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RELATIONSHIP BETWEEN HUMAN CAPITAL AND ECONOMIC GROWTH EMPHASIZING SOCIALIST AND OIL-PRODUCING COUNTRIES

Abstract

This paper aims to analyze the effect of human capital on economic growth. Linear regression models with ordinary least squares method have been used for the analysis in which the dependent variable of Gross Domestic Product (GDP) per capita growth is decided according to real price and independent variables for human capital are enrollment rate in different education levels and also literacy rate. For control variables, socialist countries and petroleum exporting countries are fed into the regression as dummy variables. The cross-country data of this research are provided and calculated in a sectional manner according to the information and statistics of the World Bank. The results of this research are demonstrative of the positive and statistically meaningful influence of the variables of enrollment rate in secondary schools and literacy level on GDP growth. Countries with socialist backgrounds and petroleum exporting countries also have a positive and meaningful effect on GDP per capita growth.

Keywords

human capital, economic growth, socialism

1. Introduction

Theoretical and experimental studies have shown that human capital resource is also another main source for countries growth rate apart from their physical capital. Human capital includes different attributes like health, knowledge, skill, and other acquired abilities levels, increasing individual productivity and ending in economic growth at a large scale (Mousavi Jahromi, 2000). Adam Smith, the most renowned classical economist believes that education increases people abilities and, in turn, the ability growth calls not only more incomes for the ability owners but also benefits for the society from investigation in them. In Smith's thought, the developed abilities of work force, in fact as a capitalist means, incur increases in the production productivity level (Emadzadeh, 1995). The concept of human capital was first introduced by Schultz in the early 1960's. He won a Nobel prize for his research on education and human capital, better known as the father of human capital. In his eyes, humans acquired abilities are assumed the most important source for productivity growth and economic development. In his studies between 1929 and 1956, he showed that 20 to 40 percent of the US national income was aimed at educational investments (Schultz, 1961). Romer (1986) also divided production agents into physical capital and human capital (work, thought, idea, and knowledge force). He measured the human capital according to the number of education years and the education according to the number of the inventions

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registered in a country. The general concept of Romer analysis is that the human capital level, like education and scientific talent, is in solidarity with the growth rate of income per capita. Psacharopoulos (1986) has conducted comprehensive research in respect of the return rate of education investments in developed and developing countries. His findings resulted in a homogenous pattern of educational returns easily detectable in different places of the world. This pattern is based on that: 1. Developing countries, in comparison to advanced industrial countries, have a relatively higher educational return. 2. The highest rate of the private and social investment return of education is in coincidence with primary education. 3. Men's educational return in primary and higher education is more than women's while women have a higher return in secondary level in comparison. Manikiw, Romer, and Weil (1992) in the article "A Contribution to The Empirics of Economic Growth", first studied the Solo pattern and estimated it for different countries by means of sectional data, then added human capital as one of production agents to the pattern and estimated it for the same countries. In their analysis, work force and capital were used as independent variables. They used the enrollment rate in secondary education as a substitute for human capital and concluded that the human capital variable meaningfully affected the economic growth. Gemmell in his study ''Endogenous Growth, The Solow Model and Human Capital'', has investigated the relationship between human capital and production per capita growth rate. He estimated the MRW model for OECD countries and less-developed countries by means of cross-sectional data during the period of 1960-1985, using students enrollment rate as the human capital variable. The results were indicative that in most of the cases the influence of the secondary and higher education enrollment rate on the production per capita growth rate was statistically meaningful.

Ranis and Stewart (2000) in a study titled, "Dynamic Links Between The Economy and Human Development" look at the mutual relationship between economic growth and human development. It was carried out for 69 developing countries using ordinary least squares method, according to cross-sectional data. They believed that the relationship between economic growth and human development was mutual implying that education could increase economic growth and economic growth paved the path of human development in the society that was demonstrative of a positive and meaningful relationship between economic growth and human development and vice versa. In a word, this study shows that both of these variables could affect each other. Mir Mohammad Sadeghi (1996) in the study, "The Relationship of Education to Economic Growth: A Cross-Country Analysis" estimated the relationship between enrollment rate and Gross National Product (GNP) growth per capita by means of simple linear regression method using sectional data, for 98 countries. In this study, two dummy variables were used for the Organization of the Petroleum Exporting Countries (OPEC) and the East Asian Countries (EAC). The results of this research suggested that the primary and secondary school enrollment rate and GNP growth per capita had a positive and meaningful relationship and the relationship of secondary enrollment rate with economic growth was stronger and its regression better than that of primary enrollment rate. The dummy variable of OPEC changes the intercept of regression downwards in the model and the dummy variable of EAC pulls that upwards. Economic growth and development are among the preliminary and prominent goals of every economic systems, and therefore, the investigation of the factors affecting them is of high importance. The human capital of every country can directly or indirectly affect the economic growth of that country. Economic systems of countries, specially more capitalist or socialist ones, can

also have effects on economic growth. Osipian (2007) in his study Relationship Between Human Capital and Economic Growth in the Former Soviet Union analyzed the role of education in the economic development in the former socialist bloc and the meaningful level of human capital effects on the economic growth per capita in Russia and Ukraine. He used the higher education index with 5-year time lags. All of the independent variables coefficients in this estimation were statistically meaningful and positive. Socialism means the publicization of ownership and its entrustment to the government, thereby arranging a comprehensive economic plan and carrying it out even by force, if necessary (Namazi 2006).

2. Data and analysis method

2.1. Data

In the current study the gross domestic product per capita has been calculated for years 2000-2008 in real price based on the World Bank information and data (2010) . Then, the following method has been used for the calculation of the GDP per capita growth column between the years 2000-2008 (the World Bank, 2010: 396) .

$$\ln Q_i = a + bt \qquad (1)$$

Where, Q_i = GDP per capita in real price for the ith country, t=time (i.e. 2000-2008 in this study), b= GDP per capita growth rate.

The calculated growth per capita has been used as a dependent variable in the regression. Calculations were made for every country in Eviews program. The number of the countries participated in the estimation of regressions was 109 and 76 according to the availability of information and data. The data regarding the primary and secondary school gross enrollment rates was obtained from the information and statistics of the World Bank (2008) for the year 1991 and the data regarding the higher education gross enrollment were obtained from the information and statistics of the World Bank (2010) for 1994. It should be mentioned that enrollment rates have been used with a time lag. The data regarding the literacy rate variable for year 2000 for 76 countries was derived from the information and statistics of the World Bank (2010). Two dummy variables have also been used in this study. One of them is for the countries with socialist backgrounds (21 countries in equation (2) and 16 countries in equation (3)). These countries have experienced socialist systems in their history any way. The other dummy variable is assigned for the petroleum exporting countries including OPEC and non-OPEC countries (34 countries in equation (2) and 23 countries in equation (3)).

2.2. Analysis Method

In order to measure the human capital in this study, literacy level and enrollment rate indices have been used in two linear regression models with sectional data and ordinary least squares method that are shown as follows:

$$Q_{\mathrm{i}} = \alpha + \beta_1 \mathrm{E}_{1\mathrm{i}} + \beta_2 \mathrm{E}_{2\mathrm{i}} + \beta_3 \mathrm{E}_{3i} + \beta_4 D_1 + \beta_5 D_2 + u_i \quad (2)$$

Where, Q_{i}= GDP per capita growth in real price for the ith country, $\mathrm{E}_{1\mathrm{i}}$= primary school gross enrollment rate for the ith country, $\mathrm{E}_{2\mathrm{i}}$= secondary school gross enrollment rate for the ith country,$\mathrm{E}_{3\mathrm{i}}$=higher education gross enrollment rate for the ith country, D_1= dummy index for countries with socialist background, D_2 = dummy index for petroleum exporting countries.

Apart from equation (2) regression equation (3) is also estimated, which is similar to equation (2) with the difference that it uses the literacy rate instead of the enrollment rate.

$$Q_{\mathrm{i}} = \mathrm{a} + \mathrm{b}_1 L_{1\mathrm{i}} + \mathrm{b}_2 D_1 + \mathrm{b}_3 \mathrm{D}_2 + \mathrm{u}_{\mathrm{i}} \quad (3)$$

Where, Q_{i}= GDP per capita growth in real price for the ith country, $L_{1\mathrm{i}}$= literacy rate among over 15-year-olds in the ith country, D_1 = dummy index for countries with socialist experience, D_2= dummy index for petroleum exporting countries.

Given that in many studies based on cross-country data heteroskedasticity problem occurs, in the current study White test has been used, in Eviews program, in order to identify the occurrence of heteroskedasticity, which is one of the methods for heteroskedasticity identification. This test uses a secondary regression in which, in addition to the model variables, the squares and productions of the independent variables are also used and the F-statistic is also extracted. If F-static probability is smaller than 5%, the hypothesis of the non-existence of heteroskedasticity is disproved. This test was run for both of the models that the hypothesis was proved in equations (2) and (3). In other words, the heteroskedasticity problem was not found in any of the equations. In the current study, in addition to the foregoing test, Wald test was also used for the insertion of limitation on the regressions coefficients. In this test, by replacing zero for the coefficient of each variable its presence or its absence is approved. In equations (2) and (3) given the F-statistics and the Wald test result that is below 5%, the hypothesis of the zero equivalence of all the coefficients is disapproved in both of the equations. In other words, the presence of all of the variables in both of the regression equations is approved.

3. Results

The results of this research are represented as two separated descriptive and analytic results in the following.

3.1. Descriptive Results

The descriptive information concerning the under study samples and the coefficients used in equations (2) and (3) have been shown in Table 1.

Variables	Equation(2)				Equation(3)			
	Max	Min	Average	Standard Deviation	Max	Min	Average	Standard Deviation
GDP per capita growth, 2000-2008	15/7	- 1/3	3/55	2/56	15/7	0/2	4/04	2/53
Primary school gross enrollment rate, 1991	131	27	94/08	21/39				
Secondary school gross enrollment rate, 1991	119/5	5/1	62/79	32/14				
Higher education gross enrollment rate, 1994	90	1	21/78	18/64				
Literacy rate, 2000					100	16	80/61	21/10
Dummy variable of socialist countries	1	0	0/19	0/39	1	0	0/21	0/41
dummy variable of petroleum exporting countries	1	0	0/31	0/46	1	0	0/30	0/46

Table 1. *The descriptive information of the coefficients used in equations (2) and (3)*

As the information in table 1 shows the average of socialist countries is 19 percent in equation (2) and 21 percent in equation (3). The average of petroleum exporting countries is also 31 and 30 percent in equations (2) and (3), respectively. The average of enrollment rate in primary, secondary, and higher education is 94.08, 62.79, and 21.78 percent, respectively, in equation (2) and the average of literacy rate in equation (3) equals 80.61 percent. Also, the average of GDP per capita growth rate during the years 2000-2008 has been calculated 3.55 percent in equation (2) and 4.04 percent in equation (3).

3.2. Analytic Results

The estimation results of equations (2) and (3) have been shown in table 2.

Variables	**Estimated coefficients of equation (2)**	**Estimated coefficients of equation (3)**
Primary school gross enrolment rate, 1991	a [- 0/005] b(- 0/456)	
Secondary school gross enrolment rate, 1991	**[0/027] (2/434)	
Higher education gross enrolment rate, 1991	***[- 0/053] (3/143)	
Literacy rate, 2000		* [0/021] (1/695)
Dummy variable of socialist countries	***[3/185] (5/906)	***[3/095] (4/846)
Dummy variable of petroleum exporting countries	** [1/375] (3/039)	* [0/958] (1/786)
R^2	0/371	0/366
Adjusted R^2	0/340	0/340
F-Statistic	***12/160	***13/893
D-W	2/095	1/875
n	109	76
Intercept	** [2/440] (2/655)	* [1/393] (1/438)

***Meaningfulness probability at 1% level, **meaningfulness probability at 5% level, *Meaningfulness probability at 10% level

a- The numbers inside brackets represent the β coefficient for each variable

b- The numbers inside parentheses represent the t-statistic for each variable

Table 2. The estimated results of equations (2) and (3), dependent variable: GDP per capita growth

The estimated results of equation (2) (Table 2) show that the estimated coefficient for the secondary school enrollment rate is positive and statistically meaningful. But, the estimated coefficient for the primary school enrollment rate is not statistically meaningful. In equation (3) (Table 2) the literacy level variable coefficient is positive and statistically meaningful. The dummy variables of the countries with socialist system backgrounds and petroleum exporting countries are also positive and statistically meaningful in both equations (2) and (3). It is mentionable that the negativity of the variable coefficient of the higher education enrollment rate in equation (2) was not expected. The interactions of the independent variables in equations (2) and (3) were also added to the independent variables in other

regressions, however, all of their estimated coefficients were statistically nonmeaningful. The results of this study in terms of the effects of human capital on the economic growth rate are coincident with the studies by Manikiw, Romer, and Weil (1992), Jamal (1995), and Rise and Stewart (2000), in terms of the meaningfulness of the model coefficients. These results also show consistency with MirMohammad Sadeghi's researches (1996) except for about the primary school enrollment rate variable. The coefficient of this variable was statistically meaningful in MirMohammad Sadeghi's research (1996) while it is not meaningful in the present study. Also, the results of the present study are not consistent with Osipian's studies (2007) in terms of the positivity of the higher education enrollment coefficient.

4. Conclusion

Based on the results of this study it could be concluded that the effect of the secondary school enrollment rate and literacy level variables on GDP growth is positive and statistically meaningful. The estimated coefficient for higher education has also become meaningful with minus mark. The estimated coefficient for the primary school enrollment rate is not statistically meaningful. Also, the countries with socialist system backgrounds and the petroleum exporting countries have a positive and meaningful influence on the GDP per capita growth. However, the dummy variable of the countries with socialist background increases the intercept of the estimated regressions more than the dummy variable of the petroleum exporting countries.

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