

# Iran and its Regional Counterparts in WoS (2003-2007)

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## *Abstract*

Using Document Study method as well as comparative analysis, this research deals with evaluation and comparison of indexed scientific products of Iran, Turkey, Egypt, Pakistan and Saudi Arabia in WoS during the 5 years between 2003 and 2007. The most important objectives of this research include the comparison of papers of each country regarding 'variety of language', 'variety of types of documents', 'subject areas', 'participant bodies' and 'number of papers and their growth rate'. Moreover, evaluation of ideality of performance of papers of these countries on the basis of the mingled indicator of "Average Gross Domestic Product (GDP) in comparison with the Indexed Scientific Products" is another issue discussed in this paper. The results show that although Iran is placed between Turkey and Egypt regarding its number of papers in WoS, it is placed after these two countries considering its performance of indexed scientific products in WoS.

## *Keywords:*

Production of science, scientific products, Iran, Turkey, Egypt, Pakistan, Saudi Arabia, Institute for Scientific Information (ISI), Web of Science (WoS).

## *1. Introduction*

Although "comparative study" has numerous advantageous, in general it can be stated that from a theoretical viewpoint, "comparative procedures" can help us reach new and comprehensive theories and frameworks. However, time, place and environmental situations should be taken into consideration to employ these theories and bring them into action.

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A comparative study of the situation of scientific products of Iran with its regional counterparts can be effective in identifying the performance of these countries in producing science which can be considered as one of the most important research output indicators of each country. It can also provide research policy makers with the available strengths and weaknesses. On the same basis, these studies can make it possible to distinguish the existing gaps between Iran and its regional counterparts and can provide Iranian research planners with useful information to lead Iran's major research plans in order to reach its regional purposes and outpace its regional counterparts regarding the growth of its indexed scientific products; because "scientific products in international indexes" is regarded as one of the most important indicators of evaluation of research and development of countries and is considered as output indicators of science and technology. Therefore, knowing the extent of ideality of performance of these countries according to their income and identifying their growth rate regarding the number of their papers in international indexes are considered as the most important aspects of scientometrical comparative studies; because we can use the results of this research in other researches dealing with multilateral analysis of scientific development of countries. On the same basis, scientometrists have always paid attention to WoS as one of the most important databases of 'Institute for Scientific Information' (ISI) which makes it possible to search and gain information about the indexed scientific products of countries. Using bibliometric and scientometrical indicators as well as referring to the data in WoS, the situation of papers of Iran, Turkey, Egypt, Pakistan and Saudi Arabia during the years between 2003 and 2007 is studied and analyzed in this article.

## *2. Methodology*

The data in this account was collected from WoS during February 20 to March 19, 2008 and was analyzed via comparative method. The data in this research covers papers which were indexed in WoS during the five years between 2003 and 2007. WoS was searched by country (cu) field by limiting it to the above-mentioned years. In assessing the development of scientific products, the entities which have had at least one paper have been considered acceptable. The entities with no papers were not included in the assessment.

## *3. Purpose of the Study*

The most important purpose of this research is the study and comparison of the situation and characteristics of papers of Iran, Turkey, Egypt, Saudi Arabia and Pakistan which are known as the most important Islamic countries in the Middle East. On the same basis, evaluation and analysis of their growth rate, percentage of subject areas and participant bodies, diversity of language and types of documents in WoS during the 5 years between 2003 and 2007 are also considered as the major objectives of this research. Furthermore, another objective of this research is to provide a real image of the ideality of performance of each country regarding the number of their indexed scientific products considering their outcome and employing the mingled indicator of "Average Gross Domestic Product (GDP) in comparison with the Indexed Scientific Products in WoS".

## *4. Total papers of countries in WoS*

As shown in table 1, Iran had 28531 papers in WoS during the 5 years between 2003 and 2007. Although the number of Iranian papers has been constantly increasing, it enjoyed a greater increase in 2005 (Thompson Scientific, 2008).

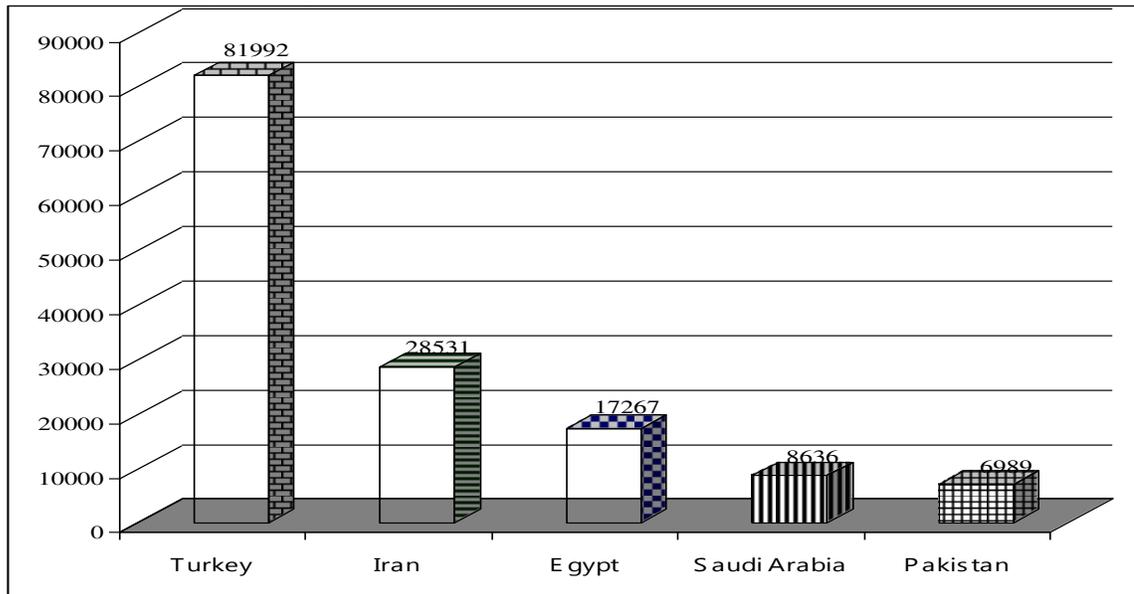
Table 1. Comparison of Papers of Countries in WoS

Year	Iran	Growth %	Turkey	Growth %	Egypt	Growth %	Pakistan	Growth %	Saudi Arabia	Growth %
2003	3283	-	12576	-	3289	-	890	-	1834	-
2004	3855	17.42	14119	12.27	2948	-10.37	1047	17.64	1582	-13.74
2005	5582	44.80	17725	25.54	3463	17.47	1265	20.82	1754	10.87
2006	6750	20.92	17912	1.06	3589	3.64	1656	30.91	1627	-7.24
2007	9061	34.24	19658	9.75	3980	10.89	2131	28.68	1839	13.03

During these 5 years, Turkey, with 81992 papers in WoS, had a better situation than Iran. As shown in table 1, the number of Turkish papers was nearly three times more than the number of Iranian papers. Turkey had its highest growth rate in 2005 which was approximately 25.54% and this rate has decreased since then. Iran's growth rate in 2005 was almost twice more than Turkey's; furthermore, Iran's growth rates were higher than Turkey's in both 2003 and 2007. This point can indicate the fact that Iranian researchers have been increasingly paying more attention to publishing their papers in internationally indexed journals. If Iran continues to have the same growth rate in the future, it will soon have more papers than Turkey in WoS. On the other hand, Pakistan had higher growth rates in 2006 and 2007 in comparison with its growth rate in the other years under the study. This increase certainly shows the greater extent of attention of Pakistani researchers to this matter. Even Egypt and Saudi Arabia which had negative growth rates from 2003 to 2007 had positive growth rates in 2007.

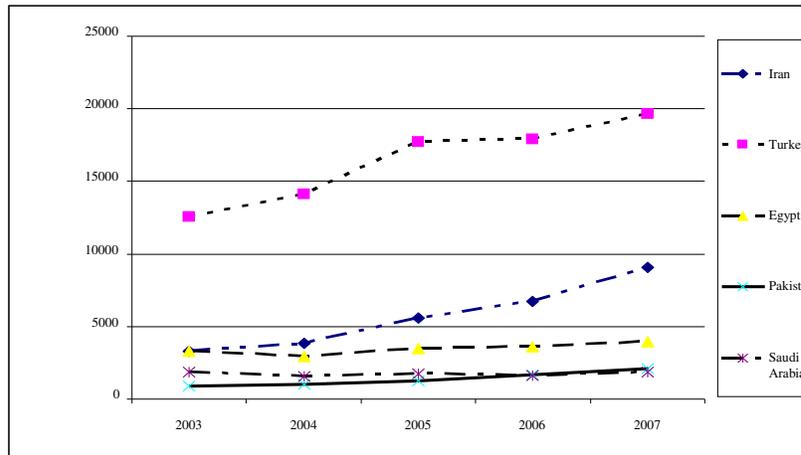
Graph 1 makes it possible to compare total number of papers of these countries in WoS during 2003 and 2007. It shows that Turkey and Pakistan had respectively the highest and lowest number of papers in WoS during the mentioned years. Iran is placed after Turkey, on the 2nd rank.

Fig. 1: Comparison of Papers of Countries in WoS from 2003 to 2007



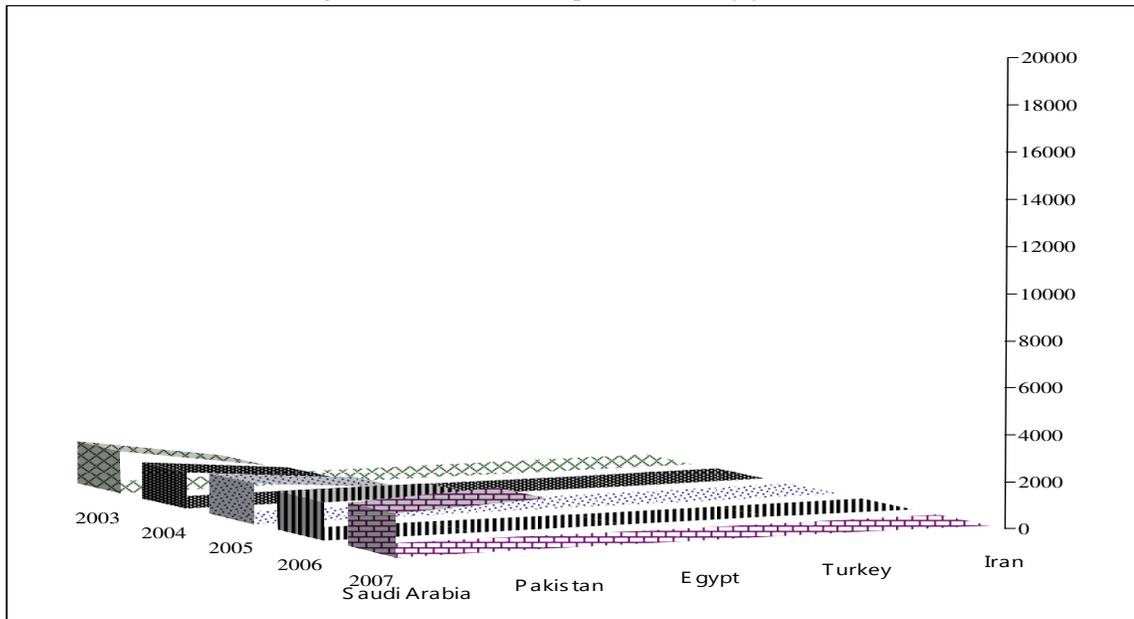
As graph 2 shows, total number of papers of the countries under the study increased in WoS; however, Iran, Turkey and Egypt had the highest growth rate in 2005. This is while the highest growth rate of Pakistan was seen during the years 2006 and 2007 and Saudi Arabia had its highest growth rate in 2007.

Fig. 2: Growth Rate of Papers in WoS from 2003 to 2007



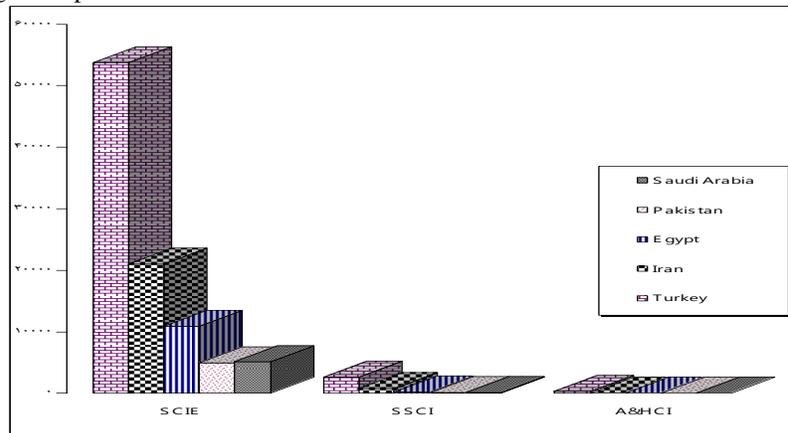
Graph 3 demonstrates the situation of papers of each country by the years and makes it possible to compare the changes that occurred during these 5 years. As shown in graph 3, although Turkey had more number of papers in WoS in comparison with the other countries under the study, Iranian papers have been constantly increased and made its total number of papers closer to Turkey's. Furthermore, graph 3 shows that total number of papers of Pakistan in WoS was less than total number of papers of Saudi Arabia from 2003 to 2005, however, it increased in both 2006 and 2007.

Fig. 3: Growth Rate of Papers in WoS, by year



Graph 4 makes it possible to compare number of papers of each country according to different sections of WoS. In general, it shows that all these countries had more papers in Science Citation Index-Expanded (SCIE) which mainly covers medicine, engineering and pure sciences. They all had fewer papers in Social Science Citation Index (SSCI) and Art & Humanities Citation Index (A&HCI) which include respectively subject areas of social sciences and art & humanities.

Fig. 4: Papers of these Countries in Different Sections of WoS from 2005 to 2007



On the same basis, Turkey and Saudi Arabia held respectively the most and the least number of papers in social sciences and art & humanities in comparison with other countries under the study. Iran was placed after Turkey on the 2nd rank. A comparison of the papers in the two sections of SSCI and A&HCI shows that each of these countries had more papers in social sciences than arts and humanities.

### 5. Comparison of Papers in WoS, by Types of Documents

The increase in the variety of papers of each country in internationally citation indexes can indicate that researchers pay more attention to publishing their papers in types which can be indexed. Thus, a study of situation of scientific productions of countries according to their “types of document” and comparing them with other countries can provide useful information. On the same basis, ISI divides all types of documents in WoS into 34 different types in order to evaluate the papers more precisely.

Table 2. Comparison of Papers in WoS, by Types of Documents

Types of Documents	Iran	Percentage	Turkey	Percentage	Egypt	Percentage	Pakistan	Percentage	Saudi Arabia	Percentage
Article	24469	85.76	67919	82.82	14979	86.73	6148	78.97	7005	81.11
Meeting Abstract	2962	10.38	7545	9.20	1572	9.1	366	5.24	781	9.04
Letter	447	1.57	3459	4.21	156	0.9	149	2.13	338	3.91
Review	292	1.02	1235	1.53	283	1.64	156	2.23	253	2.93
Editorial	246	0.86	1315	1.61	137	0.79	117	1.67	228	2.64
Correction	71	0.25	259	0.32	50	0.29	30	0.43	17	0.20
NEWS Item	20	0.07	20	0.02	6	0.03	5	0.07	1	0.01
Book Review	19	0.06	172	0.21	83	0.48	11	0.16	5	0.06
Biography	4	0.014	24	0.03	2	0.01	5	0.07	8	0.09
Bibliography	-	-	1	0.0012	-	-	1	0.01	-	-
Software Review	-	-	1	0.0012	-	-	-	-	-	-
Hardware Review	-	-	1	0.0012	-	-	-	-	-	-
reprint	-	-	7	0.009	3	0.02	1	0.01	-	-

Databases Review	1	0.003	-	-	-	-	-	-	-	-
Movie Review	-	-	6	0.007	-	-	-	-	-	-
Poetry	-	-	4	0.005	-	-	-	-	-	-
Theater Review	-	-	4	0.005	-	-	-	-	-	-
Art galleries Review	-	-	1	0.0012	-	-	-	-	-	-

Table 2, which contains the information about the types of indexed documents in WoS during 2003 to 2007, shows that “articles” and “meeting abstracts” comprise more than 80% of papers of these countries. However, the variety of documents of other papers of these countries differed from one another. For instance, Iranian and Egyptian papers consisted of 10 types of documents while Turkish papers were categorized under 17 types. Moreover, Pakistani and Saudi Arabian papers included respectively 11 and 9 types of documents. Considering the fact that all papers of these five Islamic countries in WoS were categorized under 18 types, it must be stated that they did not have any papers in 16 other types of documents such as “TV Review, Radio Review”, “Theater Review”, “Music Score Review”, “Music Score”, “Music Performance Review”, “Fiction, Creative Prose” and “Excerpts”.

It should also be mentioned that although both Iranian and Egyptian papers included 10 types of documents, it does not show the same extent of variety between their papers. That’s because Iran and Egypt had respectively 28531 and 17267 papers which shows that Egyptian papers enjoyed more variety than Iranian papers.

## 6. Comparison of Papers in WoS, by Language

The variety of languages in papers of each country could indicate shared scientific interactions between its researchers and other countries researchers. These interactions might include the exchange of instructors and students, the conduct of shared research projects, etc. Sientometrists have always paid special attention to the variety of languages. According to Thomson Scientific 2007, it was possible to index sources in 49 different languages in WoS at the time of this research. However, table 3 shows that Turkey had all its papers during the years between 2003 and 2007 in 22 different languages. In contrary, Egyptian, Iranian, Saudi Arabian and Pakistani papers were respectively published in 12, 8, 6 and 5 various languages.

Table 3. Comparison of Papers in WoS, by Types of Documents

Language	Iran	Percentage	Turkey	Percentage	Egypt	Percentage	Pakistan	Percentage	Saudi Arabia	Percentage
English	28500	99.89	81219	99.05	17243	99.84	6982	99.90	8621	99.83
French	17	0.06	50	0.06	5	0.03	2	0.03	10	0.12
German	6	0.02	137	0.17	11	0.06	1	0.01	2	0.02
Russian	1	0.003	56	0.07	-	-	1	0.01	1	0.01
Hungarian	-	-	1	0.001	-	-	-	-	-	-
Chinese	3	0.01	2	0.005	1	0.006	3	0.04	1	0.01
Italian	2	0.007	3	0.005	2	0.01	-	-	-	-
Spanish	1	0.003	12	0.01	3	0.02	-	-	-	-
Turkish	1	0.003	472	0.57	1	0.006	-	-	-	-
Polish	-	-	13	0.02	1	0.006	-	-	-	-

Croatian	-	-	6	0.01			-	-	-	-
Czech	-	-	6	0.01	1	0.006	-	-	-	-
Danish	-	-	4	0.005	1	0.006	-	-	-	-
Romanian	-	-	4	0.005			-	-	-	-
Japanese	-	-	3	0.005	1	0.006	-	-	-	-
Slovene	-	-	3	0.005	-	-	-	-	-	-
Welsh	-	-	3	0.005	-	-	-	-	1	0.01
Norwegian	-	-	2	0.005	-	-	-	-	-	-
Slovak	-	-	2	0.005	-	-	-	-	-	-
Latin	-	-	1	0.001	-	-	-	-	-	-
Portuguese	-	-	1	0.001	1	0.006	-	-	-	-
Ukrainian	-	-		0.001	-	-	-	-	-	-

Therefore, although total number of Egyptian papers is much less than total number of Iranian papers during the 5 years between 2003 and 2007, languages of Egyptian papers enjoy a greater variety than Iranian papers. Moreover, it is confirmed by many researches that most of the papers in the world are published in English; table 3 also shows that more than 99 percent of papers of these countries in WoS were published in English as well. However, Turkish had an outstanding role in publishing Turkish papers; as seen in table 3, Turkish is the second significant language in publishing Turkish papers.

Although Persian is included in the 49 languages of WoS, none of Iranian papers were published in Persian. This point can be certainly related to the fact that no Persian journals were included in WoS so far.

Another important point is the presence of German and Chinese papers among the published papers during 2003 and 2007 which is resulted from the interactions between Islamic scientists with German and Chinese scientists in economic, commercial, scientific, technical and cultural fields.

### *7. Comparison of Papers in WoS, by Subject Areas*

Evaluating papers by their subject area is one of the most important studies that require scientometrical indicators. However, this point should be taken into consideration that it is essentially inaccurate to compare different fields of study with each other, regarding the number of papers they have published. However, comparison of scientific products in a special field with similar fields of study in the countries of the same level can be a suitable context for providing information about the situations of each field of study in associated countries (Gange and Archambault, 2004). That's because the outcomes of such studies make it possible to evaluate the scientific activities of scientists in different subject areas, to identify subject areas which are more frequently employed by other countries, to judge about the situation of different countries regarding the employed subject areas and to provide research policy makers with more precise information.

Tables 4 to 8 present top 5 subject areas in which these countries published the most number of papers.

Table 4. Iranian Papers in WoS during 2003 and 2007, by subject area

No.	Subject Areas	Number	Percentage
1	CHEMISTRY, MULTIDISCIPLINARY	1967	6.89
2	CHEMISTRY, ANALYTICAL	1284	4.50
3	CHEMISTRY, PHYSICAL	1220	4.28
4	PHARMACOLOGY & PHARMACY	1151	4.03
5	ENGINEERING, CHEMICAL	1102	3.86

The study reveals that 23.56 percent of Iranian papers in WoS during the years between 2003 and 2007 belonged to the 5 subject areas presented in table 4. As seen in this table, “chemistry” and its related sciences along with “pharmacology and pharmacy” enjoyed the highest percentage.

Table 5. Turkish Papers in WoS during 2003 and 2007, by subject area

No.	Subject Areas	Number	Percentage
1	SURGERY	5932	7.23
2	PEDIATRICS	3408	4.16
3	CLINICAL NEUROLOGY	3337	4.07
4	PHARMACOLOGY & PHARMACY	2988	3.64
5	CARDIAC & CARDIOVASCULAR SYSTEMS	2749	3.35

Table 5 shows that subject areas such as “surgery”, “pediatrics” and “pharmacology and pharmacy” were dominant ones in Turkish papers. 22.45 percent of all Turkish papers in WoS during 2003 and 2007 were about the subject areas mentioned in table 5.

Table 6. Egyptian Papers in WoS during 2003 and 2007, by subject area

No.	Subject Areas	Number	Percentage
1	CHEMISTRY, MULTIDISCIPLINARY	937	5.43
2	MATERIALS SCIENCE, MULTIDISCIPLINARY	877	5.08
3	PHARMACOLOGY & PHARMACY	877	5.08
4	POLYMER SCIENCE	717	4.15
5	CHEMISTRY, INORGANIC & NUCLEAR	669	3.87

The prevailing subject areas in Egypt included areas related to “chemistry” and “pharmacology and pharmacy”. The subject areas mentioned in table 6 comprised 23.61 percent of all Egyptian papers in WoS during the years between 2003 and 2007.

Table 7. Pakistani Papers in WoS during 2003 and 2007, by subject area

No.	Subject Areas	Number	Percentage
1	PLANT SCIENCES	792	11.33
2	CHEMISTRY, MULTIDISCIPLINARY	790	11.30
3	CHEMISTRY, MEDICINAL	323	4.62
4	BIOCHEMISTRY & MOLECULAR BIOLOGY	274	3.92
5	PHARMACOLOGY & PHARMACY	269	3.85

Table 7 shows that 35.02 percent of all Pakistani papers in WoS between 2003 and 2007 consisted of subject areas such as “plant sciences”, “biochemistry and molecular biology”, “chemistry” and “pharmacology and pharmacy”. A significant point about Pakistani papers is that “plant sciences” outnumbered other subject areas.

Table 8. Saudi Arabian Papers in WoS during 2003 and 2007, by subject area

No.	Subject Areas	Number	Percentage
1	MEDICINE, GENERAL & INTERNAL	1329	15.39
2	SURGERY	384	4.45
3	MATHEMATICS, APPLIED	365	4.23
4	PHARMACOLOGY & PHARMACY	338	3.91
5	CHEMISTRY, ANALYTICAL	259	3.00

30.98 percent of Saudi Arabian papers in WoS during 2003 and 2007 covered subject areas such as “medicine”, “Applied mathematics”, “chemistry” and “pharmacology and pharmacy” which are already mentioned in table 8.

In general, it can be stated that “chemistry” and “pharmacology and pharmacy” played a considerable role in the papers of all the countries under the study. Having more papers in “chemistry” can be resulted due to different factors such as special attention of research plans to investing more on this subject area, greater number of researchers in this subject area, its wider range and sub-fields or different nature and procedure of production of science in “chemistry”. Although these two subject areas are shared among the top subject areas of all these countries, there are some differences between other subject areas; as seen in tables 4 to 8, Turkey and Saudi Arabia paid more attention to “medicine”, Egypt to “polymer sciences” and “multidisciplinary”, Pakistan to “plant sciences” and “plant sciences” and “molecular biology and biochemistry”. However, there are no other subject areas besides “chemistry” and “pharmacology and pharmacy” among the top 5 subject areas in Iranian papers as mentioned in table 4.

## 8. The Top Organizational Contributors in WoS

Tables 9 to 13 demonstrate the top 5 organizations in each country with the highest number of papers in WoS during 2003 and 2007.

Table 9. Top Iranian Organizations in WoS between 2003 and 2007

No.	Organization	Number	Percentage
1	TEHRAN UNIV	3324	11.65
2	TEHRAN UNIV OF MEDICAL SCIENCES	2175	7.62
3	SHARIF UNIV OF TECHNOLOGY	2024	7.09
4	TARBIAT MODARES UNIV	1836	6.43
5	SHIRAZ UNIV	1442	5.40

As mentioned in table 9, “Tehran University”, “Tehran University of Medical Sciences”, “Sharif University of Technology”, “Tarbiat Modares University” and “Shiraz University” are respectively the top 5 Iranian bodies which had the most number of papers in WoS during the 5 years between 2003 and 2007. It should be mentioned that 38.19 percent of all Iranian papers during the mentioned years belonged to these 5 universities.

Table 10. Top Turkish Organizations in WoS between 2003 and 2007

No.	Organization	Number	Percentage
1	HACETTEPE UNIV	5044	6.16
2	ANKARA UNIV	4937	6.02
3	GAZI UNIV	3800	4.63
4	ISTANBUL UNIV	3721	4.54
5	MIDDLE E TECH UNIV	3453	4.21

Table 10 shows that the 5 Turkish bodies which had the most number of papers in WoS between 2003 and 2007 are also among Turkish universities. During this period, more than 25.56 percent of Turkish papers belonged to these 5 universities. Considering the fact that the percentage of

papers produced by the above-mentioned Turkish bodies was less than the percentage of papers produced by the top 5 Iranian universities, it can be concluded that the number and percentage of other Turkish bodies in WoS was more than the number and percentage of Iranian bodies which were active in WoS. As seen in table 9, more than 1/3 of Iranian papers belonged to these 5 universities while according to table 10, the 5 Turkish universities covered more than ¼ of Turkish papers in WoS.

Table 11. Top Egyptian Organizations in WoS between 2003 and 2007

No.	Organization	Number	Percentage
1	CAIRO UNIV	3029	17.54
2	AIN SHAMS UNIV	1845	10.68
3	NATL RES CTR	1623	9.40
4	UNIV ALEXANDRIA	1398	8.09
5	MANSOURA UNIV	1163	6.73

Table 11 illustrates a similar situation in Egypt as well. However, there is a research institute among the top 5 Egyptian bodies with the most number of papers in WoS which makes its situation a little different from Iran and Turkey's. Approximately 52.44 percent of Egyptian papers in WoS belonged to these 5 bodies. In other words, more than half of Egyptian papers belonged to the 5 organizations pointed out in table 11. Thus, other Egyptian organizations had much less share in this regard.

Table 12. Top Pakistani Organizations in WoS between 2003 and 2007

No.	Organization	Number	Percentage
1	QUAID I AZAM UNIV	1078	15.42
2	UNIV KARACHI	1004	14.36
3	AGA KHAN UNIV	584	8.35
4	UNIV AGR FAISALABAD	494	7.07
5	UNIV PUNJAB	404	5.78

Table 5 shows that the 5 Pakistani organizations with the most number of papers in WoS were among its universities. Thus, 50.98 percent of Pakistani papers in WoS during the years between 2003 and 2007, which constituted more than half of the total number of Pakistani papers, belonged to these 5 universities. Therefore, there is a similarity between the share of top 5 bodies of Pakistan and Egypt.

Table 13. Top Saudi Arabian Organizations in WoS between 2003 and 2007

No.	Organization	Number	Percentage
1	KING SAUD UNIV	1672	19.36
2	KING FAHD UNIV PETR & MINERALS	1489	17.24
3	KING FAISAL SPECIALIST HOSP & RES CTR	1319	15.27
4	KING ABDULAZIZ UNIV	471	5.45
5	KING FAISAL UNIV	312	3.61

In table 13, the same situation applied to Saudi Arabia as well. The top 5 Saudi Arabian bodies mentioned in table 13 had a greater share than the top 5 organizations of other countries under the study. More than 60.93 percent of Saudi Arabian papers in WoS during 2003 and 2007 belonged to these organizations. There is also a hospital and research center among the top 5 Saudi Arabian bodies which is considered significant.

Thus, there is a negative relationship between total number of papers of each country and the share of its top 5 bodies. In other words, as the total number of papers of Iran, Turkey and Egypt increased, the share of their top organizations decreased. On the same basis, the share of the five

organizations in Pakistan and Saudi Arabia which had fewer papers in WoS was more than the share of top 5 bodies in other countries which had more papers in WoS.

### 9. Comparison of Papers in WoS according to GDP (current US \$)

Mingled indicators of development and progress are used in scientometrics studies in order to evaluate the extent of ideality of performance of each country regarding the number of its indexed scientific products. One of the most important procedures is the comparison of the number of papers of a country with its income. “Gross Domestic Product (GDP) in comparison with the Indexed Scientific Products” is considered as one of the most significant mingled indicators, because it reveals the extent of GDP of each country in producing an indexed paper of that country. In addition, it has a direct relationship with the extent of efficiency of countries regarding indexed scientific products, because “efficiency” is the number of references that have been used in producing a paper and on the same basis, as the number of references that are used to produce a paper decreases, its efficiency increases (Lei & Slocum, 1991, p. 17- 29).

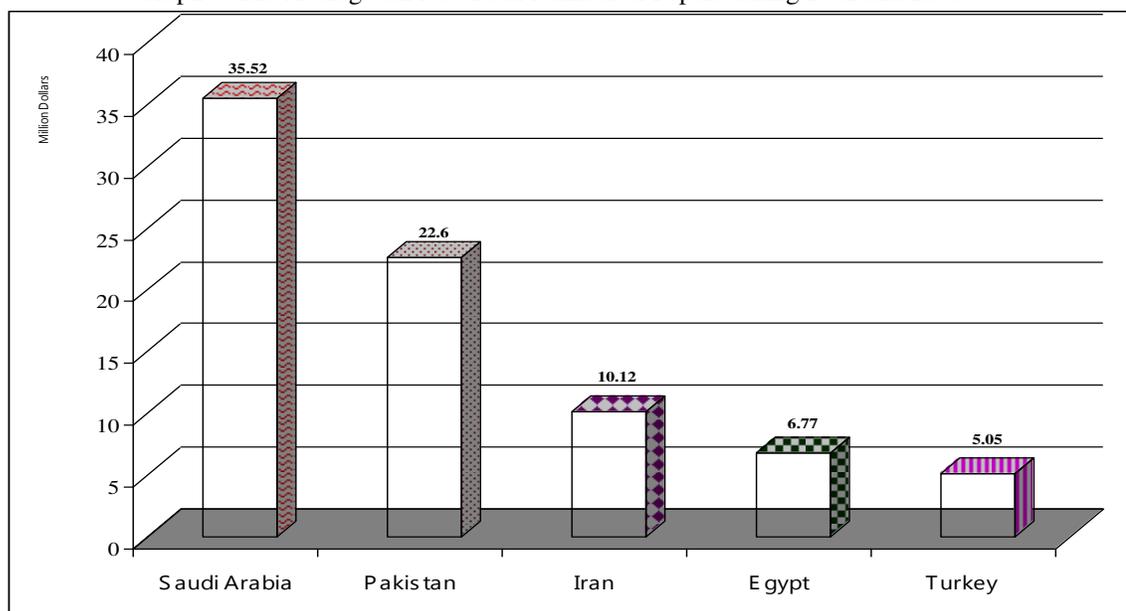
Table 14. GDP in Comparison with Indexed Papers in WoS during 2002 and 2005

Country	Average GDP (2002-2005)	Total Number of Indexed Papers In WoS	Average GDP for Each Paper
Saudi Arabia	240.810	6780	35.52
Iran	151.210	14944	10.12
Turkey	272.388	53968	5.05
Egypt	84.747	12513	6.77
Pakistan	90.171	3990	22.60

Therefore, as this digit increases in table 14, it shows a greater share of GDP for each paper. On the other hand, as this number decreases, it can indicate that countries have produced their papers with a less share of GDP. Table 14 shows that papers of Saudi Arabia and Pakistan were produced with a greater share of their GDP. In contrary, this share in Turkey and Egypt had a better situation than other countries under the study. According to table 14, Iran stands between Egypt and Pakistan.

Graph 5 is presented in order to compare the performance of countries. In this graph, higher columns indicate less ideality and the shorter ones show greater ideality. Therefore, countries such as Saudi Arabia and Pakistan did not have a suitable performance, because they did not have a suitable number of papers in comparison with their income. On the other hand, Turkey and Egypt produced more papers as their income increased which leads to having a better performance. Thus, although Iran had more papers than Egypt in WoS, it was placed on a lower level of ideality than Egypt because each of its papers was produced due to a greater share of its income. Turkey was placed higher than its regional counterparts regarding the number of papers in WoS; it was also placed on a higher level of ideality because it produced more papers with less share of its GDP.

Graph 5. The Average GDP to Total Number of Papers during 2002 and 2005



## 10. Conclusion

According to the study, Turkey, Iran, Egypt, Saudi Arabia and Pakistan had more papers in comparison with each other in WoS during the years between 2003 and 2007. A comparison of papers of the countries in WoS revealed that Turkey, Iran and Egypt had their highest growth rate in 2005, while Pakistan and Saudi Arabia had respectively their highest growth rates in 2006 and 2007. The number and growth rate of Pakistani papers had a greater increase than Saudi Arabian papers during 2006 and 2007. On the same basis, it can be concluded that Saudi Arabia and Pakistan, which did not have suitable situations during previous years regarding the number of papers in WoS, have recently paid more attention to this issue. A comparison of papers in different sections of WoS also shows that most of papers of these countries covered subject areas such as ‘medical sciences’, ‘engineering’ and ‘pure sciences’ while they had little share in subject areas such as ‘social sciences’, ‘humanities’ and ‘arts’. Turkey, Iran, Egypt, Pakistan and Saudi Arabia had respectively more papers in “social sciences”, ‘humanities’ and ‘arts’. More than 80 percent of the documents in WoS include ‘articles’ and ‘abstract of conferences’. Turkey enjoys the greatest variety of types of documents and Saudi Arabia had the least variety in this regard. Although 99 percent of the papers in WoS were written in English, Turkish, the native language of Turkey, had the second place in Turkish papers in WoS. Pakistani papers had the least variety of language and Iran was placed after Turkey and Egypt, considering the variety of languages used in their papers. ‘chemistry’ and ‘pharmacology and pharmacy’ were among the top 5 subject areas of all the countries under the study which can show the attention of scientists in all these countries to these two subject areas. In addition, since ‘medical sciences’ in Turkey and Saudi Arabia, ‘polymer sciences’ and ‘multidisciplinary’ in Egypt and ‘plant sciences’ and ‘molecular biology and biochemistry’ in Pakistan were among the top 5 subject areas, it can be concluded that each of these countries paid special attention to the above-mentioned subject areas as well. On the other hand, sub-fields of ‘chemistry’ as well as ‘pharmacology and pharmacy’ were the only subject areas among the top 5 subject areas of Iranian papers. Moreover, a study of the organizations involved in WoS revealed that most of the scientific products of these countries belonged to their top 5 bodies which were mainly regarded as universities. However, there is a

non-academic organization among the top 5 bodies in Egypt and Saudi Arabia which is considered as a research center. It was furthermore discovered that there is a negative relationship between the total number of papers of each country and the share of its top 5 organizations. In other words, as the number of papers in Turkey, Iran and Egypt in WoS increased, the share of their top 5 organizations decreased. Furthermore, although Egypt is placed after Iran regarding the number of its papers in WoS, it had a better performance than Iran because it produced its papers with a less share of its GDP. On the same basis, Turkey, Egypt, Iran, Pakistan and Saudi Arabia had a better performance in comparison with each other.

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