboration increases research productivity" (Sooryamoorthy, 2009). Melo, Bini, & Carviho (2006) found that co-authored articles with international researchers tended to receive more citations. Jonkers (2009) came to the conclusion that "on average, international co-publications receive a considerably higher number of citations than domestic papers". Iribarren-Maestro, Lascrain-Sanchez, and Sanz-Casado (2009) investigated ten research areas at Carlos III University of Madrid and found that multi-institutional and multi-national authorship raises the number of citations. They cited many articles that confirmed the positive correlation between multi-authorship and number of citations (Beaver, 1986; Bordons & Gomez, 2000; Bridgstock, 1991; Bordins, Jover & Barrigon 1993; Van Raan, 1997).

Mayrath (2008) conducted an extensive study on top authors of Educational Psychology Journal to determine the similarities in their writing approaches and practices. Four attributions emerged from his survey as follows: collaboration, passion/curiosity, research skills and time management. Also, several top author studies are cited in his survey (Hsieh et al., 2004; Kiewra and Creswell, 2000). Moreover, Xu, Yalcinkaya and Seggie (2008), as a part of their research, identified the most prolific authors in six leading international business journals.

### **Methodology**

This study is based on the scientific production generated by top ten Iranian scientists as reflected in Social Science Citation Index (SSCI), Science Citation Index (SCI), and Arts and Humanities Citation Index (A&HCI). The time period considered in this study is 1990-2007. SSCI, SCI, and A&HCI were searched by country (cu) field by limiting it to the period between 1990-2007. The papers so identified were then classified by the name of authors. Then the ten top scientists whose productivity was seen to be most optimally were identified and their scientific productions and authorship patterns were analyzed. The authors examined the bibliographic information of these productions manually to determine their domestic/international collaborations. After analysis of the results, the proportion of documents written by more than one author and the overall and partial level of collaboration by Iranian scholars were investigated. It should be mentioned that, a paper must be signed by

at least two authors to be considered a collaborative activity (Lariviere, Gingras, and Archambault, 2006).

Finally, a citation analysis was done to compare the quality of collaborative productions versus non-collaborative ones. The data obtained were subsequently represented using Microsoft Excel software.

Specifically, this study was designed to address the following questions:

- 1- How is the authorship pattern of top ten Iranian scientists?
- 2- Which authorship patterns have received more citations?
- 3- Is there any relationship between the extent of collaboration and number of citations?
- 4- How do Iranian top scientists collaborate with other nations' scientists in their scientific productions?

### **Findings**

#### ***How is the authorship pattern of top ten Iranian scientists?***

This section provides insight into top scientists' authorship patterns and analyzes articles written by them to determine authorship patterns of Iranian scholars.

The top 10 Iranian authors of the period are listed below in Table 1. This table ranks authors by number of publications. Findings revealed that during 1990-2007, 2650 articles were written by top ten Iranian authors. As can be understood from Table 1, most of articles written by Iranian scientists are the result of collaboration. In other words, the vast majority of articles were written by multiple authors. It was interesting to know, who has been the most productive author among Iranian authors during 1990-2007. Findings showed that M. Shamsipour with 463 articles is the most productive scientist of Iran during the period. M. M. Heravi with 365 articles and M. Ganjali with 283 articles appeared in the table at second and third positions, respectively. M. Ganjali, E. Yavari, A. Dehpour, and M. Zarrin Dast contributed no article singly. In other words, all of their articles are collaborative ones. M. Shamsipour, M. Heravi, and A. Mousavi Movahhedi had one single-authored article only and their other articles are the result of collaboration. M. Dehghan with 52 documents is the most productive scientist in single-authored articles. Regarding two-author-articles, M. Shamsipour with 121 documents, and E. Yavari and M. Dehghan with 70 documents were the most productive authors. Regarding 3-author-articles, E. Yavari with 112 documents and M. Shamsipour with 102 documents were the most productive authors. Also, results revealed that the frequency of more-than-three-author articles is higher than other categories. Out of 2650 articles, 2589 (97/69%) articles have been contributed by two or more authors and only 61 (2/31%) by single author.

Table 1

*Authorship Pattern of Top Ten Iranian Authors*

Rank	Name of author	Field of study	Single author	Two-author	Three-author	More-than-three-author	total
1	M. Shamsipour	Chemistry	1	121	102	239	463
2	M. M. Heravi	Chemistry	1	28	83	253	365
3	M. Ganjali	Chemistry	0	3	33	247	283
4	E. Yavari	Chemistry	0	70	112	81	263
5	A. Dehpour	Pharmacy	0	7	37	197	241
6	M. Zolfi Gol	Chemistry	4	16	83	135	238
7	M. Zarrin Dast	Pharmacy	0	33	65	124	222
8	A. Mosavi Movahhedi	Chemistry	1	13	23	174	211
9	M. Dehghan	Mathematics	52	70	55	21	198
10	A. Shafiee	Pharmacy	2	15	42	107	166
Total	-	-	61	376	635	1578	2650

***Which authorship patterns have received more citations?***

In assessment of scientific performance, bibliometric and citation indicators are among the most important impact measures of scientific literature (Davarpanah & Aslekia, 2008). The second research question asked which authorship patterns have received more citations.

Table 2 details the minimum, maximum, mean, and standard deviation of citations received by articles of top ten Iranian scientists in four different authorship patterns. As can be seen, the category of more-than-three-author articles with the mean of 120/5 received higher citations. Three-author articles (47/60), two-author articles (28/70), and single-author articles (5/30) are at the next positions, respectively.

Table 2

*Total Citations to Top Authors' Articles*

No. of citations	No. of scientists	Minimum	Maximum	Mean	Standard Deviation
Citation to single-author articles	10	1	52	5/30	14/70
Citation to two-author articles	10	2	121	28/70	33/53
Citation to three-author articles	10	10	112	47/60	27/49
Citation to more-than-three-author articles	10	8	247	120/50	65/57

In the next step, the results are shown at three different citation ranges (10-50, 50-100, and 100-200) to gain a better understanding (Table 3). Findings revealed that the range of 10-50 has received the higher mean for citations. In this range, more-than-three-author articles acquired the most number of citations. These results are consistent with former findings of the study mentioned above.

Table 3

*Distribution of Citations in Three Ranges*

No. of citations	Minimum	Maximum	Mean	Standard Deviation
single-author articles (10-50)	0	47	5/10	14/74
single-author articles (50-100)	0	1	0/10	0/32
single-author articles (100-200)	0	1	0/10	0/32
two-author articles (10-50)	2	106	28	32/12
two-author articles (50-100)	1/57	5	0/70	1/57
two-author articles (100-200)	0	0	0	0
three-author articles (10-50)	26/31	80	46	26/31
three-author articles (50-100)	1/48	4	1/20	1/48
three-author articles (100-200)	0/84	2	0/40	0/84
more-than-three-author articles (10-50)	61/27	201	117/10	61/27
more-than-three-author articles (50-100)	5/64	16	3/30	5/64
more-than-three-author articles (100-200)	0/42	1	0/20	0/42

*Is there any relationship between the extent of collaboration and number of citations?*

As cited in literature review, there are many researches which confirm the relationship between co-authorship and number of citations. Table 4 details the analysis of descriptive statistics of top ten Iranian scientists. Mean (1) is the average of citations to each scientist and Mean (2) is the average of articles written by each scientist. As expected, M. Shamsipour due to the number of his articles, collaboration, and citations acquired the highest mean (103/5). M. M. Heravi with the mean of 68/5 is in the second rank of citations received. It is interesting to note that though M. Dehghan had the majority of single-authored articles, because of his low collaboration, acquired the lowest mean (27/25).

Table 4

*The Average of Articles & Citations per Author*

Name	M. Shamsipour	M. Ganjali	M. Zolfigol	E. Yavari	M. M. Heravi	A. Shafiee	A. Dehpour	A. Mousavi	M. Zarrindast	M. Dehghan
Mean (1)	103/5	58	51/75	48/75	68/5	31/25	40/5	29/5	46	27/25
Mean (2)	115/25	70/25	59/5	65/75	91/25	41/5	60/25	52/75	55/05	49/5
Standard Deviation (1)	89/36	95/65	52/03	33/8	84/7	36/2	61/07	49/17	43	16/92
Standard Deviation (2)	97/56	118/66	61/17	47/3	113/13	46/74	92/57	81/3	52/82	20/57

***How do Iranian top scientists collaborate with other nations' scientists in their scientific productions?***

Collaborating with colleagues is an obvious important factor in becoming a successful scholar. Working with one's colleagues provides an important forum for exchanging and brainstorming ideas. In addition, it is a strong motivating factor (Mayrath, 2008). In the analysis of research communities, the emphasis is being placed on cooperation of scientists from the same country or from different ones, given the beneficial effects on many aspects of scientific activity, from researcher training to result visibility (Osca-Lluch et al., 2009). Kim (2006) believes that "International research collaboration in developing countries often functions as a way to attain knowledge and techniques from advanced countries". Table 5 illustrates the collaboration of Iranian top scientists with other nations' scholars in their scientific productions. A. Mousavi Movahhedi ranked first with 35 (16/4%) internationally co-authored articles. M. Shamsipour with 19 internationally co-authored articles, and M. Dehghan with 12 articles are at the second and third ranks, respectively. It is interesting to know that although M. Zolfigol has published 239 articles in ISI-ranked journals, only one of his articles is the result of international collaboration. As can be understood from the table, Iranian scholars work with collaborators in other nations; however, the collaboration rate is low.

Table 5

*International Collaboration of Top Ten Authors*

Name	Total No. of articles	No. of internationally co-authored articles	percentage
M. Shamsipour	463	19	4/1
M. Ganjali	282	6	2/1
M. Zolfigol	239	1	0/4
E. Yavari	263	7	2/7
M. M. Heravi	365	10	3/8
A. Shafiee	199	2	1/01
A. Dehpour	241	9	3/7
A. Mousavi Movahhedi	213	35	16/4
M. Zarrindast	223	2	0/9
M. Dehghan	198	12	6/1

### Discussion and Conclusion

This paper was the first attempt at studying scientific production of top ten Iranian authors using bibliometric techniques focused on the analysis of authorship patterns of these authors. Different conclusions can be drawn from the findings mentioned above.

As shown in Tables 1-5, top ten Iranian authors wrote 2650 articles during 1990-2007. Findings revealed that M. Shamsipur is the most productive Iranian author during 1990-2007. All of articles written by M. Ganjali, E. Yavari, A. Dehpour, and M. Zarrindast are the results of collaborative research. Further analysis showed that there have been written on average 14/72 articles per year by each author, and 265 articles per author in 18 years. Comparison of top authors in different countries, their average scientific production, and authorship patterns requires another interesting study.

Authorship pattern analysis discovered that, out of 2650 articles studied, 2589 (97/69%) were done jointly by two or more authors and only 61 (2/31%) articles were done singly. Results revealed that Iranian top authors have great tendency to publish their articles collaboratively. Therefore, the extent of collaborations among Iranian authors is very high. It seems that there is a remarkable difference between the number of collaborative articles of Iranian authors and non-collaborative ones. The reasons for such collaboration can be topic of a different study.

On the other hand, the citation analysis showed that the collaborative works received more citations than non-collaborative ones. Therefore, it can be mentioned that co-authorship raises the number of citations. In other words, findings of this study revealed that the number



of authors involved in the preparation of a paper has a positive direct effect on the number of citations. It seems that “several authors and groups sharing ideas, technology and experience generate higher quality papers than a single author working alone” (Iribarren-Maestro, Lascurain-Sanchez, & Sanz-Casado, 2009). These results concur with the findings reported by other researchers (Beaver, 1986; Sooryamoorthy, 2009; Jonkers, 2009; Iribarren-Maestro, Lascurain-Sanchez & Sanz-Casado, 2009 and Melo, Bini, & Carviho, 2006), according to which multi-authorship enhances paper quality.

Finally, while Iranian top authors tend to publish their researches collaboratively, findings revealed that out of 2650 articles written by Iranian top authors, only 103 (3/88%) are internationally collaborated articles. It seems that such a poor international collaboration is due to the fact that a face-to-face relationship is easier than distant relationship. In other words, "collaboration is more difficult over distances than being done locally" (Borgman, 2007).

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