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Impact of Human Capital on Non - Oil Economic Growth of Iran

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ABSTRACT

Thus, the purpose of this paper was to estimate share of educated manpower, non-educated manpower and physical capital in non-oil GDP in Iran. So, an attempt has been made to estimate these shares with Cob-Douglas Production Function and ARDL approach as a univariate cointegration analysis from 1971 to 2011. The results show that 1 per cent increase in educated manpower, non-educated manpower and physical capital will be increase 0.49, 0.30 and 0.48 per cent non-oil GDP. On the other hand, coefficients of two dummy variables in model showed that Islamic Revolution in 1978 and oil export increasing shock from 1981 to 1985 have been positive effects on non-oil GDP.

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INTRODUCTION

Human capital theory views schooling and training as investment in skills and competences [1]. It is argued that based on national expectation of return on investment, individuals make decisions on the education and training they receive as a way of augmenting their productivity. Most studies which have examined the relationship between economic growth and human capital accumulation have used either a growth accounting framework [2-4] or endogenous growth model [5-7]. The endogenous growth models of Romer *et al*. [6] assume that the creation of new ideas is a direct function of human capital, which is manifest in the form of scientific knowledge. Therefore investment in human capital causes growth in physical capital and this, in turn, results in economic growth. Human capital accumulation might promote growth through facilitating technology adaption [8] or human capital might be necessary for technology use (Easterly *et al*., 1994). Several studies suggest that human capital and technology use are complementary [9, 10].

Governments in developing countries spend considerable resources in human capital investment like education, health and so on (podrecca and Carmeci, 2001). The relatively rapid increase in higher education graduates in Iran in recent years presents a formidable task for trying to measure its economic growth impact. Historical evidences show that investment in higher education of Iran has been increased in 1980s and 1990s. Economic policy makers expected that education investments led to increase in economic growth. Now, three decades after Islamic Revolution of Iran, there is this question that have played results of higher education investments or educated manpower an important role on non-oil economic growth process of Iran?

The rest of the paper is as follows: Section 2 reviews existing literature on the link between human capital and economic growth; Section 3 describes the methodology applied in this research as well as sources of data; section 4 deals with the empirical analysis and section 5 concludes the study.

Literature Review:

The classical economists like Adam Smith and Alfred Marshall constructed the theories of human capital in the backdrop of Plato's idea of specialization of functions and division of labor. The concept of human capital has become a matter of grave concern in the studies of economics. The economics of education is a branch of economic theory and investigation, developed in 1960.Schultz and Becker emphasized upon the education investment. They made research upon the concept of human capital and analysed that education is the best national investment that in future would be beneficial both for the society and for the individual itself. Bowman

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makes a theoretical and empirical study upon human capital and declared the human investment as a revolution in economic thought

Denison calculations for 1930 to 1960 showed that about one fourth (23%) of the production growth rate in America relates to manpower training. he writes about role of education in economic growth of America: the education which USA labour force has acquired has increased so rapidly that we can regard it extraordinary. the number of day during which each member participated in school in 1960 was five times as much as that in 1930 and 2.5 times as much as that in 1910. With such major progress, it is not surprising that education improvement plays major part in economic growth. According to our calculation, improvement of education increased average quality of labour force from 1929 to 1957 by 29%

The impact of human capital development and economic growth in recent times emphasized the growth theory [5, 11]. An interesting idea in their work was that in the long run, output per unit of input could increase even when inputs were exhaustively accounted for. Technically advanced human capital and a growing knowledge base appear to be part of this wellspring of growth. An implication of Lucas' hypothesis on human capital is thus associated with investment in man and his development as creative and productive resources [12].

From the end of 1950 to the present day, many economists have studied about human capital and its effect on economic growth in different countries. Here a few of them are summarized.

Walters and Rubinson [13] studied the role of educated manpower on production in. They used a production function to Analysis of issue in The United States. It showed that the education has important role in production. Jorgenson and Frameni [14] studied the investment in education and U.S. economic growth. They used extensive model based on the Cobb and Douglas [15] function to determine the effect of education on economic growth in United States.

Gundlach [16] studied the economic growth of nations in the twentieth century in 85 countries with the use of cointegration analysis. He showed that human capital had a positive effect on economic growth in world. Pritchett [17] disclosed that cross-national data shows no association between increase in human capital attributable to the rising educational attainments of the labor force and the rate of growth of output per worker. Specifically, he reports that the estimates of the impact of growth in education capital on growth per workers are insignificant.

One extensive study about the relationship between human capital and economic growth is "Are Investments in Higher Education Productive: Evidence from Japanese Time Series Data", written by Raymo in 1995 [18]. With the help of an application model, it observes that the relationship between budget deficit policies and inflation has been. Concerning other research carried out on the relationship, we can point to the studies of Denison [19] and Easter Line [20].

MATERIALS AND METHODS

According to the basis of theory and research, the relationship between human capital and economic growth is extensive. Researchers have recently pinpointed different models for the study. Hence, in this study recognizes that the variables model and the type of model with respect to the study of Raymo [18] have been carried out.

$Y_t = f(K, H, E)_t \; t = (1971\text{-}2011)$

The dependent variable is output, *Y* proxies by the non-oil real GDP. *K* is physical capital. *H* is educated manpower and *E* is non-educated manpower. We consider log-linear Cobb Doglas production function in which real production is based on labor force function, physical capital and human capital as follows:

$$LnY_t = \alpha_0 + \alpha_1 LnK_t + \alpha_2 LnH_t + \alpha_3 LnE_t + U_t$$

We used annual data in exploring the relationship between human capital and economic growth. Its information is according to the time series and duration of this study was in 1971-2011. The main source that is used for the data related to model variables is the Central Bank of Iran (*CBI*).

A number of alternative tests are available for testing whether a series is stationary. Usually augmented Dickey Fuller (*ADF*) and Phillips and Perron [21] tests have been used by researchers. This study used *ADF* test for finding unit roots in time series. An indication of whether the researcher should supplement *ADF* tests by also using the adjustments proposed by Phillips and Perron [21] can be gained by inspection of the diagnostic statistics from the *ADF* regression [22].

This paper applies the autoregressive distributed lag (*ARDL*) approach introduced in Pesaran *et al*. (2001) in order to investigate long-run relationship between stock market development and economic growth in Iran. Traditionally, the cointegration approach has widely been used to establish long-run relationship among certain variables. It is believed that *ARDL* estimation technique has a numerous advantages compared to other integration estimation techniques. The main advantage of *ARDL* is because of it flexibility, which is can be applied irrespective of whether underlying regressors are purely *I(0)*, purely *I(1)* or mutually cointegrated. Another advantage of using the *ARDL* approach is that it performs better than Engle and Granger [23] and Philips and Hansen [24] cointegration test in small samples [25, 26].

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In summary, the *ARDL* procedure involves two stages. At the first stage, cointegration implying existence of a long-run equilibrium relationship between the variables of the model will be test. The second step of analysis of cointegration consists of modeling underlying short-run dynamics leading to the long-run level equilibrium equation.

RESULTS AND DISCUSSIONS

Before conducting any econometric analysis, the time series properties of the data must be investigated. So, we first conduct augmented Dickey Fuller (ADF) test to establish the order of integration for the non- real gross domestic product (*Y*), physical capital (K), educated manpower (*H*), and non- educated manpower (*E*) series. The results of the unit root tests are presented in Table 1. The null hypothesis of unit root is rejected by *ADF* test for *Y, K, H* and *E* series and so are the series non-stationary in the level. We conducted the same test on the first difference of series and found them stationary. As a result, these data series can be characterized as *I(1)* for period of analysis.

Table 1: Results of Unit Root Test.

Series	Order	ADF[1]
LnY	Level	-3.11
	1st difference	-6.23
LnK	Level	-3.13
	1st difference	-5.28
LnH	Level	-2.79
	1st difference	-6.45
LnE	Level	-3.07
	1st difference	-5.20

[1]Augmented Dickey-Fuller unit root test, denotes significance at 5%

The method of cointegration requires that variables be integrated of the same order. The results of the *ADF* stationary test showed that time series data are *I(1).* The *ARDL* model overcomes this problem by introducing bounds testing procedure to establish long-run relationship among variables.

The selection of lag to *ARDL* procedure is very important step. In this condition, maximum lags will be determined by researcher with respect to sample size. Given the Quarterly data available for estimation, we set the maximum lag order of the various variables in the model equal to four. In this study, the lag length criteria was obtain from unrestricted *VAR* estimation results which based on the maximum value of Akaike Information Criterion (*AIC*) and Schwarz Bayesian Criterion (*SBC*). Based on the *VAR* estimation, the maximum value of *AIC* and *SBC* is equal to 2.

First step is to examine the long-run relationship using *ARDL* bound testing procedure, where the non- real gross domestic product (*Y*)is considered to be the dependent variable and the best lag distribution of the independent variables, physical capital (K), educated manpower (H) and is non-educated manpower (E), was modeled.

The results of bounds testing approach for long-run relationship represent that the calculated *F- statistic* is 6.13 which is higher than the upper level of bounds critical value of 5.61 and lower bounds value of 4.38, implying that the null hypothesis of no Cointegration cannot be accepted indicating that there is indeed a cointegration relationship among the variables at 1per cent level of significance. Table 2 compared the *F-statistic* against the bounds calculated value with intercept and no trend.

Table 2*:* ARDL Bound Test to Long-run Cointegration

Test Statistics	Calculated-Value	Lag - order	Significance level	Bound Calculated Value	
				I(0)	*I(1)*
F - Statistics	6.13	2	1%	4.385	5.615
			5%	3.219	4.378
			10%	2.711	3.823

The second stage of an *ARDL* modelling for univariate cointegration test is to estimate the long- run coefficients of model. Table 3 presents the solved static long-run results of the *ARDL* model. The estimated coefficients show that physical capital (K), educated manpower (H) and non-educated manpower (E) have a positive effect on the non- real gross domestic product (*Y*) in long-run, and all the regressors are statistically significant.

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Table 3: Estimated long-run Coefficients the *ARDL* Approach. *ARDL* (0, 1, 0, 2) selected based on Schwarz Bayesian Criterion (Dependent variable is *LnY*)

Regressors	Coefficient	Standard Error	T-Ratio [Prob]
LnK	0.16364	0.068906	2.3748[.022]
LnH	0.15003	0.031574	4.7516[.000]
LnE	0.09827	0.051893	1.9038[.052]
C	11.9577	0.13137	91.019 [.000]
R-Squared	0.997921	R-Bar-Squared	0.99964
DW-statistic	1.7844	F-stat. F(13,46)	12661.5[.000]

The results of a few diagnostic tests indicate that there is no error autocorrelation and conditional heteroskedasticity, and that the errors are normally distributed. This evidence indicates that the relationship between variables is verified (see Table 4).

Table 4: Diagnostic Tests.

Test Statistics	*LM Version*	*F Version*
A: Serial correlation	CHSQ(4) = 0.0526 [.818]	F(1,28) = 0.3787[.125]
B: Functional form	CHSQ(1) = 0.23206[.630]	F(1,28) = 0.1676[.210]
C: Normality	CHSQ(2) = 1.6687[.434]	Not applicable
D: Heteroscedasticity	CHSQ(1) = .88419[.347]	F(1,37) = 0.8583[.402]

A: Lagrange multiplier test of residual serial correlation.
B: Ramsey's RESET test using the square of the fitted values.
C: Based on a test of skewness and kurtosis of residuals.
D: Based on the regression of squared residuals on squared fitted values.

Next, recursive estimation using *CUSUM* and *CUSUM* square tests found that the parameters remain stable over the entire study period because both of the recursive lines are in the bound. These indications clearly illustrated through Fig. 1 and 2.

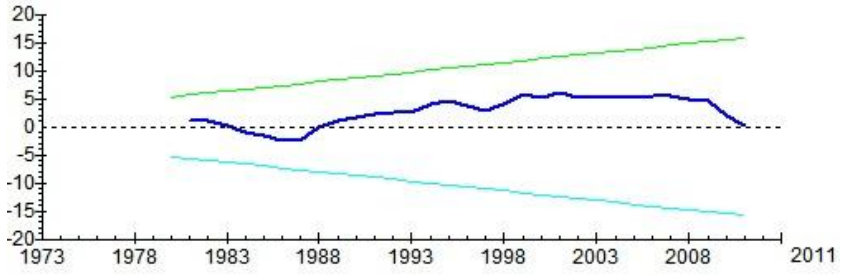

Fig. 1: Plot of Cumulative sum of Recursive Residuals.

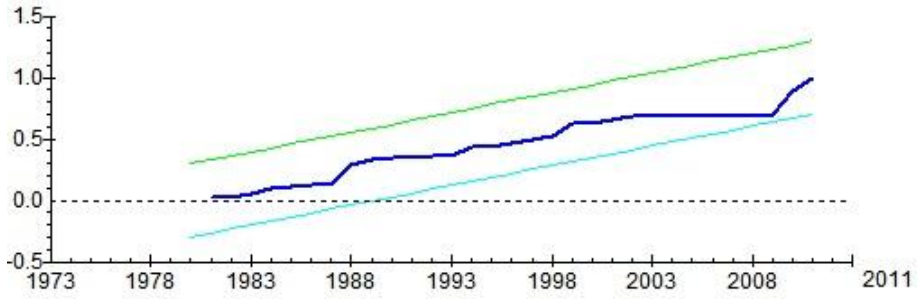

Fig. 2: Plot of Cumulative sum of Squares of Recursive Residuals.

Conclusion:

This article is aimed at finding the impact of human capital development on non- oil economic growth in Iran. It provides a systematic approach to the understanding of the importance of human capital development on non- oil economic growth, using Iran as a case study. The high level of human capital development has increased the utilization of resources both human and material and as expected, there has been a multiplier effect that has led to economic growth in Iran. As a result, a high sense of optimism has emerged concerning the benefits of increased continuous development of human skills and abilities. This eventually spilled over into

socio-economic and development policies, as many analysts and policy makers now believe that human capital development can offer great gains to developing countries of which Iran is a dominant member.

Thus, paper has considered the relationship between human capitals and non - oil economic growth in Iran using cointegration testing. Utilizing annual data from 19971-2011 the results of ARDL bounds test to long-run cointegration showed that long-run relationship between Non - oil economic growth and human capital is verified. Our findings suggest that there exist significant positive relationship between non - oil economic growth and human capital in Iran. Results of this research are similar to results of most researches which have been done abroad and have been mentioned in literature reviews in terms of a positive and significant relationship between human capital and economic growth.

It is obvious from our empirical results that physical capital and educated manpower contribute positively towards the non-oil GDP. The results of this research show that, in order to increase the non-oil economic growth, the economic politicians of the country should pay attention to manpower training in addition to increase of physical capital and employment. Therefore, the increase of educational expenses is regarded as an investment of which results to an increase of the economic growth and welfare of the society.

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