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Is the tree of the country's science fructifying the welfare? (Causality test in the science production of Iran)

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Abstract: The impact of scientific product on economic growth and social welfare is one of the interested issues for S&T policy makers. This paper is studying this impact for Iran during the years of 1970-2013.
Method: This study is library based with Scientometrics and econometrics method. The indicator of science production is the number of indexes of Iran in WOS and the indicator of welfare is GDPP.
Findings: the study shows that the impact of GDPP on the number of indexes is significant. Also shows, the impact of the number of indexes on GDPP in 2 years break is not significant but in 5 years break is significant.
Conclusion: Result of the study shows that increase in budget and facilities in higher education has caused increasing in country's science production and on other hand science production in long term has caused welfare.

Keywords: science fructifying, scientific production

1. Introduction

The judgment power of a country's scientific situation for governments and those who are deciding in this field is vital and the ultimate goal of funding in science and technology is hustling of the socio-economic issues and one of the most important of these goals is welfare. Bacon linear model in this field is one of the significant models for policy makers in science and technology. This model introduces government's support as the factor of basic researches, and basic researches as the factor of technology, and technology as the factor of welfare. In fact, this model such plans that the increase of the welfare is the

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result of academic research that is directed by the government. Already, Price in the 1960's, showed the correlation between the share of countries in scientific production and the share of them in GNP and introduced basic research as the factor of economic development. After Price and with expanding of citation indexes, was done many studies in this area and correlation between the scientific productions or researches and economic development showed again and again in different countries.(such as Heart and Sommerfeld, 1998 and Vinkler, 2008, Noormohammadi, et al. , 2013). In 2011, Lee et al, which were composed of policy makers of science and technology and the economic experts, imported one of the conventional methods in statistical analysis that has many applications in different sciences, such as econometrics, in Scientometrics and studied Granger causality between the scientific publications and the GDP of countries. The results showed that in some countries such as India, scientific production affected the GDP, and in some countries such as China this relation is vice versa. In Iran during the recent years has increased attention to science and its production, and the statistics are also indicate that the situation of Iran at least in quantity is considerable, But the economic situation and the level of the existing welfare is not considerable. In fact, perhaps there is a problem in Bacon model that has blocked the welfare. So, fundamental issue of the present study is whether the production of the country is affecting the warfare or not?
The authors in this study are trying to test the causality between the scientific production of Iran and the per capita GDP, to understand the effect of scientific production of Iran on the welfare.

So the research questions are as follows:

- What is the Iran's number of scientific production in the years 1963-2013 ?
- What is the Iran's GDP per capita in the years 1963-2013?
- How is the causality relation between GDP per capita and scientific productions?

Methods:
The research was lunched by Econometrics and Scientometrics methods. The scientific productions indicator is the number of indexes of Iran during 1970 until 2013 in WOS. GDPP data were extracted from World Bank database. After collecting and entering data into the computer, causality test using Eviwes7 was done.

2. Theoretical Foundations

Science production is a form of production that is the result of application of a Scientific method about a phenomenon or existence. Any scientific production for access of scholars should be publishing in one objective format. Therefore, a reasonable definition of scientific production is: The first step that has Judging and review prior to publish. In addition, after the publish of that, the way be open to criticism (Noroozichakoli, et all,1388,p16). So today assessment of

scientific production is done by citation indexes, as they provide possibility of detecting and retrieving of credible information and also provide citation information (Noroozichakoli,1390,p290). The important citation index and citation analysis tool are WOS. Garfield founded the Institute of Scientific Information in the early 1960s in Philadelphia. Institute of Scientific Information produced and offered the first International citation index that performed large-scale indexing of scientific journals at the international level. As mentioned, the science production is a kind of product ,So, like any other product is composed of a range of different quality. Therefore, emerge the evaluation of scientific production. Definitely, one of the most important faces of this assessment is due to economic issues, discussion of input and output.

Whether or not research activities have had for the community economic efficiency is a key issue (Godin & Doré, 2005). In fact the importance of science economic is that science is the leader of technology and technology is the leader of productivity and growth (Diamond, 1996) and because of that increasing in GDP makes increasing in life standards (Rai & Lal, 2000) therefore GDP is an indicator of people's wealth in a nation-Gross domestic product (GDP) is the market value of all officially recognized final goods and services produced within a country in a given period of time. GDP per capita is often considered an indicator of a country's standard of living.-. Hence is formed a continuum that starts from science and ends to wealth. So mentioned in introduction, many studies have done to date using correlation to show accompaniment of these two variables. But to show the direction of this correlation and to answer the vital question of this study, only one research was observed by authors that has done by Lee at al. (2011) in Scientometrics journal. In fact they used Granger causality test, a usual test in econometrics and other fields, to show the direction of this relation. Granger (1969) based on this fact that future cannot be the cause of present and past, told that if the present values of (Y_t) using past value of (X_t) more carefully compared with nonuse of these values is predicted, so (X_t) is the cause of (Y_t). in Granger causality test, for test of "(X_t) is not the Granger cause of (Y_t)", is formed a (VAR^3) model:

$$Y_t = \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{i=1}^{k} \beta_i X_{t-i} + u_t$$

Therefore, this linear model is estimated and significant assumption is tested. If assumption that factors of X_{t-1} i.e. β_i are zero, is accept, so X_t isn't the Granger Cause of Y_t. in fact if zero assumption of test i.e. meaningless assumption of model is rejected, so X_t is Granger cause of Y_t. so there are a lag between the scientific publication and the expected impact(king, 2004) here we are studying the impact of science production on wealth.

3. Findings

3.1 What is the Iran's number of scientific production in the years 1963-2013?

Values of scientific production extracted from WOS, Table 1 shows the number of scientific publication of Iran, in general, this table shows the growth during these years.

Table1. Iran Indexes in WOS during 1970-2013

year	indexes	year	indexes
1970	1	1992	235
1971	1	1993	325
1972	28	1994	378
1973	231	1995	486
1974	269	1996	594
1975	351	1997	726
1976	422	1998	1028
1977	538	1999	1166
1978	612	2000	1426
1979	465	2001	1790
1980	322	2002	2414
1981	255	2003	3248
1982	156	2004	4206
1983	143	2005	5618
1984	134	2006	7294
1985	131	2007	10583
1986	176	2008	13118
1987	157	2009	16455
1988	156	2010	19148
1989	140	2011	24677
1990	176	2012	26227
1991	230		

3.2 What is the Iran's GDP per capita in the years 1963-2013?

Table 2 shows the values of GDPP of Iran. During this period this variable, varied from 25790.44 to 72356183.

Table2. GDPP of IRAN during 1970-2013					
year	GDPP	year	GDPP	year	GDPP
1970	25790.44	1985	308003.4	2000	6731936
1971	28037.08	1986	315024.3	2001	8806915
1972	34040.01	1987	307768.2	2002	10047261
1973	41023.36	1988	360602.9	2003	13679526
1974	57258.11	1989	388709.5	2004	16187345
1975	93923.5	1990	468975.5	2005	20276736
1976	101472.5	1991	626574.5	2006	24535361
1977	132381.4	1992	866001.2	2007	28798568
1978	150904	1993	1139732	2008	36972233
1979	142293.6	1994	1696218	2009	46193312
1980	162086.9	1995	2188360	2010	48643654
1981	165718.2	1996	3074798	2011	58191691
1982	192123.4	1997	4042063	2012	72356183
1983	243778.5	1998	4679660		
1984	292842.6	1999	5165853		

3.3. How is the causality relation between GDP per capita and scientific productions?

Table 3 shows that Granger causality test in direction of GDPP to Scientific production is significant in two lag i.e. that increasing in GDPP affect the science production. But vice versa effect of science production on GDPP in two years lag isn't significant and in five years lag is significant.

Table 3. Results of causality test		
lag ~~**direction**~~	Science to GDPP	GDPP to Science
2 years	0.8035	0.00006**
5 years	0.0000000008**	0.0002**

4. Conclusions

This paper sought to answer a fundamental question if science production affects the wealth in Iran? Bacon linear model generally is one of the answers to this question but this model goes in doubt by researchers until in the late

twentieth century the opinion "technology as applied science" completely abolished (Ahmadi and Zybaklam, 1390). Price with examining of special Indexes showed that Share of world GNP is rational equal to their share of scientific publication and there is a close correlation between them. so correlation only shows the association between the two variables He inferred that probably university researchers will cause the Generation of researchers that will cause economic development and welfare. Salter and Martin (2001) mentioned Benefits for the public funding in research, for example increasing in capacity to solve problems and Establishment of new companies that will cause Economic development. Lee et al (2010) using causality test showed that in some countries, science production affect economic development and in some the relation is vice versa. So the authors of this article examined Causality test on science production and GDPP for Iran. The results showed that the science production of Iran is reliant to GDPP, this result agrees with the Keally (1996) told that the science production is the result of wealth. Causality test to examine the impact of science production on GDPP showed that the effect of short-term (two years lag) is not, but in long-term intervals (five years) this effect is significant. In other word, increasing in investment and capacity –with increasing in GDPP- increases science production. In the long-term impact of science production on economic development is significant.

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