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Scientific Impact of Islamic Nations

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Abstract

This article has attempted to present a clear image of science production by the member states of the Organization of Islamic Conference (OIC) based on the Essential Science Indicators (ESI). ESI indexes the most effective science productions of the world. The World Bank, on the other hand, has classified the countries of the world according to their economic position. Using the information accessible in these two sources, we examined the science production of each economic class, and then made a comparison between the Islamic and non-Islamic countries. The economic classes comprise the low-income, the lower middle-income, the upper middle-income, and the high-income nations. Our primary objective was to compare and contrast Islamic Countries versus the other countries of the world to show the status of their current scientific publications. Four major features characterize the statistical analysis of our study: population, economic class, citations, and publications in 22 disciplines and all fields of study as indexed in ESI.

Keywords: Islamic Countries, Scientific Assessment, Islamic World Science Citation Center (ISC), Essential Science Indicators (ESI).

Introduction

NATURE, one of the world's highly credited journals, has published a survey of the scientific position of the Islamic countries, which we believe is somewhat unilateral (Butler, 2006), (Giles, 2006) and (Fergany, 2006) and by no means precise. Butler (2006) states: "*The Islamic world encompasses remarkable diversity in political systems, geography, history, language and culture. But science in these nations is weak, with spending on research and development far lower than the global average. This much is acknowledged to be true, but what of the details behind the broad picture?* " The writer has given a misconstrued account of science in the Islamic world which suffers from lack of comprehensiveness. The statistics used in the paper are those of the World Bank and the United Nation agencies. The article has been written in 2006. However, the scientific publications of only 24 member states of the Organization of Islamic Conference –OIC have been presented for the period 1998-2003.

The authors of the present article are of the opinion that, in matters of the present nature, both strong and weak aspects of the subject in question must be made available to the readers, so that they may attain a fair and comprehensive picture of what they are after.

To this end, we examined the current state of science affairs in the Islamic countries to demonstrate their scientific impact from a different point of view. We used the statistics available at Thomson Reuters ESI (ISI, 2008), World Bank (World Bank, 2009), and the United Nations agencies (United Nations, 2009).

The Reuters possesses a well-known citation database and a wide range of information systems for indexing the core journals of the world. Web of Science, Journal Citation Reports, and Essential Science Indicators are some examples. On the basis of a threshold for each field of study, ESI makes a selection of highly cited papers and most effective sources. Regarding scholars, institutions, and papers, the top 1% in each discipline is detected and introduced. The criterion for such a choice is citation. Similarly, this ratio for journals and countries is the top 50%, and for hot papers, it is 0.01%.

The data used in this paper are extracted from ESI; the date was 8 March 2009, covering 1998-2008 (10 years), and 2004-2008 (5 years) which include citations and publications of each country indexed in the said database.

We then compared and contrasted nations according to the economic categories they are placed in by the World Bank, according to their Gross Domestic Product (GDP). In this categorization, world states are placed in one of the following classes: low-income, lower middle-income, upper middle-income, and high-income. To achieve accurate results, countries in the Organization of Economic Cooperation and Development, OECD, and those not in this organization, non-OECD, were separated. The OECD comprises more than 30 nations (OECD, 2009).

Then, we extracted the demographic information belonging to 230 countries of the world from UN statistics, which enabled us to calculate the share of scientific publications of different countries in relation to their population. Countries with a population of under 30,000 were not included in this study. Finally 222 countries were selected. In this research, the term "Islamic Countries" is used to mean the countries, which constitute the Organization of Islamic Conference (OIC).

Scientific Impact of Nations

Figure 1 shows the world share of population, publications and citations of nations based on the economic categorization and affiliation or non-affiliation to OECD. 14% of world population, 76% of ESI publications, and 87% of ESI citations between 1998 and 2008 belong to high-income OECD countries, namely 27. According to ISI data, this group of countries could actually be considered as the original owners of ESI and produce the most effective science of the world, with the United States of America ranking first. The

U.S. is the most influential country in the ISI producing 26% of journals and possessing 35% of the most effective citations in all branches of science and technology at international scale. Japan, Germany, England, and France are among the other major OECD countries of high-income group, which together with the US constitute 50% of the publications and 61% of citations of the world. Table 1 shows the share of publications and citations of 147 ESI-indexed countries, their economic group, and membership in OECD and/or OIC.

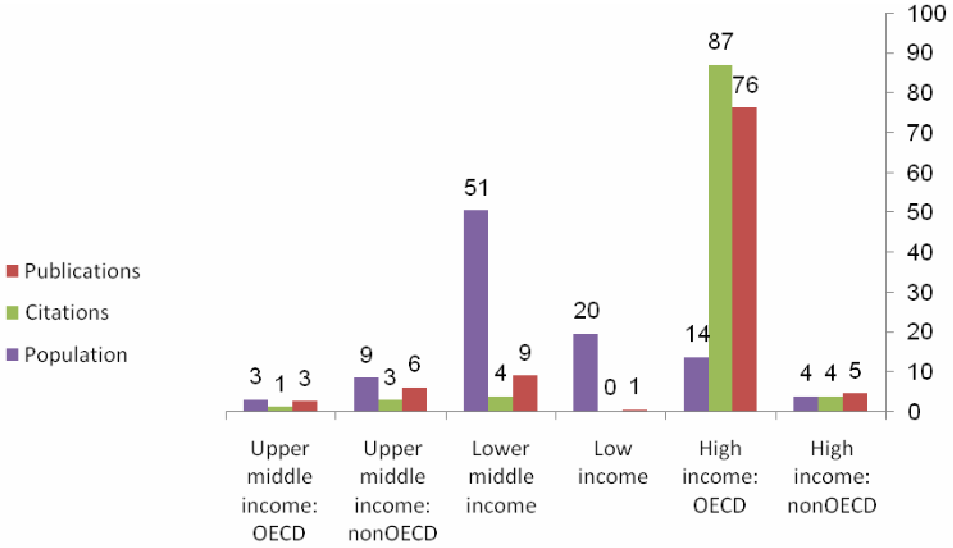

Figure 1. Share of world populations, publications & citations by economic classification

The low-income and lower middle-income groups include 106 countries which make up 71% of the world population, 10% of publications, and 4% of citations. 31 out of 51 low-income countries and 32 out of 55 lower middle-income countries are indexed in ESI. China and India belong to lower middle-income countries. These two nations make up 36% of the world population and 71% of the population of the economic category to which they belong. Also these two countries encompass 7.2% of the world publications and 3.2% of the world citations.

The high-income and upper middle-income countries are divided into OECD and non-OECD members. The 28 high-income countries, with 4% of the world population, are non-OECD nations, which possess 4% of publications and 5% of citations of the world

Table 1

Share of Publications and Citations of 147 ESI-indexed Countries

Country	Economy	OECD	OIC	Paper Share	Citation Share	Paper	Citation	Country	Economy	OECD	OIC	Paper Share	Citation Share	Paper	Citation
USA	H	O		25.945	35.230	1,479,758	10,219,203	URUGUAY	U			0.036	0.027	2,301	9,002
JAPAN	H	O		6.961	5.983	374,722	1,739,415	ARMENIA	LM			0.034	0.021	1,985	9,109
GERMANY	H	O		6.706	7.324	377,236	2,302,468	LATVIA	U			0.032	0.018	1,709	6,213
ENGLAND	H	O		5.948	7.321	336,408	2,201,913	UZBEKISTAN	L		I	0.029	0.008	1,493	3,064
PEOPLES R CHINA	LM			5.141	2.279	404,092	1,191,506	PERU	LM			0.028	0.023	1,992	8,835
FRANCE	H	O		4.803	4.949	269,200	1,488,160	TANZANIA	L			0.028	0.020	1,882	8,145
CANADA	H	O		3.645	4.049	221,335	1,283,039	ETHIOPIA	L			0.026	0.012	1,678	4,106
ITALY	H	O		3.468	3.384	209,789	1,147,828	CAMEROON	LM		I	0.026	0.014	1,817	5,603
SPAIN	H	O		2.582	2.191	163,290	796,247	COSTA RICA	U			0.026	0.023	1,608	7,498
RUSSIA	U			2.414	0.944	122,192	292,907	REP OF GEORGIA	LM			0.026	0.012	1,569	3,911
AUSTRALIA	H	O		2.355	2.337	143,990	766,335	CYPRUS	H			0.024	0.014	1,727	5,222
INDIA	LM			2.110	0.926	138,927	377,394	OMAN	H		I	0.024	0.009	1,439	2,716
NETHERLANDS	H	O		2.036	2.635	120,965	849,777	SRI LANKA	LM			0.023	0.012	1,557	4,449
SOUTH KOREA	H	O		1.938	1.066	137,541	459,332	UGANDA	L		I	0.022	0.019	1,625	7,504
SWEDEN	H	O		1.527	1.884	85,636	556,507	ZIMBABWE	L			0.020	0.013	983	3,511
SWITZERLAND	H	O		1.479	2.089	87,972	677,734	KAZAKHSTAN	U		I	0.020	0.006	1,106	2,139
BRAZIL	U			1.414	0.748	98,390	292,479	GHANA	L			0.019	0.011	1,261	4,211
TAIWAN	H			1.283	0.703	87,217	277,405	AZERBAIJAN	LM		I	0.019	0.004	1,149	1,467

POLAND	U	O		1.164	0.644	73,820	246,205	SENEGAL	L		I	0.018	0.013	1,025	3,722
BELGIUM	H	O		1.105	1.225	66,871	417,676	MOLDOVA	LM			0.017	0.007	953	2,839
TURKEY	U	O	I	0.999	0.385	76,855	177,514	SERBIA MONTENEG	U			0.016	0.005	1,913	6,118
ISRAEL	H			0.959	1.010	53,932	300,016	ECUADOR	LM			0.015	0.011	1,066	5,070
SCOTLAND	H			0.932	1.188	52,378	360,680	LUXEMBOURG	H	O		0.015	0.011	1,144	5,097
DENMARK	H	O		0.805	1.056	46,446	332,840	NEPAL	L			0.014	0.009	966	3,527
AUSTRIA	H	O		0.773	0.815	45,719	279,337	PANAMA	U			0.014	0.020	943	6,563
FINLAND	H	O		0.750	0.866	42,855	252,057	SYRIA	LM		I	0.013	0.005	843	1,769
GREECE	H	O		0.631	0.411	42,256	163,755	JAMAICA	U			0.013	0.007	720	1,991
MEXICO	U	O		0.576	0.326	36,943	115,675	COTE IVOIRE	L		I	0.013	0.010	659	2,709
NORWAY	H	O		0.556	0.581	34,718	200,212	BOTSWANA	U			0.012	0.007	774	2,668
CZECH REPUBLIC	H	O		0.511	0.315	32,597	126,546	MALAWI	L			0.012	0.010	749	3,484
SINGAPORE	H			0.474	0.319	32,387	146,598	TRINID & TOBAGO	H			0.011	0.005	0	0
NEW ZEALAND	H	O		0.465	0.411	27,835	131,157	MACEDONIA	LM			0.011	0.005	689	1,695
ARGENTINA	U			0.456	0.296	26,985	99,630	BOLIVIA	LM			0.011	0.008	729	2,729
PORTUGAL	H	O		0.433	0.307	30,227	129,338	BURKINA FASO	L		I	0.011	0.007	734	2,619
HUNGARY	H	O		0.425	0.330	24,723	112,739	SUDAN	LM		I	0.010	0.006	624	1,506
SOUTH AFRICA	U			0.411	0.270	25,443	99,183	ZAMBIA	L			0.009	0.007	571	2,560
UKRAINE	LM			0.381	0.125	19,758	41,629	QATAR	H		I	0.009	0.002	699	1,396
IRAN	LM		I	0.359	0.116	32,439	69,959	IRAQ	LM		I	0.009	0.002	607	906
IRELAND	H	O		0.332	0.318	22,194	118,897	BOSNIA & HERCEG	LM			0.008	0.003	0	0
WALES	H			0.310	0.314	17,589	95,002	BENIN	L		I	0.008	0.004	567	1,502
EGYPT	LM		I	0.264	0.103	16,088	36,908	BAHRAIN	H		I	0.008	0.002	528	801

CHILE	U			0.241	0.181	15,984	67,725	NEW CALEDONIA	H			0.008	0.006	527	2,326
ROMANIA	U			0.231	0.089	15,503	34,593	GUADELOUPE	L			0.007	0.004	437	1,219
THAILAND	LM			0.205	0.117	15,556	58,302	PAPUA N GUINEA	L			0.006	0.005	308	1,476
SLOVAKIA	H	O		0.201	0.101	11,634	35,771	GAMBIA	L		I	0.006	0.009	375	3,026
SLOVENIA	H			0.172	0.095	11,201	35,578	Libya	U		I	0.006	0.001	414	608
BULGARIA	U			0.159	0.080	9,301	27,591	REUNION	L			0.006	0.003	395	1,504
NORTH IRELAND	H			0.152	0.146	8,779	44,655	GABON	U		I	0.006	0.007	351	2,061
CROATIA	U			0.151	0.068	9,998	29,037	MALTA	H			0.006	0.005	368	1,505
SAUDI ARABIA	H		I	0.138	0.051	7,489	15,264	MALI	L		I	0.006	0.004	392	1,808
MALAYSIA	U		I	0.130	0.050	9,596	21,305	MONGOL PEO REP	LM			0.006	0.003	407	1,357
PAKISTAN	L		I	0.102	0.035	8,209	17,608	NAMIBIA	LM			0.005	0.004	343	2,391
VENEZUELA	U			0.100	0.055	5,593	16,740	NIGER	L		I	0.005	0.003	311	696
BYELARUS	U			0.097	0.033	4,703	9,809	FIJI	U			0.005	0.002	363	746
MOROCCO	LM		I	0.096	0.037	5,071	11,051	GUATEMALA	LM			0.005	0.004	309	1,217
TUNISIA	LM		I	0.094	0.028	7,200	13,267	MONACO	H			0.005	0.005	293	1,648
NIGERIA	L		I	0.091	0.028	6,074	9,064	Mozambique	L		I	0.005	0.003	322	1,548
COLOMBIA	LM			0.080	0.046	5,661	18,759	BARBADOS	H			0.004	0.004	261	1,164
LITHUANIA	U			0.078	0.034	6,022	13,602	CAMBODIA	L			0.004	0.002	354	1,634
YUGOSLAVIA	H			0.074	0.036	2,097	8,962	FR POLYNESIA	H			0.004	0.003	212	608
ESTONIA	H			0.066	0.050	4,235	18,721	BRUNEI	H		I	0.003	0.002	181	469
ALGERIA	LM		I	0.063	0.019	4,685	7,889	NICARAGUA	LM			0.003	0.002	224	845
CUBA	U			0.060	0.029	3,436	9,329	MALAGASY REPUBL	L			0.003	0.003	0	0
KENYA	L			0.059	0.048	3,490	16,466	MYANMAR	L			0.003	0.002	195	823

JORDAN	LM		I	0.057	0.018	3,672	6,852	GREENLAND	H		0.002	0.002	177	620
KUWAIT	H		I	0.052	0.021	2,878	6,373	LIECHTENSTEIN	H		0.002	0.002	175	826
INDONESIA	LM		I	0.047	0.030	2,966	11,012	DOMINICAN REP	LM		0.002	0.003	136	668
SERBIA	U			0.046	0.004	5,460	5,229	BERMUDA	H		0.002	0.004	107	1,586
BANGLADESH	L		I	0.046	0.023	2,969	8,868	W IND ASSOC ST	H		0.002	0.002	124	324
VIETNAM	L			0.046	0.026	3,271	11,503	NETH ANTILLES	H		0.002	0.002	146	866
PHILIPPINES	LM			0.044	0.030	2,744	10,555	ZAIRE	L		0.002	0.002	114	378
U ARAB EMIRATES	H		I	0.043	0.016	3,026	7,735	GUINEA BISSAU	L	I	0.002	0.002	97	559
ICELAND	H	O		0.039	0.048	2,488	17,584	CHAD	L	I	0.001	0.001	77	324
LEBANON	U		I	0.038	0.019	2,662	7,408							

* H:High income ,U:Upper middle income, LM:Lower middle income, L:Low income

Share of Papers & Citations: 1998-2008

Papers & Citations: 2004-2008

Islamic Countries

Islamic countries embody 1,444,676,000 of the world population. 40 out of 57 of the Islamic countries are indexed in ESI. Figure 2 shows the economic classification of the Islamic nations by population and income. Of the Islamic countries, 7 belong to high-income, 23 to low-income, 20 to lower middle-income, and 7 to upper middle-income group. The population distribution of the Islamic nations shows that 3% are in high-income, 88% in lower middle-income and low-income classes. Likewise, 9% of the population of the Islamic countries belongs to upper middle-income group. Turkey is the only Islamic country in the world, which is an OECD member.

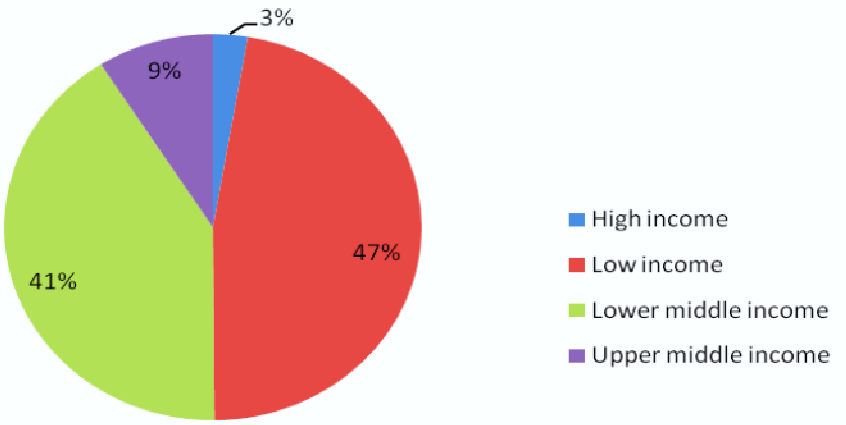

Figure 2. OIC countries classification by population & economic status.

The share of population and publications of the Islamic and non-Islamic countries, which belong to the same economic class, is compared as indexed in ESI (Figure 3). For example, this figure shows that in low-income group, the Islamic countries form 54% of the population and produce 60% of publications. In the following sections, Islamic countries are compared with other states in the same economic group.

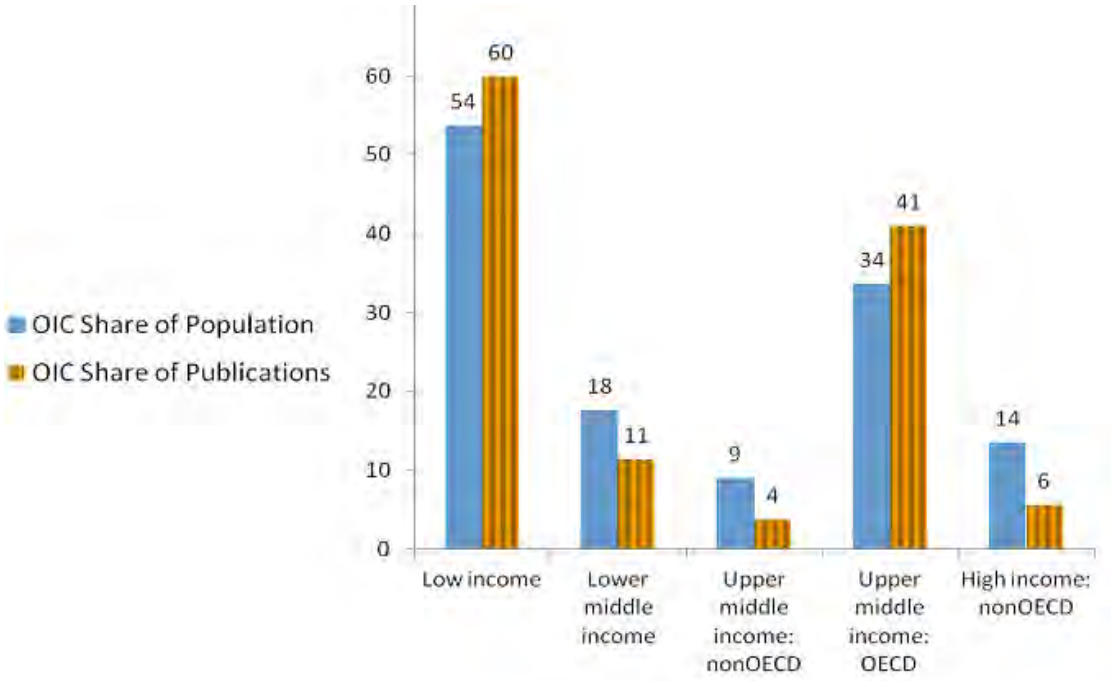

Figure 3. OIC share of publications and populations by economic classification.

Low-Income Countries

Growth National Income (GNI) per capita for low-income countries is 953$ or below. 51 countries of the world belong to this category making up 20% of the population of the world. In between 1998 and 2008, the share of these countries in publications was 0.62% and of citations 0.34%. Likewise, between 2004 and 2008 (5 years), this share in publications and citations was 0.69% and 0.4%, respectively. 31 countries in 243 subjects are active in ESI. This means that each country, on the average, possesses the most effective publications in 8 subjects out of 22. These are presented in Table 1. During the said 5 years, 2.7% of publications in Agricultural Sciences, 1.8% in Immunology, 1.6% in Plant and Animal Sciences, 1.4% in Environment /Ecology, and 0.9% in Microbiology and Social Sciences, General are indicative of the strong points of these countries. When we divide the low-income countries into two groups of non-OIC and OIC, we see that 28 of the low-income countries belong to the former division and 23 to the latter.

The Islamic countries constitute 46% of the low-income class considering the number of countries. 78% of the population of the non-OIC group are indexed in ESI and include 16 countries. On the other hand, the share of the Islamic countries indexed in ESI is 91% of the population of the Islamic nations of this group and include 15 countries. Accordingly, 54% of the population and 60% of ESI publications of low-income class states belongs to OIC countries.

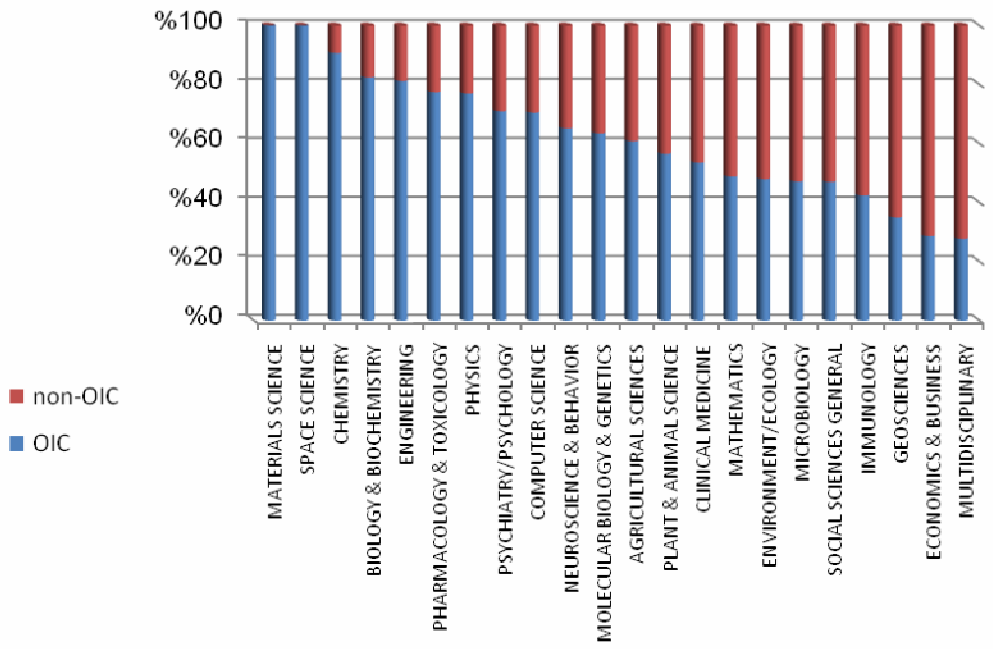

Figure 4. share of publications of OIC & non-OIC low income countries by subject fields.

As is shown in Figure 4, the share of OIC nations in 14 subjects is between 50 to 100 percent. Fields like Space Science, Materials Science, Engineering, Pharmacology and Toxicology, Chemistry, Biology and Biochemistry, Physics, Psychiatry and Psychology, and Computer Science are placed in this category. The share of the publications of this group is 40 to 50 percent in 5 fields, and 28 to 40 percent in 3 others. Pakistan and Nigeria, as members of this group held the first and the second ranks in scientific publications during 2004-2008, respectively. Bangladesh occupies the fifth rank, Uganda the ninth, and Uzbekistan the tenth.

Lower Middle-Income Countries

Of the world population, 51% belongs to countries with lower middle-income. Excluding China and India, the remaining countries of this group constitute 15% of the world population. Of the 55 countries of this group, 32 are ESI-indexed. 41% of the population of Islamic countries belongs to lower middle-income class, which constitutes 18% of the population of this group. Of a total of 20 Islamic countries in this economic category, 12 are among the top states of the world. OIC states are producers of 11% of the publications of this group.

During the ten years between 1998 and 2008, the lower middle-income countries produced 4% of citations and 9% of publications of the world. Likewise, between 2004 and 2008, they produced 6% of citations and 11% of world publications. It is worth mentioning that in the same period the ratio of Materials science was 25% and that of Chemistry 22%.

Accordingly, the members of this class possess more than 10% of the world's scientific publications in 12 fields.

Next to China and India, which occupy the first and second positions respectively, Iran is the third science producer in this category; Ukraine is the fourth, Egypt the 5th, Thailand the 6th and Tunisia the seventh. Similarly, Morocco, Algeria, Jordon, and Indonesia hold the ninth, tenth, eleventh, and twelfth rank, respectively. It must be added that Iran, Egypt, Tunisia, Morocco, Algeria, Jordon, and Indonesia are Islamic nations.

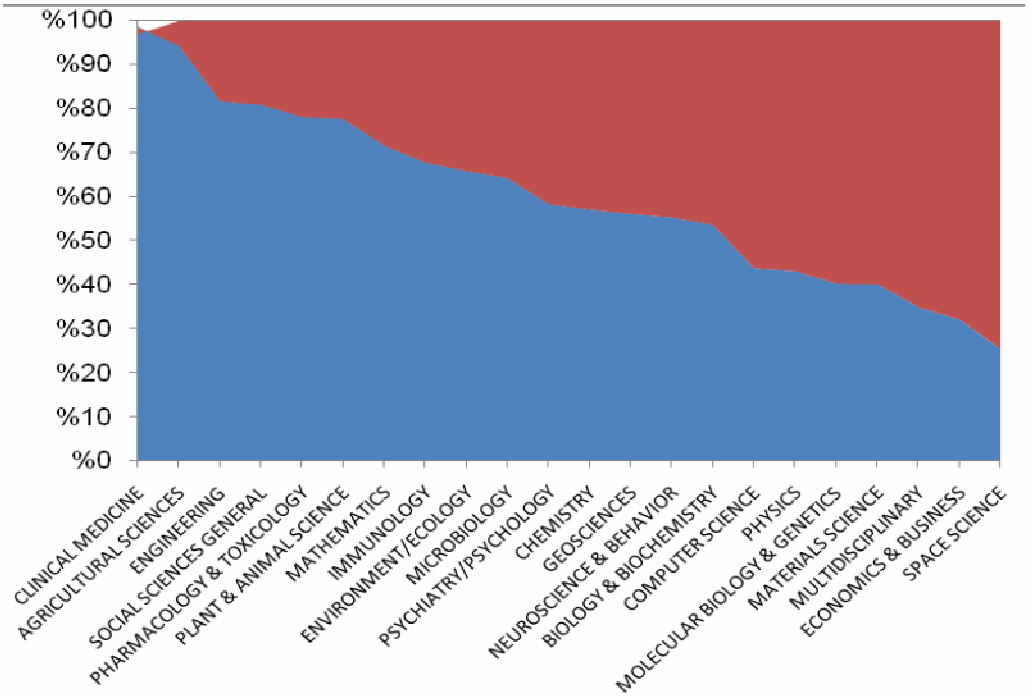

Figure 5. Share of publications of OIC countries in lower middle-income group.

As can be seen in Figure 5, Islamic countries with a share of 18% of the population of lower middle-income group enjoy a relatively notable achievement in such fields as Clinical Medicine, Agricultural Sciences, Engineering, Social Sciences general, Pharmacology and Toxicology. Iran, a member of this group, ranks 19 in Chemistry in the world, 22 in Engineering, Pharmacology and Toxicology, 27 in Mathematics, and 28 in Materials Science.

The OIC countries, including the two non-OIC countries, China and India, constitute 18% of this group's population with 11% of publications. However, when these two super-powers are excluded, the OIC countries in this economic group have a share of 58% of population and 60% of publications. In the 5 years between 2004 and 2008, China occupied the second position in scientific publications and India the eleventh. The OIC members of the lower middle-income countries occupy positions 19 through 50 in 53 fields. Again, in

135 fields they occupy ranks 19 to 70.

On the average, the OIC members of this group are active in 14 fields, whereas the non-OIC members are active in 11 fields.

Upper Middle-Income Countries

The upper middle-income group constitutes 41 countries with about 12% of the world population. Only three countries in this group, namely, Poland, Turkey, and Mexico are OECD states. Twenty-six out of 41 countries in this group, as well as the three OECD members, are indexed in ESI. Likewise, 73% of this group's non-OECD populations are ESI-indexed.

The OECD countries of this group are engaged in scientific publications in all the 22 subjects, while the non-OECD members are active in 15 subjects. About 9% of publications and 5% of citations of the world in between 2004 and 2008 belonged to this group. Similarly, this ratio for major areas of activity in Agricultural Sciences is 14%; Physics, Plant and Animal Science 13%, Chemistry and Mathematics about 12%; and Materials Science, Space Science, and Geosciences 11%.

Six out of seven OIC countries are indexed in ESI. These six states constitute 99.6% of the Islamic population of upper middle-income countries. Suriname is the only Islamic country, which is not indexed in ESI. Turkey, one of the three OECD members of this economic class, possesses 34% of population and 41% of publications. 9% of the populations of the Islamic states are economically classified as upper middle-income group.

Turkey, the OECD member of the upper middle-income group, enjoys a remarkable share of publications in different fields such as Clinical Medicine 70%, Economics and Business 60%, Psychiatry /Psychology 54%, Social Sciences, General and Agricultural Sciences 50%, Engineering and Multidisciplinary 47%. At the same time, Turkey's share in 10 fields is between 30 to 40 percent, and in 5 other fields 12 to 29 percent. On the other hand, Brazil and Russia, the non-OECD members of this class, possess 60 percent of the publications of the economic class under discussion. Next to Brazil and Russia, are Argentina and South Africa with 14 percent of this group's publications. The four countries mentioned above, constitute 50 percent of this group's population. As for the non-OECD states in this group, the OIC members possess 7 percent of publications in Computer Science, Economics and Business, 6 percent in Engineering, and 5 percent in Clinical Medicine, Chemistry, and Environment/Ecology. Again, in nine other subjects, they hold between 3 to 4 percent, in six others 2 percent, and in Space Science only 0.2 percent.

The population share of the Islamic countries of this class, excluding Turkey, is 9 percent.

High-Income Countries

Seventy-five countries of the world are categorized as the high-income nations. Of these, 27 belong to OECD group and 48 to non-OECD. Seven Islamic countries belong to high-income nations, which constitute 3 percent of the population of the Islamic countries. Fifty – five states make up 18 percent of the world population, of which 99.4% are ESI-indexed. Between 1998 and 2008, that is, for ten years, 81 percent of the world publications and 91 percent of citations belonged to this group. Again, between 2004 and 2008, that is, for five years, 79 percent of the world publications and 88 percent of the world citations were possessed by this class.

In the years between 2004 to 2008, 60 percent of citations and 51 percent of publications belonged to the U.S.A, Germany, Japan, England, France, and Canada. This is, in fact, 68 percent of citations and 65 percent of publications of high-income countries. These six nations make up 10 percent of the world population and 54 percent of the population of high-income countries.

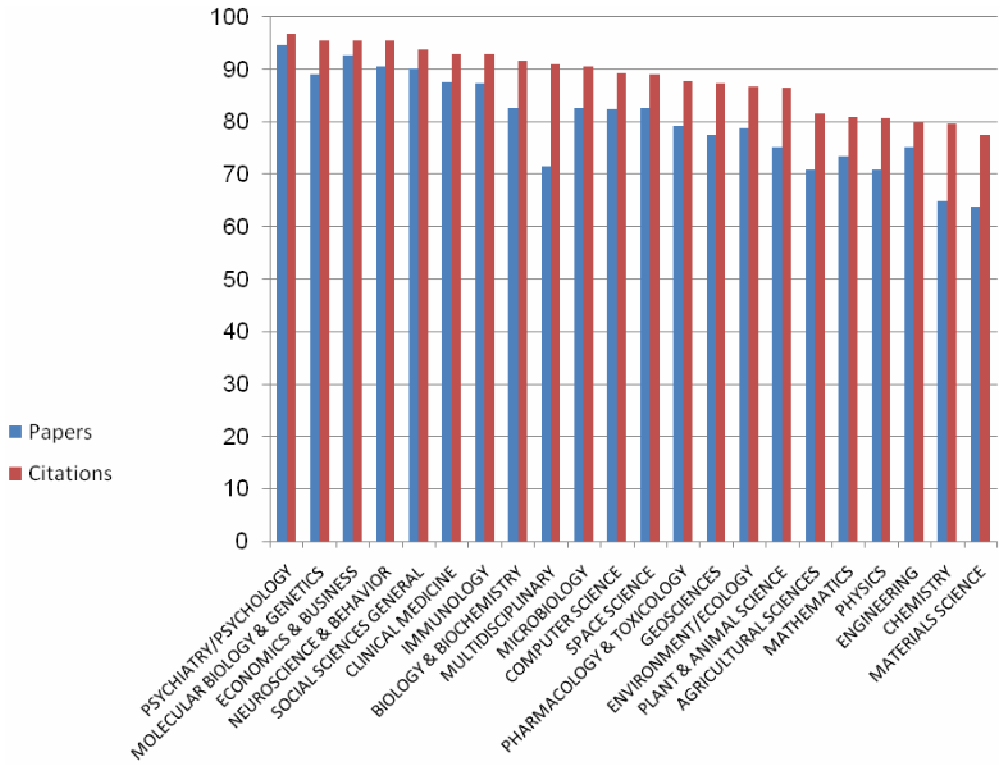

Figure 6. Share of the world papers & citations of the High-income group

As can be seen in Figure 6, high-income countries produce 90 to 95 percent of world publications in 4 fields, 82 to 89 percent in 7 fields, 72 to 79 percent in 9 fields, and 64 to 65 percent in 2 fields. Similarly, regarding citations, 91 to 97 percent in 10 subjects, 80 to 89 percent in 11 fields, and 77 percent in just 1 field belongs to this class.

The population share of the Islamic states in this class is as follows: Bahrain 0.01%, Brunei 0.005%, Kuwait and Oman 0.04%, Qatar 0.01%, Saudi Arabia 0.3%, and UAE 0.06%. On the average, these 7 countries are indexed in ESI in 10 fields. However, one should not underplay their achievements. For instance, Kuwait with only 0.041 percent of the world population enjoys 0.047 percent of the world publications. Moreover, the same country possesses similar position in 9 other areas of science, for example, 0.1 percent in Engineering. On the other hand, UAE holds a similar position in 5 areas one of which is Engineering with 0.1 percent. Another example is Oman with 0.56 percent of the world publications in Agricultural Sciences. Furthermore, Qatar and Bahrain in Engineering and Brunei in Geosciences hold a share of publications exceeding their share of population.

Scientific Growth of the Islamic Countries

During 2004 to 2008, 3.5 percent of the most frequently cited papers of the world belonged to OIC countries. The rate of growth of publications of the Islamic countries during 1998-2002 to 2004-2008 was 100 percent. Although these countries possessed 1.5 percent of the world citations during 2004-2008, a comparison with the 5 years between 1998 and 2002 reveals that the rate of growth was 200 percent. It is interesting to note that the global growth rate for the same period of time was 30 percent for papers and 78 percent for citations. Figure 7 represents the growth rate of papers and citations of the Islamic countries for each science field, separately. In this regard, Computer Sciences has secured the growth rate of 230% in publications, and 470% in citations. Next to Computer Sciences, the second best rate of growth is that of Psychiatry/Psychology with 181% increase in publications, and 370% increase in citations. The lowest growth rate belongs to Molecular Biology and Genetics with 72% increase in citations, and Pharmacology and Toxicology with 50% increase in publications.

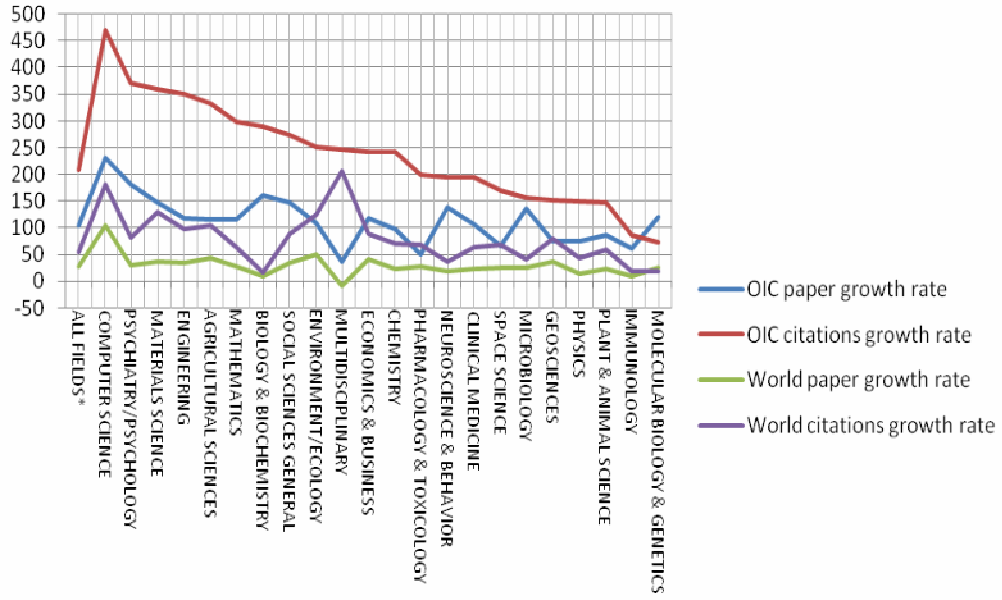

Figure 7. Growth rate of publications and citations of the OIC countries.

The growth rate of citations and publications among OIC member states and non-OIC countries in terms of their economic classification is shown in Figure 8. In the upper middle-income in publications is 100 percent, and in citations 150 percent more than other countries of the world. This remarkable increase in the growth rate of citations is also true of all other Islamic countries except those classified as lower middle-income group.

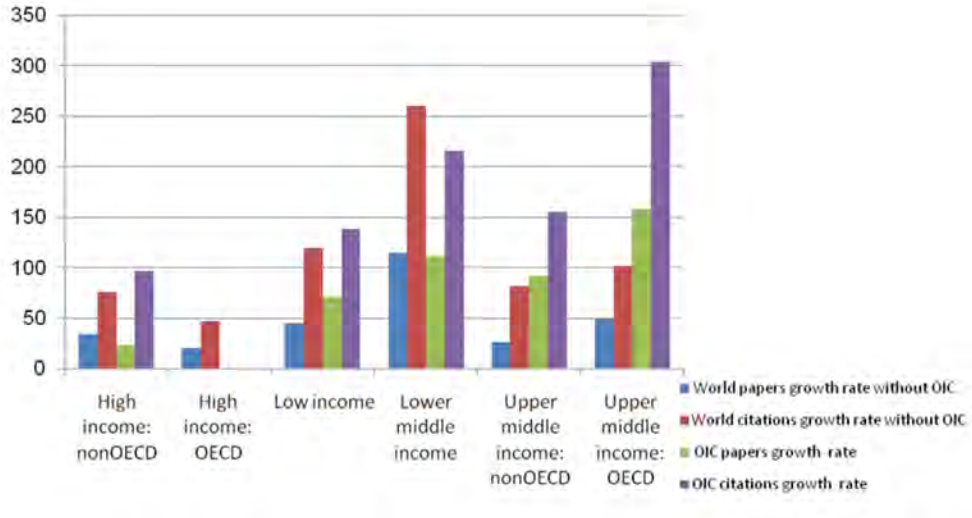

Figure 8. Publications and citations of the world and OIC growth rate by countries economy.

ISI is not the Sole Science Citation System: The Case of Iran and other OIC Nations

Iran founded the Islamic World Science Citation Center (ISC) in 2004. ISC is a citation analysis system whose main objective is to index the core journals of the Islamic world. An

examination of the case of Iran in ISC reveals certain facts to which we will attend presently. Meanwhile, it would be appropriate to note that 3500 journals are currently being published in Iran, 14 percent of which are evaluated and known as "Research Journals". The Ministry of Science, Research and Technology and the Ministry of Health, Medical Education and Treatment sponsor the evaluation of these quality journals.

`ISC has carried out the assessment of Iran's core journals since 1999. The number of journals indexed in ISI Web of Science since that time amounts to 56,000, while those indexed in ISC exceeds 78,000. A comparison of research papers published in Iran in certain fields and indexed in both ISI and ISC is displayed in Figure 9.

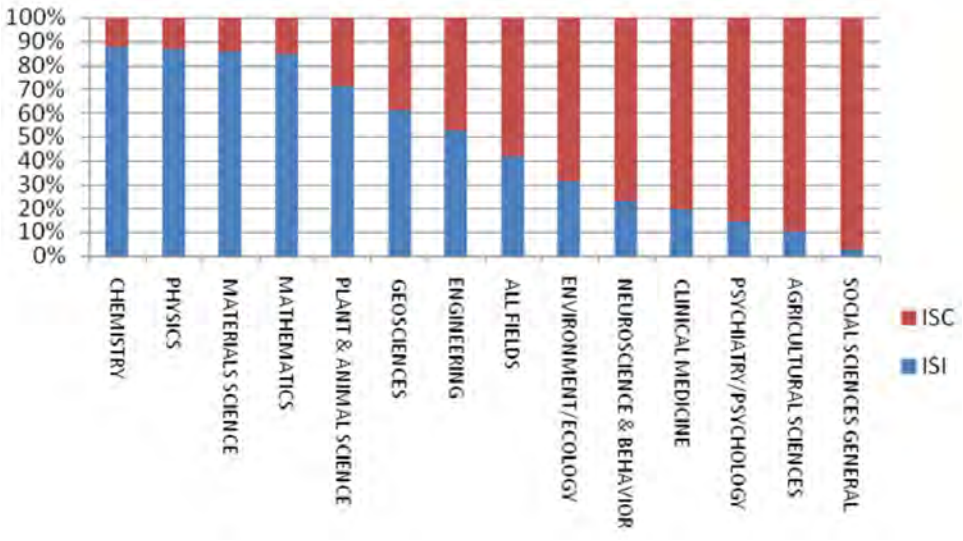

Figure 9. Share of the Iran publications in some fields of ISI & ISC.

Accordingly, 42% of Iran's core papers are indexed in ISI Web of Science versus 58% in ISC. More than half of Iran's core papers in areas such as Chemistry, Physics, Materials Science, Mathematics, Plant and Animal Sciences, Geosciences and Engineering have been indexed in ISI. On the other hand, more than half of Iran's core papers in such fields as Environment/Ecology, Neuroscience and Behavior, Clinical Medicine, Psychiatry/ Psychology, Agricultural Sciences and social Sciences are indexed in ISC. Thus, considering language barrier in ISI Web of Science, ISC has provided appropriate opportunity and proper channel for indexing and analyzing scientific publications, and for measuring scientific impact of the Islamic countries.

An analysis of data in ISC revealed that some scholars do not necessarily publish their research results in journals indexed in ISI. Rather, they prefer to publish in domestic/national journals as a desirable option. Nevertheless, in certain fields, Islamic countries possess a notable share in ESI. Examples are, 7% in Agricultural Sciences, 5% in Engineering, 4% in Chemistry, Plant and Animal Sciences, Clinical Medicine,

Pharmacology, Materials Sciences, Environment/Ecology, and 3% in Mathematics as you can see in figure 10.

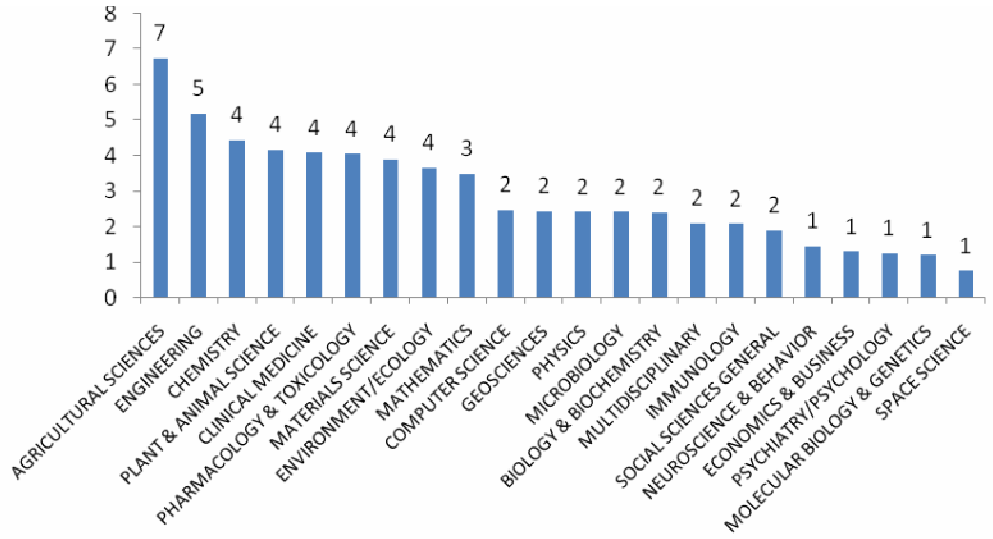

Figure 10. Percentage of OIC publications by subject fields

Conclusion

Butler's article, published in NATURE, has failed to fairly and comprehensively show the status of scientific publications by the Islamic countries. The information presented in it is only partially dependable. While we know that 80 percent of ESI publication is produced by OECD countries, and again, 50 percent of publications and 61 percent of citations belong to only 5 countries, wouldn't it be more sensible if we compared the remaining 217 countries with respect to their common and specific characteristics?

The present article has drawn upon the economic categorization of countries as a major criterion for the analysis of their scientific impact. This approach proved to be quite revealing and more effective so far as the Islamic countries are concerned. It was shown that the growth rate of publications and citations of the Islamic countries is considerably high. It is true that growth by itself is not a fully dependable criterion; however, as was noted, the share of the growth rate of the Islamic states was higher than that of other countries in the same economic class, as well as the average of world growth rate.

Scientific papers, which encompass the findings of scientific research in different parts of the world, are not solely and necessarily indexed by Thomson Reuter's citation analysis systems like ISI Web of Science. Iran's position in ISC reveals that scientists in different disciplines tend to publish in different places. Some publish in ISC, others do so in ISI.

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