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# The Effect of Schooling Enrolment Rates on Economic Sustainability

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**Abstract**

This paper studies the effects of human capital on economic sustainability. Education is one of the most important factors that stimulate human capital. Thus previous studies supported that educated work force have important contributions on economic growth. And also many studies have pointed out that human capital has an impact on firm competitiveness which leads economic performance. In this study, the relationship between human capital and economic growth will be examined by using enrolment rates at different levels of schooling for human capital and Gross Domestic Product (GDP) for sustainable economic growth.

*Keywords:* Human Capital, Endogeneous Growth Theory, Economic Sustainability



## 1. Introduction

This paper analyzes the importance and growing role of human capital and education on Turkey's economic growth. Economic growth continues to be one of the most important topics of economy's sustainable development. Economic sustainability seeks to maximise the flow of income or consumption that could be generated while at least maintaining the stock of assets (or capital) which yield these beneficial outputs. Economic efficiency plays a key role in ensuring both efficient allocation of resources in production, and efficient consumption choices that maximise utility (p:152; Islam, Munasinghe, Clarke,2003). The primary focus of the world economy and the nations' is to accelerate the growth rate. Because of this reason it is important to understand the nature and causes of economic growth. There are three factors or components which plays an important role on economic growth. The first one is capital accumulation, including all new investments in land, physical equipment, and human resources. The second one is growth in population and hence eventual growth in the labor force. The third one is the technological progress (Todaro, 1997). A major topic within the area of economic growth is the study of technology diffusion. It is well recognized that technology differences across nations, industries and firms are the main sources of productivity differences and there has been much advance in models of endogenous innovation and technology (Acemoglu, 2012). Capital accumulation results when some proportion of present income is saved and invested in order to augment future output and income.

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New factories, machinery, equipment, and materials can increase the capital stock of a nation. Similarly, investment in human resources can improve its quality and thereby have the same or even a more powerful effect on production (Todaro, 1997).

There are three main theories related to economic growth. The neo-Keynesian Harrod-Domar model, the Solow-Swan neoclassical model and Endogenous growth models. Roy Harrod (1939, 1948) and Evsey Domar (1946,1947) independently developed theories that relate an economy's rate of growth to its capital stock. While Keynes emphasized the impact of investment on aggregate demand, Harrod and Domar emphasized how investment spending also increased an economy's productive capacity (Snowdon and Vane, 2005). In neoclassical growth models such as Solow (1956), a country's per capita growth rate tends to be inversely related to its starting level of income per person. Solow model highlights the impact on growth of saving, population growth and technological progress in a closed economy (Snowdon and Vane, 2005). Later on Paul Romer (1986,1987) and Robert Lucas (1988) developed alternative models of growth where the long-run growth of income per capita depends on investment decisions which is called endogenous growth models. The Solow model try to explain per capita income level and growth differences assuming that technology is a public good and therefore freely available to all countries.

Romer emphasizes the importance of technological change such as Solow (1956). Romer in his (1996) paper pointed out three important factors related to endogenous growth models. The first one is technological change which lies at the heart of economic growth. According to him technological change provides the incentive for continued capital accumulation, and together, capital accumulation and technological change account for much of the increase in output per hour worked. The second premise is that technological change arises in large part because of intentional actions taken by people who respond to market incentives. Thus the model is one of endogenous rather than exogenous technological change. The third and most fundamental premise is that instructions for working with raw materials are inherently different from other economic goods. Once the cost of creating a new set of instructions has been incurred, the instructions can be used over and over again at no additional cost. Developing new and better instructions is equivalent to incurring a fixed cost.

The research of economists shows that successful economies are those with high rates of accumulation of human and physical capital together with sustained technological progress. Figure 1 highlights the fundamental determinants of economic growth and as shown in the figure output being directly influenced by an economy's endowments of labour ($L_t$), physical capital ($K_t$), natural resources ($N_t$) and the productivity of these resources ($A_t$)

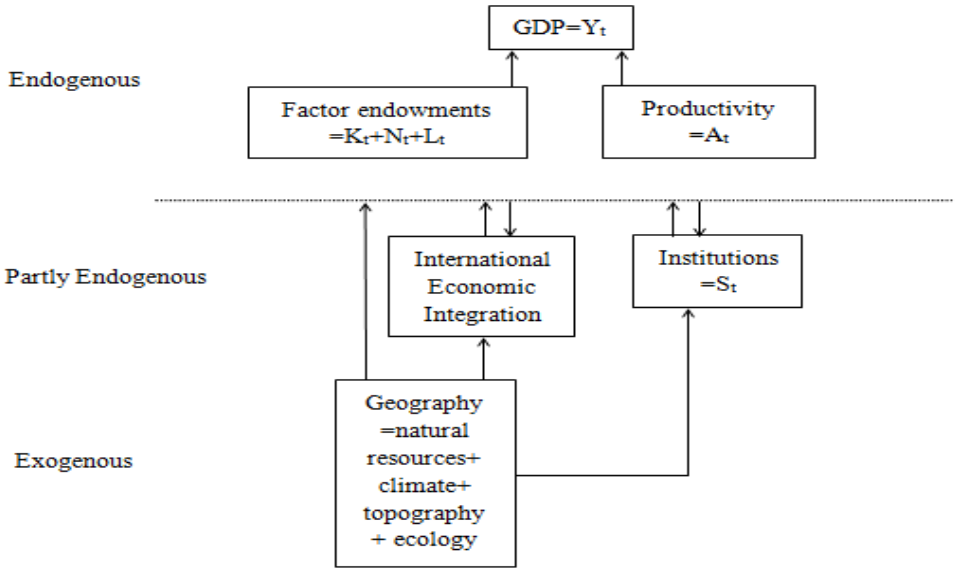


**Figure 1**Proximate and fundamental sources of growth (Snowdon and Vane, 2005)

Academicians not only need a theoretical framework for understanding the causes of growth, they also require a method of calculating the relative importance of capital, labour and technology in growth experience of actual economies (Snowdon and Vane, 2005). Recent developments in theory supports that, one of the key driver for economic growth in global economies is human capital. The aim of this paper is to investigate the basis for the link between human capital and economic growth.

The article proceeds in the following manner. First, we briefly review the literature regarding and identify the definitions of the human capital. In the second part we point out the effects of human capital on economic growth. Then we analyze the theoretical framework by applying econometric model. Lastly we conclude by discussing the findings.

## 2. Literature Review

### *2.1. Human Capital*

The economy literature suggests that human capital or average years of schooling of labor force, enhances total factor productivity (TFP). According to researchers (Romer, 1990 a,b; Aghion & Howitt, 1998) human capital affects TFP growth by facilitating the adoption and implementation of new technology developed exogenously and/or by promoting the domestic production of technological innovations (Wei & Hao, 2011). The presumption is that an educated labor force is better at creating, implementing and adopting new technologies, thereby generating growth (Benhabib, Spiegel, 1994).

What is human capital? Human capital is widely used concept with varying and interchangeable definitions in such areas like management, economy and information technology. In management literature human capital represents the individual knowledge stock of an organization by its employees (Bontis, 2001; Youndt et al, 2004). According to Skandia(1996), human capital is accumulated value of investments. However, Hudson (1993) claimed that combination of genetic heritance, education, experience, attitude about life and business can be defined as human capital on individual level.

On the other hand, Schultz (1961) and Becker (1962, 1964) known economy authors formalized the theory of human capital in 1960s from the macroeconomic development theory. According to Becker (1993) human capital activities occurs formal education, off-the-job training (general human capital) and on the job training (specific human capital). He argues that

"…schooling, a computer training course, expenditures on medical care and lectures on the virtues of punctuality and honesty are capital too in the sense that they improve health, raise earnings or add person's appreciation of his/her lifetime. Capital traditionally defined to say that expenditures on education, training, and medical care, etc., are investment in capital. However these produce human, not physical or financial, capital because you cannot separate a person from his or her knowledge, skills, health, or values..."(p:15)

These are not simply costs but investment with valuable returns that can be increase economic growth. Besides other economy scholar Schultz (1993), explained "human capital" a key element in improving a firm assets and employees in order to increase productive as well as sustain competitive advantage. Human capitals refer to processes that relate to training, education and other professional initiatives in order to increase the levels of knowledge, skills, abilities, values, and social assets of an employee which will lead to the employee's satisfaction and performance, and eventually on a firm performance.

### *2.2. Human Capital and Economic Growth*

In literature there are two different thoughts about the effects of human capital on economic growth. The Lucasian models supports that the level of output depends on the level of human capital, because human capital is an input, just like any other input. So the growth rate of output depends on the growth rate of human capital. This means to get more output you should have more input. The other view is Nelson-Phelps approach and it supports the idea that

human capital is not an input just like any other but human capital is the primary source of innovations. Thus the growth rate of output will depend on the rate of innovation and hence the level, rather than the growth rate, of human capital (Aghion and Howitt, 1998).

Previous growth studies underline human capital accumulation as key factor in country's long run economic performance. In this context there are numerous studies investigating empirically returns from human capital on economic development. Extensive research carried on the subject however remains uncertain about the level of influence and impact of human capital to economic growth. The uncertainty rises from the methodological difficulties in measuring human capital and different estimation procedures used in the analyses (Škare, 2012).

One of the most known research is Barro's (1991) cross-sectional study, which involving 98 countries found a positive relationship between enrolment rates and growth, while the role of initial GDP per capita was negligible for flexible enrolment rates. On the other hand, when enrolment rates were held constant, the correlation between per capital growth and initial GDP became negative.

Another study done by Lau, Jamision and Lou in 1991. Schoolars examine the role of education in economic growth in developing 58 countries from 5 different regions (East Asia, South Asia, Africa, Latin America, Middle East and North Africa (MENA)) and; uses different human capital indicators. In general, the study asserts that there are significant differences among regions in the context of the role of education on economic growth. It is found that the average years of primary education plays a key role for African and East Asian countries.

Mankiw, Romer and Weilin (1992) used the proportion of working age population as a proxy for human capital extending the Solow growth model framework to evaluate human capital impact on growth. Their results offer evidence on a direct and robust impact of human capital on growth (Škare, 2012).

In addition Petrakis and Stamakis (2002) investigate the effect of human capital on growth in three groups of countries that exhibit significantly different levels of development. They conclude that development levels of countries associate positively with human capital stocks. The empirical findings of the cross-country data sets suggest that the link between growth and education varies as a result of different levels of economic development.

Moreover, Agiomirgianakis and friends (2002) examine the contribution of schooling rates to economic growth for a sample of 93 countries by employing a dynamic panel analysis. Results suggested a positive and significant correlation between education and economic growth. But, most important conclusion is the higher the level of education, the higher is the contribution from education on economic growth.

Another research is Škare's (2012), he analyzed relationships between human capital and GDP growth in Croatia which is newborn economy emerging in 1990. Results showed that human capital in Croatia was the second most important engine of growth, and that output is elastic to change human capital stock.

On the other hand, Benhabib and Spiegel (1994) find no evidence on positive and robust influence of human capital on economic growth. After they introduce an alternative model in which human capital influences the growth of total factor productivity, they obtain more positive results. In alternative model human capital affects growth in two mechanism: first, human capital levels directly influence the rate of domestically produced technological innovation, second the human capital stock affects the speed of adoption of technology from abroad.

There are a limited number of empirical studies focusing on the linkage between human capital and economic growth for the Turkish economy. The first group of these studies explores the linkage by analyzing the relationship between education and wages on the basis of micro-level data. The second group uses sectoral or industry level data and tests the significance of a number of human capital indicators on output growth or productivity (Saygılı, Cihan and Yavan, 2005).

Güngör (1994) study investigates the role of education on industrial economic growth for 67 provinces in Turkey by employing a production function. According to the results educational attainment of the workers employed in industry has a positive and significant effect on industrial output in the period 1980-90. Another research done by

Kar and Ağır (1998), which aims to analyze the causal relationship between human capital and economic growth in the period 1926-1994 in Turkey. Their analyses show that there is a causality relation between human capital and economic growth. Besides, Saygılı and his colleagues (2005) examine empirically the validity of the human capital-productivity growth linkage for a panel of 50 countries from different levels of development. Their analysis covers the period 1981-2002 and uses the average years of education of the labour force and schooling rates for different education levels as proxies for human capital.

The educational achievement of a society, usually referred to as the "human capital stock" plays an important role in economic growth. Because of this reason the effects of the level of human capital and the accumulation of human capital, which means how much the level of education is increasing over time, must be well distinguished. (Aghion and Howitt, 1998). Dias and Tebaldi figure out that human capital growth has a positive impact on the growth rate. But the most important point is that the positive relationship between the human capital and economic growth observed in the second lag. The coefficients of the current period and the first lag give insignificant results. The results obtained in this study indicates that human capital accumulation affects growth rate in the long-run, and this implies that it takes some time fort the increase in human capital to affect economic growth (Dias and Tebaldi, 2012).

Figure 2 shows the numbers of educated people in different levels in the labour force in Turkey. As shown in the figure both primary education, secondary education and high education numbers are increasing since 2000. Also figure 3 shows the total number of educated people in the labor force in Turkey and again it can be seen that it is increasing since 2004.

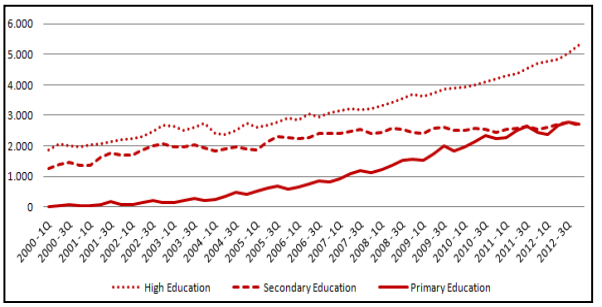


**Figure 2** Education Level

**Source:** www.tuik.gov.tr

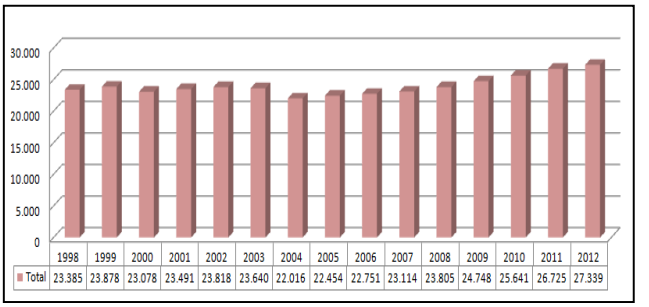


**Figure 3** Total Number of Educated Labor Force

**Source:** www.tuik.gov.tr

## 3. Methodology

### *3.1. Research Goal*

In this research, the effect of human capital on economic growth will be tested. According to the prior studies, schooling enrolment rates are the major instruments for human capital. Consequently these parameters will be used to test the hypothetical model. In this context, these variables will be explored from, Turkish Statistical Institute. On the other hand Gross domestic product (GDP) is an economic indicator for countries. GDP data is gathered from Turkish Statistical Institute. Therefore this paper aims to investigate how the changes in human capital influence gross domestic product. Most of the studies in literature show that there is a strong correlation between human capital and GDP of a country. Because of this reason, in this study it is expected that there is a positive relationship between human capital and GDP in Turkey.

**The Model is then:**

$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + u$

The Variables:
$Y_t$ is the gross domestic product (GDP) in Turkey.
$X_{1t}$ is the population growth in primary education in the labor force inTurkey.
$X_{2t}$ is the population growth in secondary education in the labor force inTurkey.
$X_{3t}$ is the population growth in high school education in the labor force inTurkey.

The method used in this paper is a special case of the instrumental variable technique which is named *Two-Stage Least Squares (2TSLS)*. *"Two-Stage Least Squares (2TSLS)* is a method of systematically creating instrumental variables to replace the endogenous variables where they appear as explanatory variables in simultaneous equations system" (Studenmund, 2006). In 2TSLS, instrumental variables are used. And a good instrumental variable is one that is highly correlated with the regressor and acting as an instrument (Kennedy,1998). An instrumental variable replaces an endogenous variable; it is a good substitute for the endogenous variable and is independent of the error term. Since there is no joint causality between the instrumental variable and any endogenous, the use of instrumental variable avoids the violation of the assumption that all explanatory variables are uncorrelated with the error term (Studenmund, 2006).

2TSLS consists of two stages:
**Stage 1**: Each endogenous variable acts as a regressor in the equation, estimated on all the exogenous variables in the system of simultaneous equations, and calculates the estimated values of these endogenous variables.
**Stage 2:** Using these estimated values as instrumental variables for these endogenous variables or simply using these estimated values and the included exogenous variables as regressors in an OLS regression (Studenmund, 2006).

**Table 1**Test Results

| **Dependent Variable** | | | **Variables** | |
|---|---|---|---|---|
| ***Log(GDP)*** | | ***dlog(primary)*** | ***dlog(secondary)*** | ***dlog(high-school)*** |
| **Coefficients** | | 0.2604*<br>(3.6422) | 2.1914*<br>(3.3415) | 1.1489**<br>(2.1587) |
| **$R^2$** | 0.65 | **Adjusted $R^2$** | 0.62 | |
| **F-Statistic** | 33.95 | | | |
| **DW-Stat.** | 2.73 | | | |

* Significance at 1% level ** Significance at 5% level

Before applying two stage least square analyses we used the Augmented Dickey-Fuller (ADF) test and examined the stationarity of the series. Augmented Dickey Fuller test results of all the dependent and independent variables shows that gross domestic product and the variables of primary, secondary and high-school education levels are both stationary at their second difference. These findings suggest that the relationship between human capital and economic growth implies a positive relationship in the long run. This results also supported by the findings of the study of Dias and Tebaldi (2012), who observed the relationship between human capital and growth.

Table 1 presents the test results. Based on regression results the explanatory power of the model is significant ($R^2$=0.65) and there is no autocorrelation (DW=2.73). According to this model the coefficient of primary education *(dlogprimary)* is positive and significant at the 1% level. On the other hand the coefficient of secondary education *(dlogsecondary)* is positive and significant at the 1% level and the coefficient of the high school education *(dloghigh-*

*school)* is positve and significant at the 5% level. The results show that there is a positive relationship between the school enrollment rates and GDP.

## 4. Conclusion

The goal of the study is to examine the effects of human capital on economic growth as stated by endogenous growth models. Our findings support the findings of a majority of other relevant studies that human capital contributes significantly to economic growth (Barro,1991; Benhabib et al,1994; Mankiw et al,1992; Lau et al., 1991; Petrakis et al., 2002; Agiomirgianakis et al.,2002; Škare, 2012). There is positive relationship between human capital measures at primary, secondary and high level education and economic growth, which means if there is increase in human capital investment at this level of education; it helps to increase economic growth. The results shows that the relationship between human capital and economic growth is a long-run relationship. Due to the lag differences as Dias and Tebaldi pointed out in their study human capital accumulation affects growth rate in the long-run, and this implies that it takes some time fort the increase in human capital to affect economic growth. Consequently one of the ultimate aim of the countries should be to invest in the human capital (education) to improve the life standards of their citizens.

## References

Acemoglu, Daron. (2012), Introduction to economic growth, 147, pp.545-550

Aghion, P. and Howitt, P. (1998), **Endogenous Growth Theory**. The MIT Press, London.

Agiomirgianakis, G., Asteriou, D. and Monastiriotis, V. (2002), "Human Capital and Economic Growth Revisited: A Dynamic Panel Data Study", *International Advances in Economic Research*, 8 (3), 1977-87.

Barro, R. J. (1991), "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, 106 (2), 407-43.

Becker, G. S. (1993), **Human Capital, A Theoretical and Emprical Analysis with Special Reference to Education.** The University of Chicago Press, 3rd ed., Chicago and London.

Becker, G.S. (1963), "Investments in human capital: a theoretical analysis", *Journal of Political Economy*,Vol. 70, pp. 9-44.

Benhabib J., Spiegel M.M., (1994), "The role of human capital in economic development evidence from aggregate cross-country data", *Journal of Monetary Economics*,Volume 34(2), 143-173.

Bontis, N. (1998). "Intellectual Capital:An Exploratory Study That Develops Measures and Models*", Management Decision*, 36(2),3-76.

Bontis, N., (2001) Assesing Knowledge Assets: A Review of the Models Used to Measure Intellectual Capital, *International Journal of Management Reviews*, 3( 1) .

Dias, J., Tebaldi, E., (2012), Institutions, human capital, and growth: The institutional mechanism, *Structural change and Economic Dynamics*, 23, 300-312.

Islam S.M.N, Mohan Munasinghe, M.and Clarke M(2003), "Making long-term economic growth more sustainable: evaluating the costs and benefits", *Ecological Economics,* 47,149– 166.

Hudson W.(1993), **Intellectual Capital: How to Build It, Enhance It, Use It**. New York: Wiley

Lau, J. L., Jamison, D. T. and Louat, F. F. (1991),"Education and Productivity in Developing Countries", *World Bank Working Paper Series*, No. 612.

Marımuthu, M.; Arokiasamy,L; Ismail, M., (2009),"Human Capital Development and Its Impact on Firm Performance: Evidence from Developmental Economics", *The Journal of International Social Research,*Volume 2 (8), 265-272.

*METU Studies in Development*, 32 (December), 489-516.

Petrakis, P.E. and Stamatakis, D. (2002), "Growth and Educational Levels: A Comparative Analysis", *Economics of Education Review*, 21 (5), 513-21.

Romer, P.M. (1990), "Endogenous Technological Change", *Journal of Political Economy,* October

Saygılı,Ş., Cihan, C., Yavan, Z.A.(2005), "Human Capital and Productivity Growth: A Comparative Analysis of Turkey"

Schultz, T. (1993), "The economic importance of human capital in modernization", *Education Economics*, Vol. 1 (1), pp. 13-19.
Skandia (1996), **Power of Innovation: Intellectual Capital Interim** Annual Report Supplement.
Škare, M. (2011), "How important is human capital for growth in reforming economies?", Technological and economic Development of Economy, Volume 17(4): 667–687.
Snowdon, Brian and Vane, Howard R. (2005), Modern Macroeconomics Its Origins, Development and Current State, Edward Elgar Publishing Ltd., United Kingdom
Solow, Robert M. (1956), A Contribution to the Theory of Economic Growth, Vol.70, No.1, pp.65-94.
Todaro, Michael P. (1997), Economic Development, Sixth Edition, Addison Wesley Longman Limited, England.
Wei,Z. And Hao,R. (2011). "The role of human capital in china's total Factor productivity growth: A cross-province analysis", *The Developing Economies* 49(1),1-35.
Youndt, M.; Subramaniam, M.; Snell, S. A.(2004), Intellectual capital profiles: An examination of investments and returns, *Journal of Management Studies,* 41(2), pp. 335-361.